

THE IMPLEMENTATION OF TECHNOLOGICAL AIDS AND ERP SOLUTIONS

In the Manufacturing
Industry in Kenya

Research conducted by Strathmore University
In partnership with SYSPRO



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Foreword

The manufacturing sector has a major role to play in Kenya's economic development, with a projected 20% contribution to the GDP by 2022 (according to the government's Big Four action plan). Because it currently makes up only 9.2% of the GDP, the sector has a very short period to achieve this ambitious goal.

This study has explored the productivity and competitiveness of the manufacturing sector in Kenya, as well as the role of new technologies in improving the sector and the state of adoption and use of these new technologies.

ICT adoption has been identified as a key factor that can increase the competitiveness of Kenya's manufacturing sector within both local and export markets. However, there is need to have a workforce with the knowledge and skill to implement the relevant technologies. Access to the latest technology solutions and financial resources to acquire these technologies are also indispensable.

The study was carried out through a collaboration between Strathmore University and SYSPRO (a leading ERP solution provider for manufacturers). Partnering with a leading academic institution allowed SYSPRO to tap into new audiences, to which it would not normally have access.

SYSPRO recognises the importance of knowing its market. This knowledge will allow the company to remain at the cutting edge of ERP solutions for manufacturers.

It is our sincere hope that this report provides a good foundation for its readers to understand the challenges and opportunities within manufacturing in Kenya, and enables stakeholders to collaborate in finding solutions that will move the industry closer to its goals.

Mark Wilson,

Managing Director,

SYSPRO Africa.

Preface

I am pleased to present this report on the implementation of technological aids and ERP software in the manufacturing industry in Kenya. Several prior studies have indicated that manufacturing sector has the potential to put Kenya on a higher economic growth path.

However, the sector not lived up to this potential. Its growth still trails that of the overall economy, and its contribution to GDP and merchandise exports has stagnated.

From the data presented and analysed in this report, three vital factors stand out as being responsible for the dismal performance of the manufacturing sector. These are the poor state of the automation and software adoption; a lack of technical skills to fully support development and growth; and the high cost of capital financing in the sector.

Stakeholders in the manufacturing sector must work to address these challenges in order to grow the sector. This must be done urgently if the manufacturing industry is to become the crucial engine for sustaining economic growth and development, job creation and poverty alleviation that it has been identified to be.

It is my hope that this report will be an effective resource for manufacturing sector investment decisions and stakeholder policy interventions, as well as a solid foundation for future research pursuits.

Prof Ismail Ateya Lukandu,

Principal Investigator

Acknowledgments

At the outset, I would like to sincerely thank SYSPRO for commissioning this study and generously supporting it to conclusion.

I would also like to thank everyone who worked tirelessly to bring the project to a successful end. I thank my co-principal investigator, Prof Reuben Marwanga. Throughout the project, he worked assiduously to address technical issues, which arose constantly.

It was also my honour to work with Mr Patrick Shabaya and Ms Florence Nyongesa for the tiresome preparations and review of several documents and data analysis. Most notably, I thank them for continuously working with the data collection team as they surveyed organisations across three counties. Their work made the interpretation and presentation of the results from of 96 participants much easier.

The main data collection team was made up of Ms Elizabeth Owino, Ms Dephine Otieno, Mr Willis Nyabuto, Mr Moses Gichana, Mr Sephaniah Obanda, Mr Joseph Mungai, Mr Vincent Michieka and Ms Annefelicitas Ojowa. Their tireless efforts yielded high quality data from which we have gained the insights presented in this report. To all of them, I express my deep gratitude.

I would also like to thank the Strathmore University Institutional Review and Ethics Committee (SU-IERC), the National Commission for Science, Technology and Innovations (NACOSTI) and County Education Officers of Nairobi, Kiambu and Machakos Counties for the approvals and permits that facilitated the study. The organisations from which data was collected are also particularly deserving of my gratitude.

Special thanks go to the Communications and External Relations Office and Research Services Office, and other departments at Strathmore University for their internal support.

Finally, I would also like to sincerely thank the Greydale Marketing and Communications Consultancy team for their continuous linkage with SYSPRO and their support on the dissemination of the research findings.

About SYSPRO

SYSPRO is a global, independent provider of industry-built ERP software designed to simplify business complexity for manufacturers and distributors. Focused on delivering optimised performance and complete business visibility, the SYSPRO solution is highly scalable, and can be deployed on premise, in the cloud, or accessed via a mobile device.

SYSPRO's strengths lie in a simplified approach to technology, expertise in a range of industries, and a commitment to future-proofing customer and partner success. SYSPRO has more than 15,000 licensed companies in over 60 countries across six continents. For more information, visit www.syspro.com.

About Strathmore University

Strathmore University is chartered private university in Nairobi, Kenya. It seeks to become a leading outcome-driven entrepreneurial research university by translating its excellence into a major contribution to culture, economic well-being and quality of life. It provides an all-round quality education in an atmosphere of freedom and responsibility, excellence in teaching, research and scholarship, ethical and social development and service to the society. Visit www.strathmore.edu to learn more.

Executive Summary

Kenya is striving to boost the performance of its manufacturing sector. The sector has been identified as a priority sector to drive the realisation of the Kenya Vision 2030. Furthermore, the current government's Big 4 Agenda aims to revamp the sector to accelerate economic growth, create jobs and reduce poverty.

According to the World Bank, a robust, diversified and globally competitive manufacturing sector can, without a doubt, contribute significantly to increasing the economic growth of the country.

However, according to the study whose results are presented in this report, it can safely be concluded that the manufacturing sector has not lived up to its full potential, with its growth trailing that of the overall economy, and its contribution to GDP and merchandise exports having stagnated.

For this study, respondents from 96 companies across 12 sectors of the manufacturing and 3 counties were interviewed. One of the major factors identified as a hindrance to growth is the state of the automation in the sector.

The study showed that 83% and 11% of manufacturers currently use semi-automated and fully automated production processes respectively. 6% of the manufacturers still rely on fully manual and outdated production processes and units. Furthermore, almost the 10% of the manufacturers do not use any hardware or machinery for production.

63% of the manufacturers surveyed had installed Enterprise Resource Planning (ERP) systems while 33% did not use any. This is in stark contrast to the global competitors, which rely heavily on ERP systems to reduce production costs and increase productivity.

On a positive note, 53% of the studied businesses have plans to upgrade their hardware and software in the next 2-3 years. This is particularly encouraging since, according to Overseas Development Institute (ODI), an independent thinktank, digitalisation is key to the competitiveness of African countries as labour costs become less important.

The growth of the manufacturing sector between 2013 and 2016 was 3.8%, according to the Kenya National Bureau of Statistics (KNBS). This is much lower than the overall economic growth of the country, which stood at 5.7% in the same

period. In addition, the sector's share of GDP has been on a downward trend, from 13.6% in 1994, to 10% in 2004, and 9.2% in 2016.

This study found out that if a typical manufacturer ran production for 24 hours a day, it would take three months to complete the work it currently does in a year. This is because most operate for less than eight hours a day for five days a week, meaning that they only produce for 76 days each year.

On top of this, the study also found that only about 46% of companies run for a full eight hours a day. The rest run for between six to eight hours. Moreover, 50% of the companies run for three to five days a week. This is a stark contrast to the country's quest to become a 24-hour economy.

Another important finding of the study was that there is lack of technical skills to fully support the growth of the manufacturing sector. About 62 respondents concurred that the local manufacturing sector cannot compete with counterparts in developed countries, which have an advanced education and training system.

The World Economic Forum (WEF) has pointed out that the Kenyan labour problem is one of both quantity and quality. The education system produces too few workers with the skills that industry needs.

Additionally, Kenyan students lack practical experience when they graduate. This is because universities and polytechnics often have outdated equipment. 54% of the manufacturers studied identified apprenticeship, graduate internships and technical courses in universities as means to close the skills gap in the near term.

The report further states that there is a need to be urgently address the high cost of capital financing, which remains a major hurdle that has adversely affected business operations in the last 2-3 years. Most of the manufacturers rely of self-financing, in the form of bank loans, invoicing and shares, to expand production, hence their reliance on outdated production units. This is due to difficulties in accessing access mainstream funding.

It is therefore clear that, to grow the manufacturing sector, the level of automation must be increased, appropriate technical skills must be developed, and access capital financing must be eased.

List of Abbreviations and Acronyms

B2B	Business-to-Business
B2C	Business-to-Customer
CIO	Chief Information Officer
COMESA	Common Market for Eastern and Southern Africa
CRMs	Customer Relations Management System
EAC	East African Community
EPZ	Export Processing Zones
ERP	Enterprise Resources Planning
EU	European Union
FDI	Financial Direct Investment
GDP	Gross Domestic Product
GOK	Government of Kenya
ICTs	Information and Communication Technologies
IoT	Internet of Things
IP	Intellectual Property
KAM	Kenya Association of Manufacturers
KEMSA	Kenya Medical Supplies Authority
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KITP	Kenya Industrial Transportation Programme
KNBS	Kenya National Bureau of Statistics
LCM	Light Commercial Vehicles
MSEs	Micro and Small Enterprises
MTP	Medium Term Plan
R&D	Research and Development
ROI	Return on Investment
SEZ	Special Economic Zones

SMEs	Small and Medium Enterprises
SPSS	Statistical Package for the Social Sciences
VAT	Value Added Tax

Definition of Terms

Micro-, Small- and Medium-sized Enterprises (InfoDev Documents, 2019):

The World Bank Group definition includes three sub-categories:

1. Micro-enterprise: up to 10 employees; total assets/total annual sales of up to US\$100,000; turnover must be in excess of US\$400,000, and tangible assets in excess of US\$200,000;
2. Small enterprise: between 10 and 50 employees; total assets/total annual sales between US\$100,000 and US\$3 million;
3. Medium-sized enterprise: between 50 and 300 employees; total assets/total annual sales between US\$3 million and US\$15 million.

CHAPTER 1: INTRODUCTION

1.1 Background

Kenya has set an ambitious development plan presented in Kenya Vision 2030 that has aimed to create “a globally competitive and prosperous country with a high quality of life by 2030” (Government of Kenya, 2007). It is hoped that in the process the country will be able to move into the upper-middle income category.

Achieving these ambitious goals will depend largely on a thriving and competitive manufacturing sector in the country. This has been recognised by the current government and manufacturing is one of the “Big Four” areas of focus in the next five years, according to the 2018 Budget Statement (Government of Kenya, 2018). This is intended to accelerate economic growth, create jobs and reduce poverty.

Indeed, over the years, Kenya has consistently made efforts to increase the contribution of the manufacturing sector to the national economy. In the different economic blueprints, policy makers have asserted the eminence of manufacturing in spurring economic development, right from Sessional Paper No 10 (1965) to Sessional Paper No 10 (2012) and the current budget plan.

According to the World Bank (2014), manufacturing can without a doubt put Kenya on higher economic growth path because of its capacity to create productive employment. With its strong linkages to virtually all other sectors of the economy, manufacturing stimulates more economic activity than any other sector.

The manufacturing sector however has not lived up to its full potential. Presently, the sector is still small in comparison to agriculture and service sectors. In 2016 the manufacturing sector accounted for about 9.2% of Gross Domestic Product (GDP), 26% of merchandise exports, and 12% of total formal employment, with about 280,000 people employed (KNBS, 2017).

Growth in manufacturing has trailed that of the overall economy, and the percentage contribution of manufacturing to GDP and merchandise exports has stagnated (World Bank, 2014). For example, the growth of the manufacturing sector between 2013 and 2016 was 3.8% compared to the overall economic growth of the country at 5.7% in the same period.

In addition, the sector’s share of GDP has been on a downward trend, from 13.6% in 1994, to 10% in 2004 and 9.2% in 2016 (World Bank, 2014; KNBS, 2017). In terms of

subsectors, food production has been the dominant manufacturing activity in Kenya, accounting for about 30% of total manufacturing output in 2016. The food subsector largely leverages on Kenya's large agricultural economy and strong domestic demand.

On the global stage, competitiveness of Kenya's manufacturing exports has also been on a slow downward trend. Kenya's manufacturing exports represented about 0.02% of global manufacturing exports in 2013, down from 0.06% in 1994 and 0.18% in the 1980s according to the World Development Indicators. The share of manufactured goods imported by the East African Community (EAC) from Kenya declined, from 9% of total manufacturing imports in 2009 to 7% in 2013.

These changes are significant because almost 40 percent of Kenya's manufacturing exports have traditionally gone to the EAC markets (World Bank, 2014) Kenya being the largest exporter of various manufactured goods to the EAC its market share has obviously declined for a range of traditional products.

Kenya's manufacturing exports represented about 0.02% of global manufacturing exports in 2013, down from 0.06% in 1994.



1.2 Problem Statement

The manufacturing sector can put Kenya on higher economic growth path because of its capacity to create productive employment (World Bank, 2014). With its strong linkages to virtually all other sectors of the economy, manufacturing stimulates more economic activity than any other sector.

The sector is still small relative to agriculture and services and its share of GDP has been on the decline, from 13.6% in 1994, to 10% in 2004 and 9.2% in 2016 (World Bank, 2014; KNBS, 2017). To reverse this trend and grow the sector, focus needs to shift to promotion of excellence in manufacturing processes as a strategic goal.

This has been recognised by the current government and manufacturing is one of the "Big Four" areas of focus in the next five years, according to the 2018 Budget Statement (Government of Kenya, 2018). To support this effort, new innovative approaches are required to turn around the manufacturing sector for it to achieve its full potential.

One such approach is the adoption and use of new technologies such as ERPs that integrate the entire supply chain from raw materials to end products and users. For this to happen, it is important to understand the current state of the manufacturing

industry in Kenya and its future trends, with regards to the implementation of existing and new technologies as well as production methods and processes to reliably inform the kind of interventions that may be necessary.

1.3 Objectives

The overall aim of the research was to establish the current state in the Manufacturing Industry in Kenya and its future trends, with regards to the implementation of existing and new information communication technologies as well as production methods and processes. The specific objectives were to:

1. Determine the state of the manufacturing sector in Kenya from secondary sources.
2. Establish the factors that impact on productivity and competitiveness of the manufacturing sector in Kenya.
3. Determine the role of new technologies, including information and communications technologies (ICT's) in improving productivity and competitiveness in the manufacturing sector.
4. Determine the state of adoption and use of new technologies in the manufacturing sector in Kenya.
5. Recommend approaches for adoption and use of new technologies in the manufacturing sector in Kenya for competitive advantage.

1.4 Methodology

1.4.1 Research Design

The work in this research project integrated different methods and tools for data collection and analysis into an overall strategy for understanding of the manufacturing sector in Kenya and achieving the objectives set. The study used both primary and secondary sources to obtain data with the former being obtained from the field through the filling of sector-tailored questionnaires.

The secondary data was collected through desktop document reviews using online sources and publicly available publications from such organisation as KAM, KNBS,

Kenya government and the World Bank. In effect, a mixed-method approach for data collection and analysis was used. Mostly, quantitative techniques were employed in the study for the collection, entry, and analysis and reporting of both primary and secondary data with minor cases of qualitative data collection.

Initially, the Research Team (RT) reviewed and analysed key documents that were important in answering research questions, including the Kenya Association of Manufacturers (KAM) documents, government reports on manufacturing and Kenya National Bureau of Statistics (KNBS) data and reports.

Based on knowledge generated through desk review and in consultation with SYSPRO, the RT then selected the manufacturing sectors to focus on for data collection. A cross sectional survey using a questionnaire targeting 12 manufacturing sectors in Nairobi County and its environs was carried out.

Nairobi County was selected in consultation with the SYSPRO due to the limited resources and given that most of the manufacturing companies are found within the County and its environs. KAM's classification of manufacturing sectors (KAM, 2019) was used to select the 12 sectors under study.

1.4.2 Population and Sampling

As per the KAM lists of organisations that are located in Nairobi County and its environs – ideally Kiambu and Machakos counties, 367 companies were identified that formed the sample frame. Most of the selected sectors (9 of the 12) had less than 20 companies per sector while the remaining 3 had an average of about 45 companies per sector.

It was thus agreed to run a census of all sectors with less than 20 companies but purposefully and conveniently sample 20 companies from each of the sectors with more than 20 companies. The convenience sampling was based on both accessibility and acceptance on the part of the respondent to be part of the sample frame.

On average 20 companies per sector represented more than 50% of the companies in the study area (Nairobi County and its environs). This sample was equivalent of 240/367 (65%) companies selected from 12 sectors which were perceived to be a representative sample of the manufacturing population in Nairobi, Kiambu and

Machakos Counties. The organisations that agreed to participate in the study are listed in Appendix A.

1.4.3 Data Collection

This research utilised trained and qualified researchers who were sent to the identified manufacturing firms with questionnaires. The questionnaires were filled by staff who were key decision makers in their firms e.g., company managing directors, production managers, chief information officers, etc.

A total of 12 research assistants were recruited and trained for data collection and were allocated to collect data from the 12 sectors (240 companies) in Nairobi County and its environs. In order to seek approval and consent to collect data from the companies, a respondent consent form together with a questionnaire were given to each research assistant who physically visited the companies to complete the activity.

Since this study utilised organisational key informants, the main target respondents were the chief information officers (CIO) or his/her equivalent. However, others in charge of manufacturing including operations managers, factory managers, production managers or an equivalent were eligible as key informants for the company.

The key informant would also consult with other officers for data not readily available within their jurisdiction. But, the key informants were responsible for data collected and were the ones who signed off the consent forms to complete the data collection.

The consent form ensured that respondents agreed to voluntarily participate in the study. In case of a need to involve other informants, their consent were also sought. All participating companies promised to be part of a workshop to disseminate the results from the data.

However, prior to the workshop, any company wishing to consult the research team on the accuracy of the data collected were at liberty to do so as specified in the consent form.

1.4.4 Data Analysis

The data collected during the study was checked for consistency, grouped, coded and analysed using Statistical Package for the Social Sciences (SPSS) software application. Data was analysed in line with the key variables that included Matrix analysis (to depict how individual items related both to specific characteristics and to one other).

The data analyst used qualitative and quantitative techniques in order to compile a comprehensive report addressing all the objectives of the study. The results obtained from the analysis was then presented in various forms including, tables, charts and graphs as given in Section 3.

1.4.5 Ethical Considerations

Ethical considerations for this study involved the research team having to seek approvals to collect data from an Institutional Review Ethics Committee (IERC) and the national regulatory body National Council of Science, Technology and Innovations (NACOSTI).

For the ethical clearance, Strathmore University Institutional Ethics Review Committee (SU-IREC) gave the approval after review with reference number SU-IERC0288-18 of 2018 (See Appendix B) while National Council of Science, Technology and Innovations gave the permit for research with Ref. No: NACOSTI/P/19/19516/27597 of 2019 (See Appendix C).

For the final dissemination and acceptance of findings, it was important that all the permits were obtained to ensure confidence in the information obtained. Data was only collected from consenting companies through key informants after the objectives of the study were explained through an introductory letter or verbal means and asking respondents to sign a consent form (See Appendix D).

This ensured that respondents agreed to voluntarily participation in the study. In case of a need to involve other informants, their consent were also sought. All participating companies were promised to be part of a workshop that disseminates the collected data.

CHAPTER 2: THE STATE OF MANUFACTURING IN KENYA

2.1 Introduction

Kenya registered an economic growth of 6 percent in 2018 according to the Kenya National Bureau of Statistics (KNBS, 2018). This growth was primarily driven by improved agricultural output, growth in the manufacturing sector, and increased tourism numbers.

The Vision 2030, the Kenya Industrial Transformation Programme (KITP) and most recently Big 4 Agenda have all been designed by the Government to revamp the manufacturing sector. Very few countries in the world have managed to industrialise and develop without the manufacturing sector playing a leading role.

Kenya, like many other developing countries, has not managed to develop a robust manufacturing sector and growth has been primarily driven by the agriculture and services sectors respectively.

The country has thus experienced a premature deindustrialisation as evidenced by the decline in GDP contribution by the manufacturing sector which was at a paltry 8.4% in 2017 and 9.2% in 2016 (KAM, 2018).

Deindustrialisation has been characterised by a rising share of the services sector in GDP and fuelled debate as to whether services can replace the manufacturing sector as an engine of economic growth.

As expressed under the Medium-Term Plan 3 Concept Note, 'the low and declining shares in manufacturing, industrial and exporting sectors in GDP constitute a major challenge to economic growth'. Increasing the size of the country's manufacturing sector with an emphasis on exported goods is one of the Big Four Agenda priority areas.

This policy initiative, unveiled on 12th December 2017, places one of the four main targets of the Government's priorities up to the year 2022 as an increase contribution of the manufacturing to GDP from the current 8.4 percent to 15 percent (KAM, 2018).

While Kenya is the most industrially developed country in the East Africa region, manufacturing only accounts for 14% of GDP. According to the World Bank this is

The contribution of the manufacturing sector to GDP reduced to 9.2% in 2016.



attributable to the fact that most of Kenya's exports such as tea and coffee require little or no processing (Deloitte Report, 2017). Kenya has a manufacturing presence in textiles, food and grain milling, cement production, and oil refining. A large portion of Kenya's manufacturing comes from the informal sector, with homemade arts and crafts being a popular product for tourists and residents alike.

In January 2017, the Kenya Association of Manufacturers (KAM) launched the Manufacturing Priority Agenda (MPA) 2017 under the theme "Driving industrial transformation for job creation and inclusive economic growth".

The initiative was meant to enhance technical skills, create a nurturing environment for the Small and Micro Enterprises (SME's); with a special emphasis on women and youth enterprises.

On the Information and Communication Technology front, in the country's National ICT Policy Bill, the Government stated that the vision for Kenya is to be "a prosperous ICT-driven society" (Deloitte Report, 2017), which was meant to "improve the livelihoods of Kenyans by ensuring the availability of accessible, efficient, reliable and affordable ICT services".

As such, Kenya has seen tangible growth in the ICT sector though the uptake of technologies in the manufacturing sector is not clearly.

2.2 Distribution of Manufacturing Organisations

To harness resources in different parts of the country, the Government promotes region-specific industrial and manufacturing clusters. Necessary infrastructure and services are provided to stimulate development of these clusters.

Investment opportunities exist in development of industrial parks, including small and medium enterprises (SME) parks and Export Processing Zones (EPZs), which offer a range of fiscal incentives that help in reducing start-up and operational costs, thereby making exporters internationally price-competitive. The investor will be able to recover investments through either renting or selling the units.

Potential locations for Industrial Parks include Nairobi due to its proximity to most important markets, Eldoret due to its location in a high-potential agricultural area and access to airport facilities, Kisumu due to easier access to regional markets and availability of raw materials such as limestone (Koru), chemicals (e.g. ethanol from

sugar factories).

A Special Economic Cluster (SEC) have been set up in Mombasa to allow for easy importation of necessary raw materials and exportation of finished goods. The project will include an agro-industrial zone, incorporating activities like blending and packing of fertilisers, tea and coffee and a consolidated meat and fish processing facility.

The second SEC is in Kisumu to allow for access to regional markets and availability of limestone to support cement, chemicals and metal industries and agro-processing through increased horticultural production along the lake shore.

Under the Vision 2030 initiative, the Government is in the process of developing centres of excellence for micro and small enterprises (MSEs) to promote transfer of technology, build capacity and market MSE products.

Potential locations for industrial parks include Nairobi, Eldoret, Kisumu, Mombasa.



2.3 Top Sectors of Manufacturing and their Emerging Sub-Sectors

The members of Kenya Association of Manufacturers (KAM) are categorised into 14 sectors, 12 of which are in processing and value addition while the other two offer essential services to t manufacturers. Sub-sectors in the classification are defined by the type of raw materials companies import or the products they manufacture (KAM, 2019).

This is understandable given that Kenya is predominantly an agricultural country with an economy based on the production and export of primary agricultural products. Having consistently remained the top most economic support system for the country for many years, agriculture's productivity remains rooted in the manufacturing sector's ability to augment suppliers and businesses in value chains mainly through backward and forward integration (Wakiaga, 2019).

The Kenya Association of Manufacturers (2018), Kenya Business Guide (2018) and Kenya National Bureau of Statistics (KNBS, 2017) have classified the top performing and emerging sectors as follows:

2.3.1 Textile and Apparel Product Sector

The sector is divided into two sub sectors namely local sector and the apparels exports subsector. The sub sectors cumulatively employ over 200,000 directly and indirectly. Further, 40,000 cotton farmers are currently engaged. Total annual turnover of the apparel subsector is estimated to be KSh38 billion while the textile sector is about KSh24 billion.



2.3.2 Food and Beverages Sector

This sector has seven sub-sectors: alcoholic beverages and spirits; bakers and millers; cocoa, chocolate and sugar confectionery; dairy products; juices/water/ carbonated soft drinks; slaughtering, preparation and preservation of meat; tobacco and edible oils.

There are many categories of players operating across the country and in different sides with a majority operating as informal businesses. Also, majority of enterprises in this sector are privately owned. In terms of contribution to GDP, the manufacture of food, beverages and tobacco is estimated to have contributed to about 3.5 percent of the GDP in 2017.

Exports from food and beverages sector were valued at KSh254,686 million in 2017. In the same year, KSh245,280 million was spent on imports of food and beverages.



2.3.3 Edible Oils Sector

The edible oil manufacturers have invested approximately KSh1.6 trillion in the edible oil industry, their turnover amounts to KSh110 trillion annually. They have directly employed 7,000 employees and indirectly employed 23,000 employees in their supply chain links to the paper, plastic and transport sectors.

They contribute 2 percent to the country's Gross Domestic Product (GDP). Kenya Revenue Authority collects taxes over KSh20 Billion annually from the edible oil manufacturers.



2.3.4 Paper and Board Sector

The production of paper and paper products increased by 30 percent in a ten-year period from 2008. Manufacture of wood and wood products mainly consists of plywood and block boards. Under KAM, there are several paper manufacturers; one integrated paper mill, four recycled paper mills, and a few operators on anvil as well as over 100 converters. The sector has large informal establishments in the supply of stationeries and in printing and publishing mainly due to the increased availability of technology infrastructure driven by ICT developments in the country.



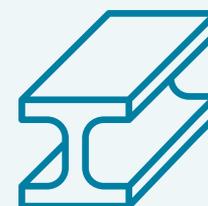
2.3.5 Automotive Sector

The industry has the following sub-sectors: Auto vehicle production and assembly – passenger cars, light commercial vehicles (LCVs) and pick-ups, and heavy commercial vehicles (buses and trucks); and motorcycles production and assembly and automotive parts and component manufacture. The assemblers sub-sector directly employs 3000 people and about 5000 indirectly. Direct employment for second-hand car industry stands at 3000 people made up mainly of sales clerks and the industry commands a market share of about 80 percent of the national market by volume.



2.3.6 Metal and Allied Sector

The metal and steel industries are considered the backbone of economic activities of any given country. In Kenya, the sector consists of five sub-sectors; Smelting/ Hot Rolling/Foundry and Forgers; Cold Rolling/Galvanizing/Colour Coating; Wire Products & Allied Manufacturers; Pipes and Tubes Manufacturers and; General Fabricators. The sector directly employs 21,300 people and indirectly employs 74,000 people. The sector recorded a growth of 12.5 percent in 2016 according to KAM (2018).



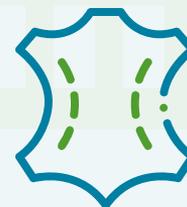
2.3.7 Pharmaceutical and Medical Equipment Sector

There are 32 pharmaceutical companies under KAM membership directly employing 4500 and indirectly 20,000 people. Kenya's local pharmaceutical industry plays a key role in the formulation and manufacture of pharmaceutical and health care products. The Government is the major institutional buyer of locally manufactured pharmaceutical products (through the KEMSA under the Ministry of medical Services). The production of pharmaceutical products increased by 14.7 percent in 2016. Almost 50 percent of pharmaceutical exports go to the neighbouring EAC and Sudan accounts for about 14 percent.



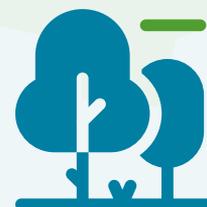
2.3.8 Leather Products and Footwear Sector

The sector registered a growth of 7.5% in 2016 and in 2017, leather exports were estimated at 24,271 tonnes valued at KSh5,088 million. Under KAM membership base, there are 12 companies directly employing about 14,000 (during peak times) and indirectly employing about 10,000 to 14,000 people.



2.3.9 Timber, Wood and Furniture Sector

There are 33 companies in the timber, wood and furniture sector under KAM membership employing approximately 160,000 people –starting from forestry sub-sector and extending through to manufacturing. The industry produces approximately KSh4.5billion of furniture per year and exports KSh0.2 billion.



2.3.10 Energy, Electrical and Electronics Sector

Under the KAM membership base, there are 61 companies under this sector of manufacturing directly employing about 1,500 people and indirectly over 5,000. Production of electrical equipment registered a 3.5 percent growth in 2016.



2.3.11 Plastic and Rubber Sector

Under KAM membership base, there are about 100 companies under the plastic and rubber sector and directly employs 30,000 people and 100,000 indirectly. The ban of plastic bags in August of 2017 had a significant impact on the subsector with the total output of plastic products declining by 3.8% in 2017.



2.3.12 Building and Construction Sector

The Kenyan construction industry is set to grow steadily for the next decade. An improved road network enhances connectivity, mobility and promotes trade and investments by reducing cost of doing business. Data from the KNBS indicates that the construction industry grew by 8.6 percent in 2017 compared to a 9.2 percent growth in 2016.



The construction sector contributed 5.5% of the GDP in 2014 due to increased spending on infrastructural development by the Government and improved construction activities from private sector. The construction sector currently has 511,676 workers employed as skilled, semi-skilled and unskilled artisans.

2.3.13 Chemical and Allied Sector

Under KAM membership, there are 96 members in the chemical and allied sector directly employing over 3,000 people and over 5,000 indirectly. The sector has three (3) sub-sectors: paints and resins, agro-chemical and cosmetic and hygienic. Some of these companies are large multinational players and the sector is largely made up of private players with no identified public enterprise.



2.4 Obstacles to Manufacturing Sector in Kenya

It is clear from Section 2.1 that the manufacturing sector in Kenya is struggling in a broad sense. In the past, various reasons have been attributed to the lacklustre performance of the sector. These included lack of access to an efficient and effective labour force, inadequate infrastructure, political uncertainties, corruption, and poor business environment (KIPPRA, 2013).

In more recent surveys carried out on Kenyan manufacturing firms, perceived competition from the informal sector, electricity, and lack of access to finance were identified as the top obstacles for the manufacturing sector (World Bank, 2014). As regards electricity, typically manufacturers are normally concerned about its high cost and poor reliability.

Comparatively, indeed the cost of electricity in Kenya is burdensome for businesses. In 2013 Kenyan manufacturers paid US\$0.20 per kilowatt-hour, many times over the rate in Tanzania (US\$0.08) or South Africa (US\$0.05).

The other issue of availability of educated and skilled workers was not rated as a top obstacle in the 2013 surveys, but firms perceived it to have risen in severity from 2007 when similar surveys were done. To help address these issues and raise firm productivity growth, the World Bank (2014) suggested that focus be placed on the stock and flow of skills, use of technology, and information among manufacturing firms.

Specific analyses of key manufacturing subsectors show that firms operate using outdated technology, in silos within their respective value chains, and with skills deficits both at the managerial and technical levels. The Kenya Association of Manufacturers (KAM) also launched the Manufacturing Priority Agenda (MPA) 2017 in which it identified the need for investment in technical skills and creating a nurturing environment for the Micro and Small Enterprises (MSE's) (Deloitte, 2017).

2.5 Technology and the Manufacturing Sector

Two elements related to technology in the manufacturing sector in Kenya were of interest for this research. The first issue is the adoption and use of various modern technologies and the second is the extent to which the technology community in Kenya intersects with the manufacturing sector.

In terms of the prevalence of modern technology, Micro, Small and Medium size, Enterprises (MSMEs) constitute 67% of manufacturing firms in Kenya, and most of these do not or cannot effectively leverage technology, usually because of the related cost of doing so. Thus, while larger players can boast of using new technologies to a broader extent, smaller entities cannot.

As a consequence, numerous manufacturers are either not using the new

**MSMEs constitute 67%
the manufacturing sector
in Kenya, but most of
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leverage technology.**



technologies or are using outdated technologies, running outdated systems and using obsolete machines which does not augur well for manufacturing sector competitiveness.

Many players are aware of technological advancements but cannot afford to make use of them. For example, a census by KNBS (2010) noted that use of outdated technology was a key factor contributing to cost of production due to various process inefficiencies. However, there are segments of the manufacturing sector that have modernised their machinery to keep up with competitiveness in terms of quality, price and design variety.

Further, there are opportunities for manufacturers to take advantage of new technologies that are cheaper and more efficient and hence establish truly efficient and productive manufacturing plants. The second issue linked to technology pertains to the extent to which the Kenyan technology sector can address issues that manufacturers face operating in the country.

For example, a common complaint by manufacturers is linked to erratic power supply and the negative effect this has on machine operations and life span. The local technology sector should be the first place the manufacturing sector should go to address this issue, using indigenous solutions that understand the issues linked to running a manufacturing firm in Kenya. However, the intersection between the local technology and manufacturing sectors is weak.

The manufacturing sector does not articulate its technology needs to the technology sector well nor does the sector actively seek input from local technology companies in solving its incessant problems. This may be for several reasons, including a general lack of awareness in the manufacturing sector of how advanced the local technology scene truly is.

It may also be informed by a stubborn perception that local technology firms are not as sophisticated as foreign firms and cannot develop effective solutions to local problems in manufacturing – the default being to call in a foreign provider to fix the problem.

Finally, because of lack of engagement between the two sectors, the technology community does not know what types of problems manufacturers face and therefore cannot effectively develop and provide solutions.

CHAPTER 3: RESULTS

3.1 Introduction

The research team interviewed 96 companies spread across 12 sectors of the manufacturing sector in Kenya. One of the major factors was the state of the automation in the manufacturing sector. This section gives a report on both the descriptive and analysis of the level of the uptake of technological aids and ERP solutions in the manufacturing sector in Kenya from the study undertaken.

For the purpose of this study and the type of data we have from 96 firms participating, we shall assume SMEs to be those companies or firms that have less than 200 employees, according to the World Bank. From this definition, 63 companies reported to have less than two hundred employees thus are classified as SMEs.

96 companies in 12 sectors and 3 counties in Kenya were surveyed for this study.

3.2 Sectors of the Study Organisations

The status of manufacturing report is based on 96 respondents drawn from 12 sectors of the production and manufacturing industry in Kenya who participated in the study. Figure 1 gives a summary of the number of firms in each sector that participated in the research.

The highest number of participants was from the Food and Beverage Sector, representing 23.7 percent while the automotive sector had only 1 respondent, representing 1 percent of the participants. Of the respondents, 84 indicated their gender out of which 58.8 percent were male with 27.8 percent female.

Companies reporting that they had been in operation for 40 or more years were 36, while 60 companies had been in operation for less than 40 years. In terms of employees, 63 companies reported to have less than 200; 24 between 200 to less than 500; and 9 companies had 500 or more employees.

When asked about their knowledge of any new products besides their current product lines in the last 2-3 years; 65 company representatives were aware, the rest were neither unaware or were not sure. Most companies (66%) targeted both local and export markets in the last 2-3 years. While only 1 company concentrated on the export market, 33% targeted the local market alone.

As regards business models, 14 companies are both business to business (B2B) and business to customer (B2C), 57 are only B2B and 24 are only B2C.

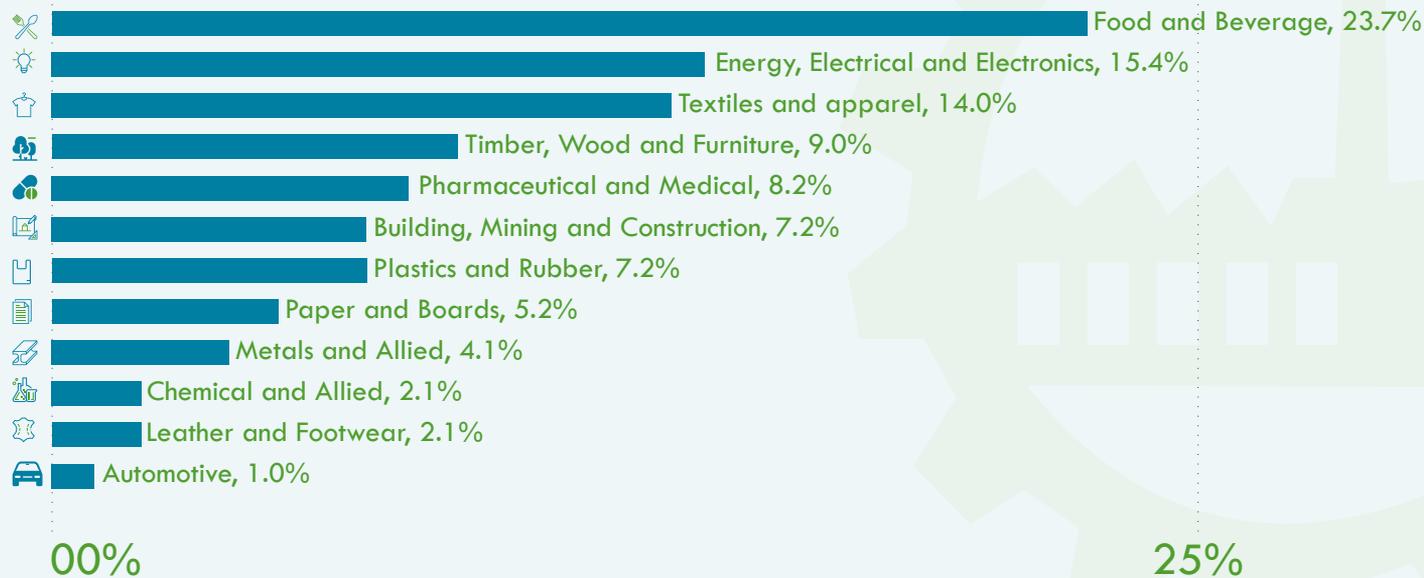


Figure 1: Percentage of organisations that participated in the study

3.3 Operating Environment and Growth Prospects

A total of 22 company representatives (22.7%) stated that it was significantly difficult for them to recruit experienced personnel while 12 companies (12.4%) felt that it was significantly difficult to recruit executives. More than 50% of the company representatives (69) were optimistic about the prospects for growth of the Kenyan economy in the next 1 year or so.

Figure 2 provides a summary of initiatives that manufacturers considered important to increase competitiveness for both local and export markets for the companies. Approximately 70% of the companies indicated that tax incentives would increase their competitiveness in both local and export markets.

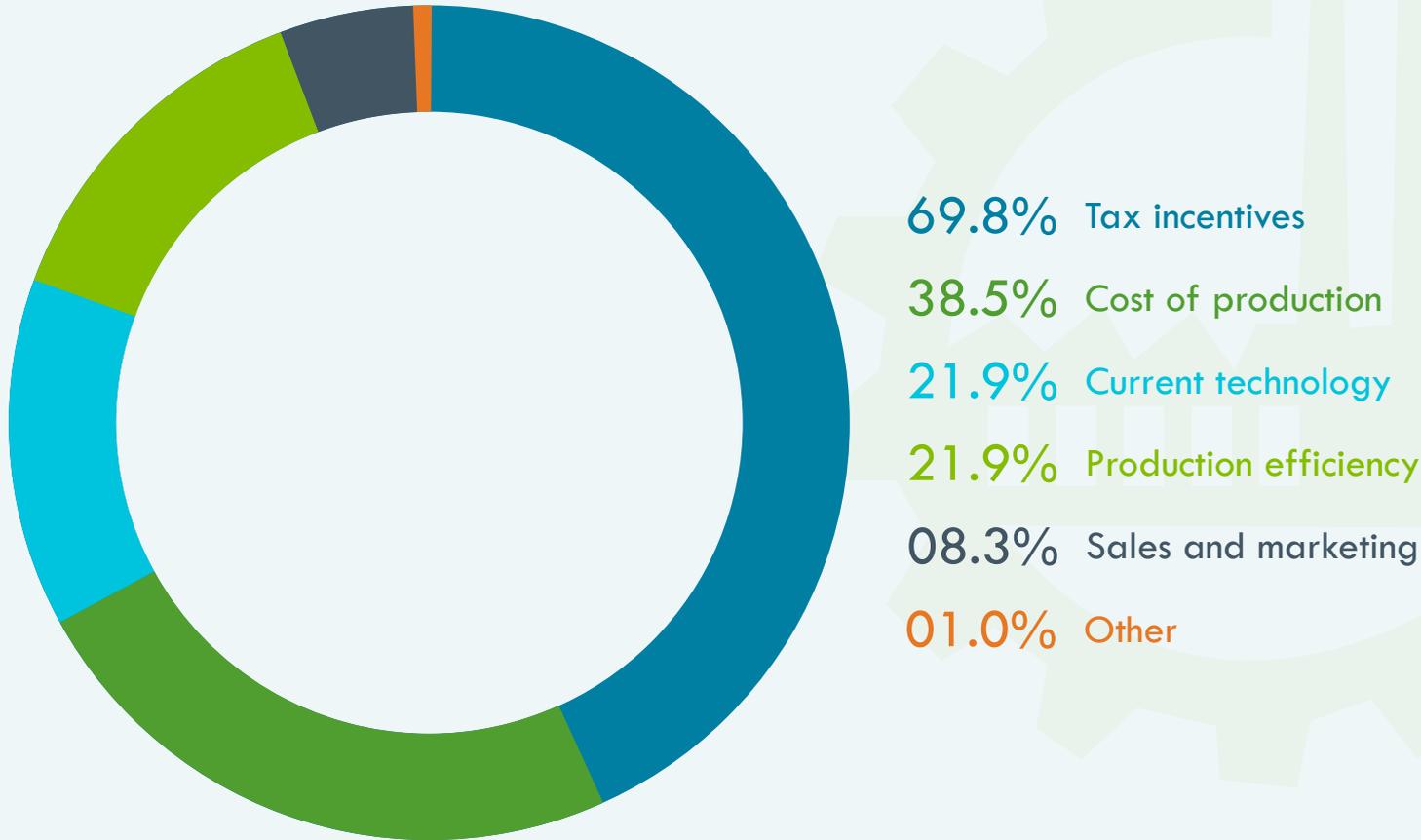


Figure 2: Summary of initiatives to increase competitiveness in industry

When asked about various external factors that adversely affected business operations in the last 2-3 years, the manufacturers listed several of them as shown in Table 1. Over half of the 96 respondents reported energy as the main external factor that adversely affected business operations.

It was followed by the political climate, taxes and cheap imports respectively and then by exchange rates and raw materials. Technical skills, labour wages, climate conditions and visa requirements were rated as having the lowest adverse effect on the business operations comparatively.

Table 1: External factors affecting the manufacturing industry businesses

External Factors	Percentages (%)
Energy	54.3
Political Climate	50
Taxes	42.9
Cheap Imports	40
Raw Materials	24.3
Exchange Rates	24.3
Technical Skills	17.1
Labour Wages	12.9
Climate Conditions	12.9

When asked about the Government support, less than 50% (33 companies) of the respondents were of the opinion that the government supported the manufacturing industry moderately well, 30 company representatives or 30.9% were neutral. Figure 3 shows the responses on the perceived government of Kenya's support of the manufacturing industry.

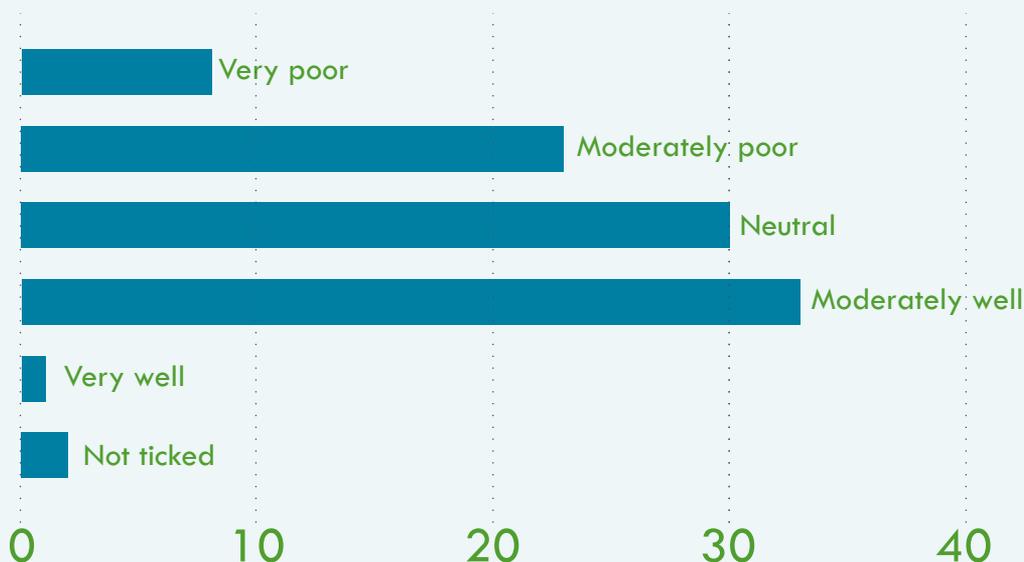


Figure 3: Impression on government support to the manufacturing sector

Table 2 indicates initiatives that respondents felt would make local manufacturing an attractive business venture while Table 3 shows the government incentives for increasing production in manufacturing.

Table 2 also shows government support for apprenticeship was identified by 54 companies as a major initiative that would make local manufacturing an attractive business venture.

Positive reporting on manufacturing (42 companies); graduate internship opportunities and technical courses in local universities (21 companies); apprenticeship support from large businesses (19 companies); and mentorship in schools and colleges (18 companies) followed respectively.

Table 2: Initiatives to enhance local manufacturing

Initiatives	Percentages (%)
Government Support for Apprenticeship	58.1
Positive Reporting on Manufacturing	45.2
Graduate Internship Opportunities	22.6
More Universities with Technical Courses	22.6
Apprenticeship Support from Large Businesses	20.4
Mentorship in Schools and Colleges	19.4

Table 3 shows that 35 companies (47.9% of the respondents) indicated that provision of qualified or trained personnel would be suitable for increasing manufacturing production in the industry. About 41% (30 companies) stated that government provision for infrastructure development would be an incentive to increase manufacturing production.

Table 3: Government incentives for increasing manufacturing production

Government Initiatives	Percentages (%)
Personnel Development	47.9
Various Other Factors	46.6
Infrastructure Development	41.1
Subsidies	32.9
Purchase Guarantee	23.3

Companies can enhance local manufacturing by supporting graduate internships and technical courses in universities, among other ways.



Finally, 32.9% and 23.3% of the respondents indicated that government provision of exemptions, grants and subsidies; and purchasing guarantee from the government or tax incentives for technology purchases respectively; were useful incentives for increasing manufacturing production in the industry.

62 respondents reported that the manufacturing sector would have difficulty competing with counterparts in other developed countries that have an advanced education and training system.

On the other hand, 55 respondents indicated that adoption of more flexible manufacturing techniques and smart supply chains will enable manufacturers to provide better products and services. Also, 50 respondents reported that adoption of technology will improve the manufacturing landscape.

The development of personnel and provision of infrastructure are the main means by which the government can spur manufacturing output.



Table 4: Impact of economic pressure on exports and imports in the sector

Economic Pressure	Number of Organisations				
	Least Agree	Agree	Neutral	Relatively Agree	Most Agree
Technology	2	8	28	19	26
Competition	10	22	21	14	16
Attraction of New Talent	1	5	29	29	12
Getting Trainable People	4	13	35	17	12

The data has been summarised according to sectors and presented in Table 5 showing dominance of the economic pressures in respective sectors in the manufacturing.

Based on the statistics in Table 5, it is clear that, besides competition, the food and beverage sector is highly impacted by technology adoption in its supply chains and manufacturing.

The other sectors significantly impacted by technology include Energy, Electrical and Electronics; Pharmaceutical and Medical; Textiles and Apparel; and Timber, Wood and Furniture.

Table 5: Economic impact dominance per sector

Industry Sector	Technology	Competition	Talent	Trainable
Automotive	-	1	1	1
Building, Mining and Construction	5	6	2	6
Chemical and Allied	1	1	2	-
Energy, Electrical and Electronics	8	9	7	7
Food and Beverage	10	15	8	8
Leather and Footwear	2	2	2	2
Metals and Allied	2	3	2	3
Paper and Boards	3	5	2	1
Pharmaceutical and Medical	7	5	3	4
Plastics and Rubber	4	5	4	3
Textiles and Apparel	6	8	8	6
Timber, Wood and Furniture	7	5	6	6

3.4 Capital Financing and Investments

Table 6 provides the source capital financing to the companies in the past 12 months and the related investments areas in the organisations. The table shows that 41 companies sourced their capital finances from bank loans and 28 from shares.

Some companies got their capital financing from invoicing while a few sourced capital from asset financing, equity, personal loans and venture capital among other sources. As a strategy to improve business in the next financial year, Table 8 further shows a representation of how the companies anticipate allocating their capital investments.

The data shows that 47 companies anticipate investing in new product development while 42 of them in advertisement and marketing. Also, a significant number of companies (32) will give priority to computer systems, hardware and software as potential investment areas.

The main sources of capital financing are bank loans and shares.



Table 6: Sources of capital financing for the organisations

Sources of Capital Financing	No. of Organisations
Bank loans	41
Shares	28
Invoicing	24
Asset	19
Venture capital	14
Equity	7
Personal loans	6
Hire purchase or leasing	1

Further investigation of the data presented in Figure 4 shows that 58 companies would invest approximately more than half to three quarters of their capital in expansion rather than for replacement of existing equipment. In fact, 6 companies indicated that they would invest nearly all of their capital on their expansion strategy.

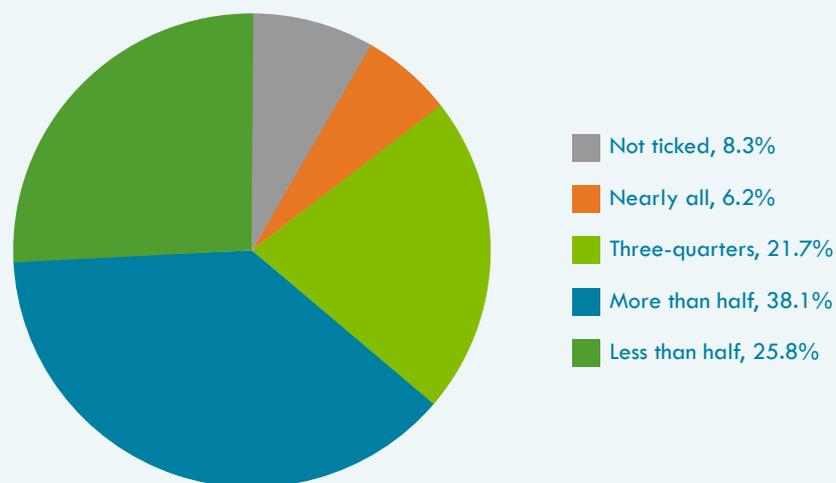


Figure 4: Proportion of capital investment for expansion

From the capital investment areas identified in Table 7, 62 companies indicated that marketing and advertising had improved their company's revenue in the last 12 months. This represents 63.9% of the respondents. Further, the following were

identified as being responsible for improved company revenue: rebranding of products (24 respondents), information technology (17 respondents) and product information (12 respondents).

Table 7: Capital financing investment areas

Capital Investment Area	No. of Organisations.
New product development	47
Advertisement and marketing	42
Hardware and software equipment	32
Computer systems	32
Property	28
Pack and processing	27
Operations technology systems	27
Market niche products	25
Processing of raw materials	20

Marketing and advertising improved the revenue of 62 companies in the last 12 months

3.5 Manufacturing and Production Technologies

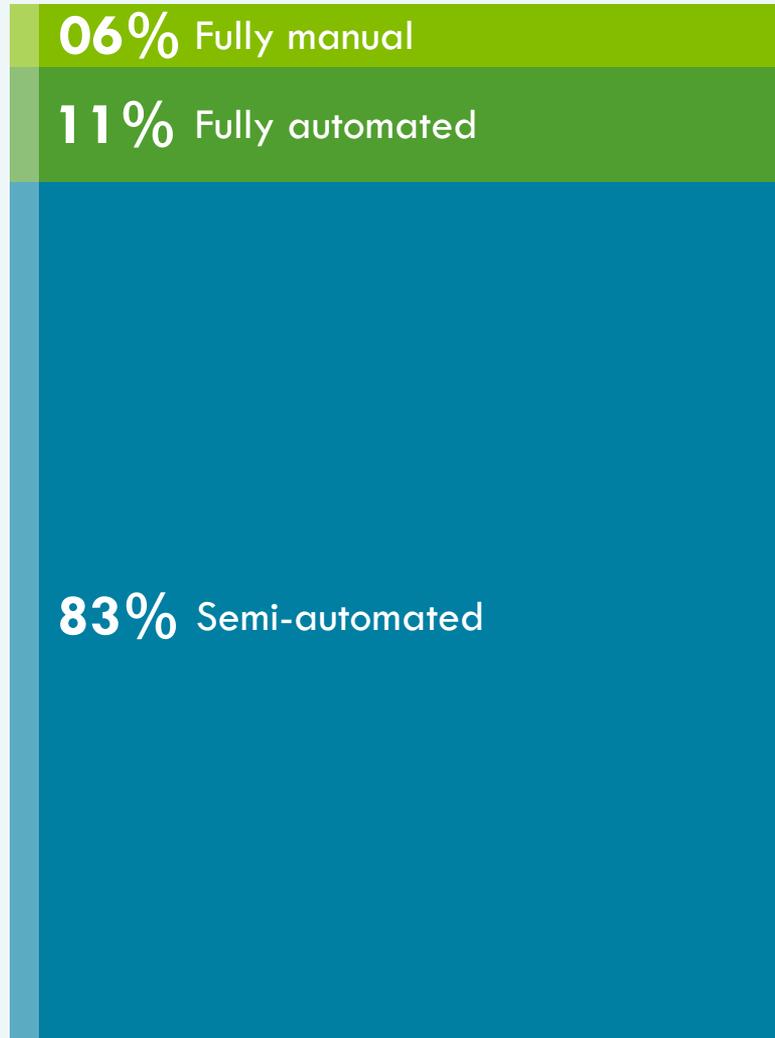
The respondents were asked to indicate the manufacturing value chain domains their organisations were involved in. From data shown in Table 8, it was established that approximately 70% of the companies were involved in the manufacturing and production section of the value chain. On the other hand, only 17.5% of the

Table 8: Sections of manufacturing production value chain

Value Chain Area	Percentage (%)
Manufacturing and production	70.10
Movement and distribution	49.50
Inventory management	36.10
Maintenance and repair	32.99
Valuation and costing	31.96
Order and replenishment	26.80
Planning and forecasting	25.77
Support and product traceability	17.53

companies were involved in the support and product traceability section of the value chain.

Figure 5 represents a summary of responses from 90 respondents concerning the state of automation in their firms. It was established that most companies were semi-automated (83%), 10 companies were fully automated (11%) while 5 companies were fully manual (6%).



Most companies are semi-automated or fully manual. Only 10.3% are fully automated.



Figure 5: Level of automation in manufacturing or production

Further information indicates that approximately 64% (62 companies) had their production technology up to date, with 24 companies having 50% and above of their manufacturing or production technology being supported by internet of things (IoT).

Table 9: Hours machine operation in 8- hour shift and frequency of maintenance

	Daily	3 to 4 days	Less than 3 days	
Complete 8 hours	16	12	11	20
Between 6 to 8 hours	17	13	15	23
Less than 5 hours	2	0	1	1
	35	25	27	

As regards spare parts, 64 companies stated that it has been somewhat difficult to source spare parts for production or machinery units in the last 2-3 years with 7 companies stating that it was very difficult.

The greatest challenge faced when sourcing spare parts is high cost of the parts and the second challenge stated was associated with unavailability of locally manufactured parts. Some companies identified outdated production units as another challenge in sourcing spare parts.

Another important factor that lead to poor quality products and hence rejects or rework was the employment of unskilled or semi- skilled personnel as indicated by 46 respondents.

The second factor indicated by 39 respondents was the use of outdated machines and thirdly use of sub-standard raw materials (36 respondents). Also, another 35 companies stated that usage of inefficient production systems lead to poor quality products.

The greatest challenge faced when sourcing spare parts is high cost of the parts.



3.6 Information and Communication Technologies

Figure 6 shows the areas of expenditure in information communication technology. From responses regarding this issue, 53 companies had plans to upgrade their software while 42 others who had no plans to upgrade stated that they had recently upgraded their hardware and software.

In response to challenges posed to their upgrading plans, it was established that software cost was a major hindrance. The second hindrance was hardware costs, consequently skills, and expertise gap.

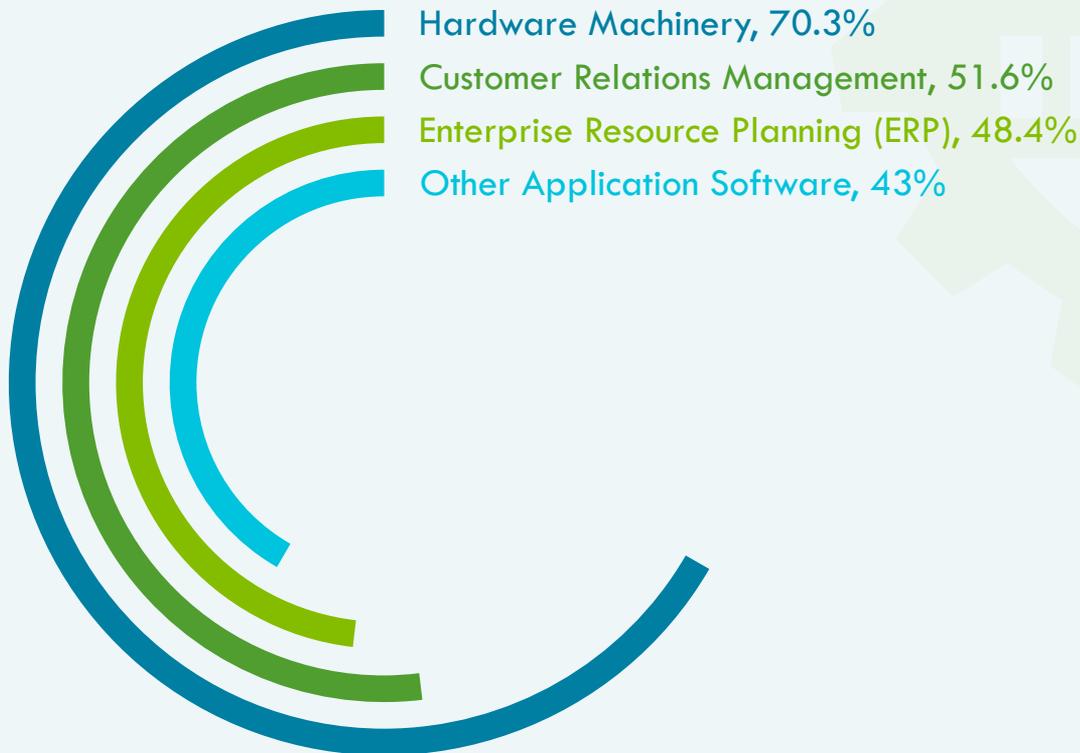


Figure 6: Areas ICT expenditure in the organisations

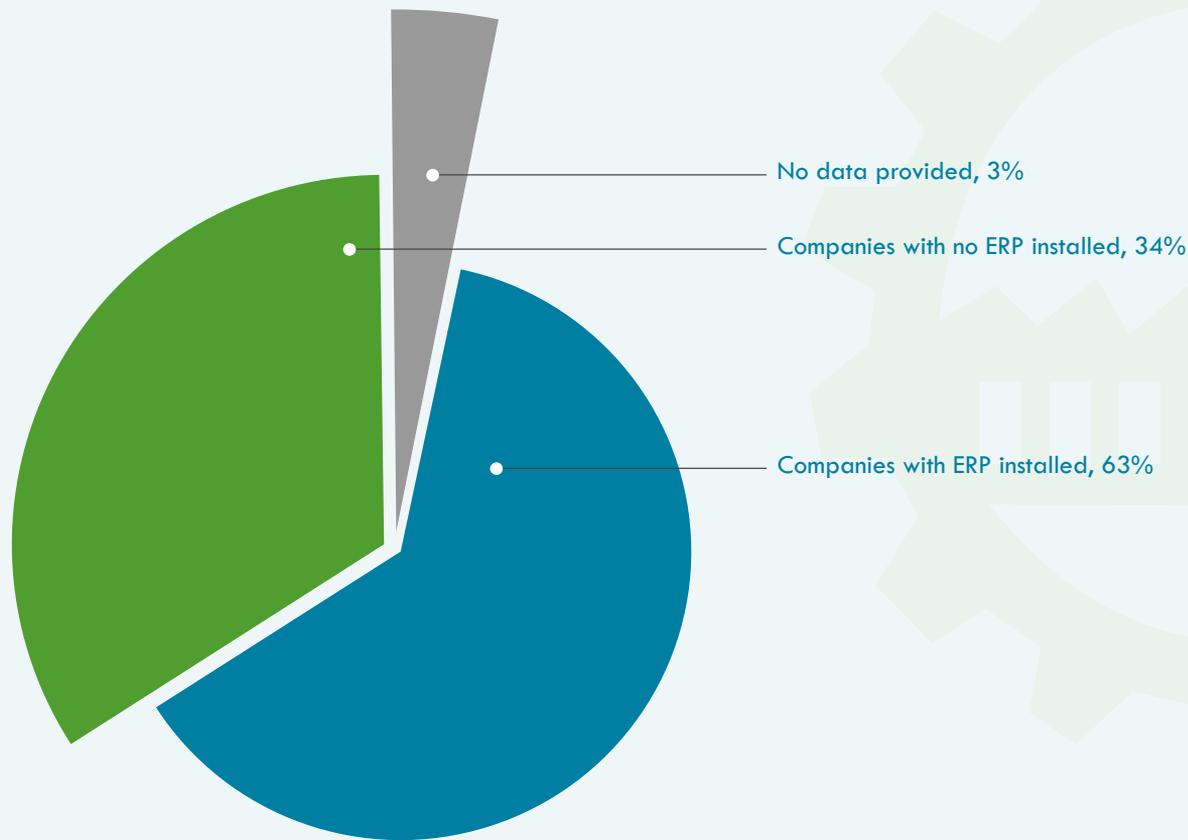


Figure 7: Companies with installed enterprise resource planning (ERP) systems

Since it is known that ERPs offer production advantage for manufacturers, the respondents were asked if they have installed any ERP. It was established that 33 companies had not installed any ERP system while a significant number, 63 (62.9%) had ERP systems.

Out of the 96 companies, 10 do not use hardware or machinery in their day to day manufacturing processes. The 78 companies that use hardware or computer machinery apply them in various production domains summarised in Figure 8.

Most (51.6%) companies use software applications in inventory management while manufacturing and production ranks second (42.3%). It is also important to note that materials requirement planning (MRP) with 35.1% may be considered part of manufacturing. The rest of software use can be grouped into support services for manufacturing.

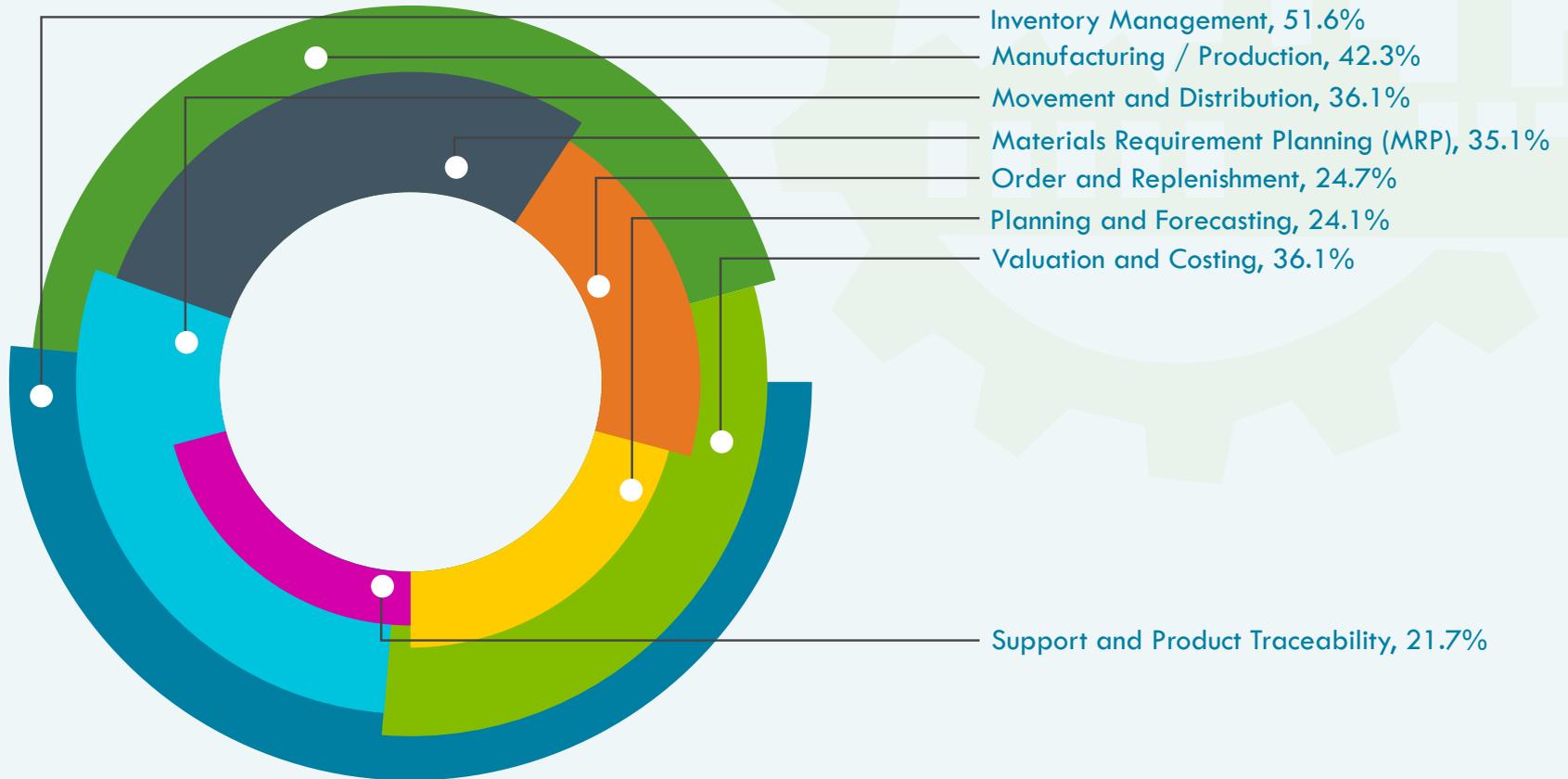


Figure 8: Manufacturing or production domain

Table 10 provides responses regarding desirable automation objectives in order of highest priority to lowest priority measured by the number of respondents. The most desirable objective considered for recent automation project by these firms was to improve business efficiency. To free up staff to undertake more value add tasks was the least desirable objective for automation project.

Table 10: Desirable automation objectives

Key Desirable Automation Objectives	Percentage (%)
Improve Business Efficiency	83
Improve Product Quality	78.4
Reduce Downtime	55.7
Reduce Production Time	54.5
Reduce Staff Costs	52.3
Improve Cycle Time	48.9
Improve Health and Safety for Staff	45.5
Improve the Working Environment	44.3
In Order to Satisfy the Growing Product Demands	40.9
Improve Throughput Time	40.9
Reduce Non-Staff Input Costs	36.4
Introduction of New Products	31.8
Free up Staff to Undertake More Value Adding Tasks	28.4

The most desirable objective of automation is to improve business efficiency



Consequently, Table 11 below shows the most important areas of ICT considered for future improvements by the respondents, in order of highest to lowest priority as indicated by the number of respondents who selected respective choices.

The top three areas earmarked as future ICT improvement areas are: upgrading ICT infrastructure such as internet, intranet, and security; company financial or accounting software; and warehouse management systems.

Table 11: Important future ICT improvement areas

Future Improvement ICT Areas	Percentage (%)
Upgrading ICT Infrastructures e.g., Internet, Intranet, Security	57.8
Company Financial or Accounting Software	55.6
Warehouse Management Systems	43.3
Time / Attendance / Workforce Labour Management	42.2
Enterprise Resource Planning (ERP)	36.7
Internet / Cloud-based Sales and Marketing	35.6
Customer Relationship Management (CRM)	33.3
Business Intelligence , Analytics and Reporting Software	33.3
Supply Chain Management (SCM)	33.3
Manufacturing Systems Integration	32.2
Manufacturing Execution Systems	27.8
Materials Requirement Planning (MRP)	23.3
Cloud-based Business-to-Business (B2B)	13.3
Simulation and Modelling for Products or Processes	12.2
Cloud-based Business-to-Customer (B2C)	10

Table 12 indicates that the greatest perceived barriers associated to the use of automation and robotics technology are: high costs of the application, difficulty in updating the technologies and lack of technical skills for implementation.

Some of the perceptions on how the barriers to implementation of ICT in manufacturing or production can be minimised were mentioned by approximately 26% of the respondents as consideration for better training for local technology partners that would minimise barriers to implementation of automation in manufacturing.

Similarly, 26% identified improved availability of the technologies as a useful measure in reducing barriers of adoption. In addition, 23% of respondents stated that barriers to automation of manufacturing could be minimised by making automation and robotics technology cheaper to acquire and maintain as well as availability of skilled workers.

High software costs, difficulty in updating technologies and lack of technical skills for implementation are the main barriers to the use of automation and robotics.



Table 12: Perceived barriers of automation and robotics technology

Barriers to Automation and Robotics Technology	No. of Organisations
High Costs associated with Automation and Robotics Application	32
Updating the Technologies is Difficult and Expensive	22
Lack of Technical Skills Implementation	21
Technologies Not available Locally	19
Government Policies e.g. tax exemptions, bans etc.	16
Fragmented Nature of the Manufacturing Sector	12
Tight Project timeframes inhibit Implementation of new Technologies	9
Relatively Low Level of Awareness (Exposure) / Knowledge to the Technologies	9
Resistance to change by workers and some project Participants	9
Lack of access to current Market Trends in Automation / Robotics Technology	9
Lack of Cloud-Services for out of office Business Continuity	8
Lack of Internet Stability, Internet Downtimes, Poor Connectivity	2

Table 13 shows respondents' perceived benefits and opportunities brought about by implementation of ICT or automation in manufacturing sector. Automation was mainly perceived to result into high levels of output and improved quality and therefore overall customer satisfaction.

Table 13: Benefits and opportunities of ICT implementation in manufacturing

Benefits / Opportunities of ICT Implementation in Manufacturing	No. of Organisations
Higher Outputs / Produces Varying Products	29
Improves Quality and Therefore Overall Customer Satisfaction	28
Local Companies to be Price Competitive Against Offshore Companies	26
Protect Workers from Repetitive And Dangerous Tasks	25
Saves on Utilities	23
Lowers Risk by Allowing Repeatable Business Processes	23
Frees Manpower for Companies Maximise Workers Skills Elsewhere	20
Higher Outputs / Produces Varying Products	29

3.7 General Regulations and Legislations

Most (63%) companies especially in the Food and Beverages Sector have their products and services regulated annually; 10% are either regulated semi-annually or quarterly; while 6% are regulated monthly. About 10% of the respondents did not make any selection indicating either they are not regulated or are unaware of any regulation requirement.

As regards usefulness of regulation, 78 companies (80% of the respondents) considered the regulations as helpful to their current business and 80 companies mentioned they have a functional quality control department which accounted for 83% of the respondents.

Companies generally view regulation positively.

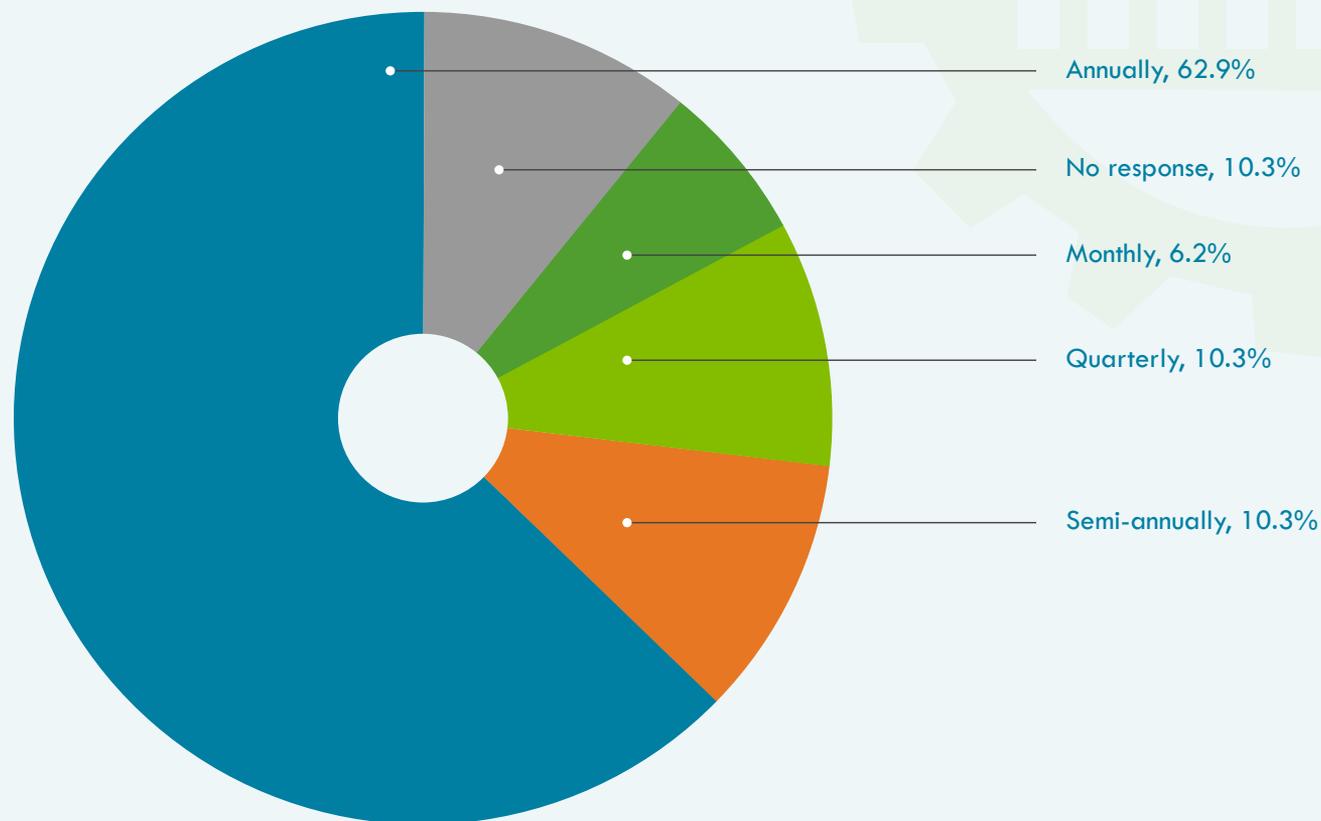


Figure 9: Frequency of government regulation

CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

Firstly, one of the major factors affecting the manufacturing sector is poor state of automation in the sector. It is indicated that 83% of manufacturers currently use semi-automated equipment and processes while only 11% have fully automated production processes.

Also, the data indicates that 6% of manufacturers are still relying on manual and outdated production processes for their operations. The reasons given for the low-level of automation in this sector include high cost of spare parts, unavailability of locally manufactured spare parts and lack of appropriate skills.

The lack of automation issue was further augmented by almost the 10% of the manufacturers who do not use any hardware or machinery for production. About 63% of the Manufacturers had installed Enterprise Resource Planning (ERP) Systems while 33% had not installed any ERP Systems.

Without ERP Systems, a significant number of manufacturing firms would not know the gaps in their production processes leading to slow responses to their customers. ERP solutions allow manufacturing firms to integrate their internal functions as well as upstream and downstream supply chains resulting in efficiency and higher productivity in operations.

Without ERP Systems it would be difficult for Kenyan manufacturers to compete in the global marketplace where competitors are fully automated and rely of ERPs to reduce production costs and increase productivity. As indicated above, high software and hardware costs as well as the lack of skilled labour were cited as major hindrances to technology adoption.

As a consequence, low use of ICT and related technologies in the manufacturing sector would negatively impact the competitiveness of the country's goods in the global market.

Secondly, the lack of technical skills to fully support the growth of the manufacturing sector was another very important finding with 62 respondents having reported that their sector would have difficulty competing with counterparts in other countries that have an advanced education and training system.

The major factors affecting the manufacturing sector are the poor state of automation, lack of skills and poor access to mainstream financing



It is known that many Kenyan university graduates lack practical experience even as they are released to the workplace. The universities and polytechnics themselves have outdated equipment and hence not equipped to provide appropriate skills. Therefore, most (54%) manufacturers interviewed emphasised the need for apprenticeship programs, graduate internships and appropriate technical courses in universities and polytechnics.

Thirdly, the manufacturers indicated a need to urgently address the high cost of capital financing, which has remained a major hurdle that has adversely affected business operations in the last 2-3 years. Most of the manufacturers relied on self-financing to grow their businesses, which include expensive loans from banks, invoicing and shares due to difficulty in accessing financing with reasonable terms.

More than half of the manufacturers interviewed felt that the government could do more to make the sector competitive and attractive to potential investors, especially with the issue of financing through such incentives as grants, subsidies, purchase guarantees as well as provision of tax exemptions.

Other areas in which the government can make a difference include development of infrastructure, regulation of cheap imports, stabilising the exchange rates and creating an enabling political environment for business.

Regarding future projections and strategic planning, companies interviewed prioritised product development, advertisement and marketing, computer systems, hardware and software acquisition as potential investment areas to improve business operations in the next financial year.

In conclusion, it is clear that though manufacturing industry is a crucial engine for sustaining economic growth and development, job creation and poverty alleviation, we have to urgently seek ways to improve the level of automation in the sector, develop appropriate technical skills for manufacturers and provide opportunities for ease of access to capital financing to expand the sector.

Other notable factors include tax incentives for technology purchases, better training for local technology partners, an improved local availability of new technologies, and availability of affordable automation and robotics technologies that would make local manufacturing an attractive business venture in Kenya.

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Appendices

Appendix A: Organisations that participated in the project

Table A-1: Textiles and Apparel Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
1	Alliance Garments	10 - 15	300 - 500
2	Barjolia Sports Company	-	< 20
3	Brand Track	< 5	300 - 500
4	Chalange Industries	5 - 10	100 - 200
5	Kema East Africa	10 - 15	> 500
6	Manchester Fitters	> 40	300 - 500
7	Mantoz Enterprises	10 - 15	100 - 200
8	Mills Industries	< 5	300 - 500
9	Oriental Mills	-	-
10	Specialized Towel Manufactures	35 - 40	20 - 30
11	Stitch Masters Limited	15 - 20	30 - 50
12	Straight-Line	25 - 30	50 - 100
13	Tarpo Industries	> 40	100 - 200
14	Teita Masters	> 40	100 - 200

Table A-2: Leather and Footwear Sector

S/No.	Organisation Name	Years (In Operation)	Size (Employees)
15	Alpharama Leather Ltd	20 - 30	> 500
16	Sand Storm Leather	10 - 15	50 - 100

Table A-3: Automotive Sector

S/No.	Organisation Name	Years (In Operation)	Size (Employees)
17	Honda Choda	< 5	50 - 100

Table A-4: Food and Beverages Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
18	Koba Waters	15 - 20	20 - 30
19	Pioneer Foods	15 - 20	200 - 300
20	Farmers Choice	35 - 40	200 - 300
21	Nestle	> 40	100 - 200
22	Tropical Heat	> 40	300 - 500
23	Mars Wrigley Confectionery	> 40	100 - 200
24	London Distillers	5 - 10	100 - 200
25	Baraka Flour Mills	> 40	200 - 300
26	Elliot's Limited	10 - 15	100 - 200
27	Bakemark Ltd	< 5	50 - 100
29	SBC	5 - 10	200 - 300
30	-	> 40	300 - 500
31	Bakers Corner	20 - 25	50 - 100
32	DPL Festive	15 - 20	100 - 200
33	Patco Ltd	> 40	100 - 200
34	Manji Food Industries Ltd	> 40	50 - 100
35	Viva Product Line	15 - 20	100 - 200
36	Pernord Ricard	> 40	50 - 100
37	Glacier Products	20 - 25	100 - 200
38	Dot Com Bakery	10 - 15	100 - 200
39	Britania Foods Ltd	> 40	200 - 300
40	Nairobi Bottles	> 40	> 500
41	Weetabix East Africa	> 40	100 - 200

Table A-5: Paper and Boards Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
42	Bag & Envelope Limited	15 - 20	100 - 200
43	Fortune Printers & Stationary	15 - 20	< 20
44	Kenya Stationaries Limited	> 40	> 500
45	-	> 40	20 - 30
46	Twiga Stationaries	> 40	> 500

Table A-6: Energy and Electrical Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
47	Kenwest	> 40	50 - 100
48	Solar Gen	5 - 10	20 - 30
49	Suntech Power Ltd	10 - 15	50 - 100
50	BOC Gases	> 40	50 - 100
51	Avery	20 - 25	100 - 200
52	Daima Energy	10 - 15	< 20
53	Metsec	> 40	300 - 500
54	Assa Abloy	25 - 30	30 - 50
55	Metlex	> 40	20 - 30
56	Serengeti	10 - 15	< 20
57	Tullow Oil	> 40	30 - 50
58	Iberafrica	20 - 25	100 - 200
59	KPLC	> 40	> 500
60	Go Solar Power Ltd	10 - 15	20 - 30

Table A-7: Plastics Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
61	Betatrad Kenya Ltd	20 - 25	50 - 100
62	Brush Manufacturers Ltd	5 - 10	300 - 500
63	Galaxy Plastics	5 - 10	50 - 100
64	General Plastics	> 40	> 500
65	Ketainers Ltd	30 - 35	300 - 500
66	Precision Plastics	> 40	50 - 100
67	Prosel Plastics	25 - 30	50 - 100

Table A-8: Chemical and Allied Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
68	East Africa Foundry Ltd	> 40	200 - 300
69	Insteel	10 - 15	100 - 200

Table A-9: Pharmaceuticals Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
70	Biodeal Laboratories Ltd	> 40	100 - 200
71	Cosmos Pharmaceuticals	> 40	300 - 500
72	Dawa Limited	< 5	< 20
73	Elys Chemicals	30 - 35	100 - 200
74	Laborex	> 40	100 - 200
75	Oss Chemie (K) Ltd	35 - 40	20 - 30
76	Surgipharm	30 - 35	200 - 300
77	Wessex	10 - 15	200 - 300

Table A-10: Timber and Wood Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
78	Furniture Palace International	15 - 20	200 - 300
79	Mobilcasa	10 - 15	50 - 100
80	Panesar	> 40	100 - 200
81	Renocon	30 - 35	50 - 100
82	Rosewood Furniture	25 - 30	100 - 200
83	Saumu	5 - 10	< 20
84	Shah Timber	> 40	100 - 200

Table A-11: Building and Mining Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
85	Bamburi Cement Ltd	10 - 15	300 - 500
86	Ideal Ceramics	30 - 35	> 500
87	Saj Ceramics	30 - 35	200 - 300
89	Space And Style Ltd	10 - 15	< 20
90	Tiles & Carpet	35 - 40	> 500
91	Twyford Ceramics Ltd	10 - 15	100 - 200

Table A-12: Metals and Allied Sector

S/No.	Organisation Name	Years (in Operation)	Size (Employees)
92	Mecol Ltd	> 40	50 - 100
93	-	> 40	50 - 100
94	Spectra Chemical	5 - 10	30 - 50
95	Temech Engineering Ltd	< 5	30 - 50
96	Twiga Chemical	> 40	300 - 500

Appendix B: Strathmore University Institutional Ethical Review Committee Approval



4th January 2019

SU-IERC/288/18

Prof Ismail Ateya Lukanola
Strathmore University
P.O BOX 59857 - 00200
Nairobi

Email: iateya@strathmore.edu

Dear Prof Ateya,

REF Protocol ID: SU-IERC/288/18
AN INVESTIGATION INTO THE IMPLEMENTATION OF TECHNOLOGICAL AIDS AND ERP SOFTWARE IN THE MANUFACTURING INDUSTRY IN KENYA

We acknowledge receipt of your application documents to the Strathmore University Institutional Ethics Review Committee (SU-IERC) which includes:

1. Covering Letter dated November 26, 2018
2. Responses to SU-IERC Comments dated December 14, 2018
3. Research Proposal dated December 14, 2018
4. Participant information sheet and informed consent form dated December 14, 2018
5. Research Tool (Manufacturing Questionnaire) dated December 14, 2018
6. An introductory Letter seeking consent to collect data from Organisations (Letter to Participating Companies) dated December 14, 2018
7. Research Budget
8. CV for Investigators
9. Conflict of Interest Declaration
10. Letter of Delegation of Roles and Responsibilities

The committee has reviewed your application, and your study "An investigation into The implementation of Technological Aids and ERP Software in the Manufacturing Industry in Kenya" has been granted approval.

This approval is valid for one year beginning 4th January 2019 until 3rd January 2020.

In case the study extends beyond one year, you are required to seek an extension of the Ethics approval prior to its expiry. You are required to submit any proposed changes in this proposal in SU-IERC for review and approval prior to implementation of any change.

Old Borego Rd, Mathare Estate, PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)771 034000
Email info@strathmore.edu www.strathmore.edu

Appendix C: National Commission for Science and Technology Research Permit



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241348, 3310371, 2219430
Fax: +254-20-318245, 318249
Email: cg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Wajaki Way
P.O. Box 20623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/19/19516/27597**

Date: **15th January, 2019**

Patrick M. Shabaya
Strathmore University
P.O. Box 59857, 00200
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Investigation into the implementation of technological aids and ERP solutions in the manufacturing industry in Kenya*" I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **15th January, 2020**.

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

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

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

Appendix D: Respondents Consent Form to Participate in the Research



PARTICIPANT INFORMATION AND CONSENT FORM

AN INVESTIGATION INTO THE IMPLEMENTATION OF TECHNOLOGICAL AIDS AND ERP SOFTWARE IN THE MANUFACTURING INDUSTRY IN KENYA

PRINCIPAL INVESTIGATORS: Prof Ismail Ateya and Prof Reuben Marwanga

INSTITUTIONAL AFFILIATION: Strathmore University and SYSPRO Africa

1 INFORMATION ABOUT THE STUDY

1.1: Why is this study being carried out?

- **Objective #1:** Determine the state of the manufacturing sector in Kenya from secondary sources.
- **Objective #2:** Establish the factors that impact on productivity and competitiveness of the manufacturing sector in Kenya.
- **Objective #3:** Determine the role of new technologies, including information and communications technologies (ICT's) in improving productivity and competitiveness in the manufacturing sector.
- **Objective #4:** Determine the state of adoption and use of new technologies in the manufacturing sector in Kenya.
- **Objective #5:** Recommend approaches for adoption and use of new technologies in the manufacturing sector in Kenya for competitive advantage

1.2: Do I have to take part?

No. Taking part in this study is entirely optional and the decision rests only with you. If you decide to take part, you will be asked to complete a questionnaire to get information on how Kenyan manufacturing companies have automated their processes. If you are not able to answer all the questions successfully the first time, you may be contacted and asked to answer the questions a second time. You are free to decline to take part in the study from this study at any time without giving any reasons.

1.3: Who will have access to my information during this research?

The information may be coded and transcribed for storage in a database for future use but within tight control of the research team. All research records including questionnaires and any recorded audio clips will be stored in securely locked cabinets accessible only to the researchers and to those with express consent from the researchers.

1.4: Who can I contact in case I have further questions?

You can contact the Research Office at Strathmore University on Tel 254 703 034 000 or directly call any of the two researcher principals; Prof Ismail Ateya at e-mail iateya@strathmore.edu, Telephone 254 728 054 615 or Prof Reuben Marwanga at e-mail rmarwanga@strathmore.edu or Tel 254 720 731 496.

Participation in the Research Study

I AGREE to take part in this research I DON'T AGREE to take part in this research

Signature _____ Date _____ Time: _____

SYSPRO Proprietary Limited
Ground Floor - Office No. 1E
Panari Sky Centre, Mombasa Road
Nairobi, Kenya

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