

**TECHNOLOGICAL CAPABILITIES, LEARNING
MECHANISMS AND INNOVATION PERFORMANCE: A
STUDY OF POTATO CRISP PROCESSING IN KENYA**

By

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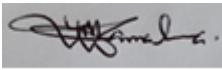
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DECLARATION

This thesis is my original work carried out during my PhD study at the Institute for Development Studies, College of Humanities and Social Sciences, University of Nairobi and has not been presented for a degree in any other university or learning institution.

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ABSTRACT

The main objective of this thesis was to investigate the extent and how food processing firms in Kenya build their technological capabilities as a part of a broad firm strategy to achieve competitiveness. In doing this, it explored three specific objectives. The first objective was to identify and document the level of technological capabilities the firms were operating at. The second objective was to examine the learning processes which have supported the development of the said capabilities. The third and last objective was to explore the relationship between capability building and a firm's innovative performance.

To explore these objectives, the study drew on the innovation studies theory which argues that examining the learning mechanisms adopted by different firms potentially holds the key to explaining the differentiation in how the firms build their capabilities. This builds into the technological capability building framework that maps the relationships that govern a firm. A firm learns in order to build its technological capabilities. The technological capabilities in turn affect its innovative performance. This in turn affects the firm's outcomes.

Placing building of technological capabilities at the heart of firm success and growth in developing countries is a departure from previous studies. It builds on recent studies which have shown that internal capabilities among a growing number of African firms are improving leading them to achieve growth and success. However, many studies have not explored in detail how such firms build those capabilities in the first place.

This thesis extends the discourse in the area by using a case study methodology whereby an in-depth study of six potato processing firms drawn from the Nairobi Metropolitan Area in Kenya was done. The data collection was accomplished in three rounds. The first round of data collection was done between December 2013 and January 2014. This was followed by a second round of interviews which were done between October and November 2014. Finally, the third and last round of interviews were conducted between August and November 2016. By the end of these rounds, each of the six firms had been visited at least three times.

On the objective of technological capabilities based on the functions they perform, the study analysed production and marketing capabilities. Eight capabilities were analysed under production while four were analysed under marketing. Based on the degree of complexity, the capabilities were analysed based on four levels starting with very basic, to basic, to intermediate and finally advanced. Looking at the findings, the conclusion is that there are variations first from one firm to the next and secondly from individual capability to the next. There are two exceptions both relating to the production capabilities. The first is firm A which featured at the advanced level in seven out of eight production capabilities. The second is where all the six firms were at the same level specifically in terms of the sorting capability. Nevertheless, cumulatively more firms featured in the basic level compared to advanced one. Similarly, we observed that the marketing capabilities seemed to be more developed compared to the production ones.

On the objective of learning mechanisms, a dichotomy was made of internal versus external mechanisms. Looking at the findings, the study concluded that there are marked variations in the way the six case study firms appropriate the learning opportunities. Comparing internal and external mechanisms, it was established that the internal mechanisms were the most popular among the firms. These were followed by the private external mechanisms and finally collective external mechanisms. Of the specific mechanisms, training came out very strongly

as a favoured mode of capability accumulation. Similarly, size featured very strongly as an explanatory variable determining how each firm undertook its learning processes.

On the last objective of the relationship between capability building and the firm's innovation performance the study concluded that a firm's capability level was a good predictor of how the firm performed. Thus, the effort which was put in the capability building ultimately paid off by propelling the firm to better innovation performance. As a result, though there are variations, the firms which featured at the advanced capability level also did very well as far as innovation performance was concerned.

This study has implications for theory, policy and practice. Theoretically, it extends knowledge on the study of successful African firms by focussing on how firms build their capabilities so as to achieve competitiveness. At the policy level, the study highlights various opportunities that need government intervention so as to support private enterprise in the country. A key recommendation arising from this is the need to have more government agencies coordinating various initiatives that are supposed to support firms. The study also recommends that the government increases its efforts towards increasing publicly provided training programs to firms. Additionally, to address the skills gap in the sector, the study recommends that the government increases its support to institutions such as the National Industrial Training Authority (NITA) which are mandated to respond to such concerns.

Regarding practice, the study delves into the food processing industry in Kenya and analyses how firms in a particular sub-sector engage with various actors in their quest to learn and build their capabilities to attain competitiveness. A key recommendation arising from this study concerns the need for local firms to increase their efforts towards improving the packaging capabilities to match the customer expectations. This will also enable the firms to cope with competition particularly from abroad.

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It takes a village to raise a child is a popular African saying. This thesis is like that baby.

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DEDICATION

This thesis is dedicated to my dear wife Catherine Mwendu, and my lovely children Rita Nanjala and Adrian Wamalwa. Catherine, thanks for the support throughout. For Rita and Adrian, I hope that this will be inspiration enough for you pursue your dreams in life. This family is not complete without the inclusion of Aunty Mwikali Kisaa. She has been with us for the entire period this PhD has lasted and took charge of Rita and Adrian while Catherine and I were away. As such, this thesis is also dedicated to her.

LIST OF ACRONYMS AND ABBREVIATIONS

AfricaLics	African Network of Researchers in Learning, Innovation and Competence Building systems
APO	African Packaging Organisation
CIS	Community Innovation Survey
EBIT	Earnings Before Interest and Tax
ECAPAPA	Eastern and Central Africa Programme for Agricultural Policy Analysis
ERS	the Economic Recovery Strategy
ESA	European Snacks Association
FAO	Food and Agricultural Organisation
FDI	Foreign Direct Investment
FFA	Free Fatty Acids
FKE	Federation of Kenya Employers
FMCG	Fast Moving Consumer Goods
FPA	Food Processing Africa
GDP	Gross Domestic Product
GIZ	German Development Agency
GlobeLics	Global Network for Economics of Learning, Innovation, & Competence Building Systems
GoK	Government of Kenya
HRD	Human Resource Development
IDS	Institute for Development Studies
IFDC	International Fertilizer Development Center
IIP	Investors in People (UK)
IOPPK	Institute of Packaging Professionals Kenya
IPC	the International Potato Centre
IPPK	Institute of Packaging Professionals Kenya
IT	Information Technology
KAM	Kenya Association of Manufacturers
KARLO	Kenya Agricultural and Livestock Research Organisation
KCSE	Kenya Certificate of Secondary Education
KEBS	Kenya Bureau of Standards
KEPHIS	Kenya Plant Health Inspectorate Services
KEPSA	Kenya Private Sector Alliance

KES	Kenya Shillings
KIRDI	Kenya Research and Industrial Development Institute
KNBS	Kenya National Bureau of Statistics
MAP	Modified Atmosphere Packaging
MSME	Micro Small and Medium Enterprises
MVA	Manufacturing Value Added
NCPK	National Potato Council of Kenya
NIS	National Innovation System
NMA	Nairobi Metropolitan Area
R&D	Research and Development
RPED	Regional Programme on Enterprise Development
SAFIC	Successful African Firms and Institutional Change
SFA	Snack Food Association
SME	Small and Medium Enterprises
SSA	Sub Saharan Africa
UNIDO	United Nations Industrial Development Organisation
WPO	World Packaging Organisation

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CHAPTER ONE

INTRODUCTION

1.1. Introduction

This chapter introduces this study whose broad objective was to contribute to the understanding of how potato crisp processing firms in Kenya build their technological capabilities as part of a broad strategy to increase their innovative competitiveness in the face of a changing business and institutional environment. Potato crisp processing entails adding value to raw potatoes through various processes before availing the final product to the market. Potato crisp processing is part of the larger food processing sector in Kenya so it is useful to review the key issues around food processing in order to appreciate the context crisp processing operates. The food processing sector is very crucial to the country's economy. The sector makes significant contribution to economic indicators such as the country's exports, gross domestic product (GDP), foreign exchange earnings, and employment. The sector has been an important contributor in Kenya's industrialisation process, being one of the sectors to emerge early in the country's industrialisation (McCormick & Atieno, 2002).

The sector's contribution in terms of value added and employment has been considerably above the national manufacturing average. Recent statistics for Kenya indicate that the earnings from agro-processing accounted for 30% of total export value, an equivalent of 70% of total manufacturing by 2007 (Atieno, 2012). In 2013 it was reported that agro-processing in Kenya was a USD 3.25 billion market, 40% of which was manufacturing value add. The sector contributed 2.4% of employment and 53% in 2013 (World Bank, 2015).

Nonetheless, it has been argued that the potential of the food processing sector has not been fully realised in Kenya. It has been observed that in spite of the fact that the country has a comparatively well-developed manufacturing sector, most food processing firms were inward looking and stagnated (McCormick & Atieno, 2002). Most firms catered for only the local market, which shielded them from world market competition and contributed to the low quality of their products. Recent studies indicate that this may not have changed much. A study by Atieno (2012) points out that productivity levels in agro-industry are low, reflecting the limited scale of activities mainly due to dispersed sources of raw materials as well as backward technologies and weak managerial and technical skills. Additionally, poor technology and inadequate technical skills have been highlighted by the government as some

of the main factors undermining Kenya's economic performance and competitiveness (GoK, 2013).

Globally, the food industry has faced dramatic changes in its competitive environment over the past decades. Some of these changes are external such as the internationalisation of the global food market and the mergers among supermarkets. Similarly, many developing countries' domestic policies have also become market oriented thus opening their markets to international competition. Additionally, many economies are forming into regional economic blocs (Hoskisson et al., 2000). All these changes have a bearing on the food processing sector. For example, the changes have put pressure on the prices that can be realised by the suppliers of both the fresh and processed food. As a result of these pressures, food processing, which is generally viewed as a mature and relatively low technology industry, has been forced to introduce changes that have affected all aspects of operation (Avermaete et al., 2003; Otieno & Mwangola, 2006). Similarly, increased competition has pushed food companies to become more efficient in processing, to reorganise management, develop new products and explore new markets in order to meet the needs and wants of consumers competitively (Avermaete et al., 2003; Jaffee & Masakure, 2005; Ouma, 2010; Ouma & Whitfield, 2012; Reardon et al., 2004).

This leads one to ask the following important question: in the face of such changes in the business environment and against a perceived background of unfulfilled potential, how do food processing firms in Kenya, including potato crisp processing firms which are the focus of this study, go about building their capabilities to improve their competitiveness? This is because a limited number of empirical studies suggest that the internal capabilities of African firms are improving: entrepreneurs are growing in impact and diversity; firms are building organisational and managerial capabilities that allow them to be successful not only in domestic markets but also in regional and global markets; and more firms are reaching a critical size that enable them to obtain scale and scope economies (Tvedten et al., 2014).

On the link between agriculture and industrialisation, Ouma & Whitfield (2012) argue that the discourse around agro-industrialisation is now moving from comparative advantages to creating competitive advantages. They argue further that creating competitive advantages in turn requires a transformation in firm capabilities, organisational forms and the inherited frameworks and routines. In other words, successful industries or firms for that matter do not just emerge but are instead consciously made. Ouma & Whitfield (2012) indicate further that

thanks to global value chain analysis, we know what capacities and organisational forms required for African firms/farms to enter global agro-food markets and stay in them. On the other hand, what is not widely known is how such capacities and organisational forms are built. A number of reasons are advanced to explain this. Of interest to this study and which formed its major point of departure is the fact that much literature on agro-industries in Africa has not dealt in detail with the formation of new technological capabilities at the firm and industry level (Ouma & Whitfield, 2012: 303).

Such a view builds on others such as Khan (2010) who says that even though there are many other widely recognised constraints such as infrastructure, technological capabilities of workers and the management in firms deserves more policy attention in Africa. This is because they are more important in explaining why some countries take off industrially while others do not. Yet the technological capabilities have historically received less policy action in many developing countries.

It is against such a background that this study used the potato crisp processing sub sector in Kenya as a case study to unravel the relationships that underpin firms' quest to learn in order build their technological capabilities as part of a strategy to increase their innovative competitiveness. This study selected the potato processing crisp sub sector of the larger food processing industry in the study area on purpose. According to the National Potato Strategy (GoK, 2016b), potato in Kenya is an important food and cash crop that plays a major role in food security and it is only second to maize in terms of production and utilisation. Though most of the potato produced in Kenya is consumed where it is grown, potato processing particularly crisp processing has been growing steadily to about 40 firms in 2014 from five in the 1980s (Abong' et al., 2010b; Kaguongo et al., 2014). This increase in the consumption of potato products calls attention to an exploration of how crisp processing firms in Kenya are building their technological capabilities to improve their innovative competitiveness.

1.2. Research Problem

The food processing sector in Kenya has been the country's steppingstone to industrialization. The sector also contributes to the economy through job creation, income generation, foreign exchange earnings and stabilization of farm incomes (Atieno, 2012; McCormick & Atieno, 2002). On the other hand, it has been argued that the sector's full potential is yet to be realized. This is largely attributed to the unfriendly business environment that the sector operates under. As a result, value addition remains very low.

Consequently, the competitiveness of many food processing firms is low with a majority just catering for the local market. Yet Kenyan firms now face competition, both at home and abroad, from firms who are often more efficient, have more product variety and superior marketing capabilities.

This notwithstanding, there is evidence that the internal capabilities of some Kenyan firms are improving. Such firms are growing in size, impact and are diversifying their product lines. They are competing well on the domestic market and some are also venturing in the export markets. This is attributed to among other things their continuous building of organisational and managerial capabilities.

Thanks to global value chain analysis, we now know a lot about the capabilities and organisational forms which are needed for firms to compete not only locally but also globally (Ouma & Whitfield, 2012). What is less known is how such capabilities and organisational forms are built. While several studies have discussed the structural and regulatory constraints that hinder industrial development in Sub Saharan Africa, very few focus on firm specific strategies and how firms interact with particular market structures and institutions. Consequently, much literature has failed to deal in detail with the formation of new technological capabilities and technological capabilities have historically received less policy action in many developing countries in general and Kenya in particular. This therefore creates a knowledge gap in the understanding of how firms in Kenya build their capabilities, the nature of the mechanisms that support the building of such capabilities, and the relationship between the capability building processes and the firms' competitiveness.

1.3. Research Questions

This study sought to answer the following broad question: to what extent and how have potato processing firms in Kenya built their capabilities to be competitive? To answer this question, the study addressed the following specific questions:

1. At what level of technological capabilities do the firms operate?
2. What learning mechanisms have supported the development of the firms' technological capabilities?
3. What is the nature of the relationship between the capability building process and the firms' innovative performance?

1.4. Research Objectives

The main objective of this study was to investigate the extent and how potato processing firms in Kenya build their technological capabilities as part of a broad firm strategy to achieve competitiveness. The following were the specific objectives:

1. To identify and document the level of the technological capabilities of the firms;
2. To examine the learning mechanisms which have supported the development of the technological capabilities;
3. To explore the nature of the relationship between the capability building process and a firm's innovative performance.

1.5. Justification of the study

Kenya's *Vision 2030* stresses the importance of the manufacturing sector and identifies food processing as the most important single sub-sector in terms of its contribution to GDP and manufacturing-sector employment (GoK, 2007). The government has identified the sector as very important in driving the industrialisation agenda. This is in line with its quest to transform Kenya into a middle income industrialising country by 2030 by increasing value addition as the country moves away from primary commodity exports and instead moves up the supply value chain. In view of the fact that most firms in the food processing sector are operating below potential, this study's contribution lies in the documentation of the learning mechanisms used by the potato crisp processing sub sector in their quest to build their technological capabilities and improve their innovative competitiveness.

Many past studies applying the technological capabilities building approach were situated among firms that are at the technological frontier in industrialising economies (Bell & Figueiredo, 2012; Marcelle, 2005). These were firms that operated at or near the international frontier of innovation (Bell & Figueiredo, 2012; Marcelle, 2005). Such firms tracked their innovative performance using patent citations and or research and development expenditure overlooking the role of learning in creating firm capabilities. The focus therefore was on what firms already knew and how that could be used to push their capabilities forward. Not how the firms accumulated those capabilities in the first place which is critical for firms in latecomer economies (Bell, 2006; Bell & Figueiredo, 2012) such as the Kenyan potato crisp processors. By focussing on the interaction between learning mechanisms, technological capabilities and firm's innovative performance among Kenyan crisp processors, the study makes an important empirical contribution.

1.6. Key concepts used in this study

The following are three key concepts used in this study:

- i. Learning mechanisms – these are a wide range of mechanisms through which firms acquire knowledge to build their technological capabilities. Firms can draw this knowledge from external and internal sources. Learning in the context of technological capabilities therefore entails all ways in which a firm increases its capability to manage technology and to implement technical change (Bell & Pavitt, 1995).
- ii. Technological capability – this is the level of knowledge, skills and experience acquired by firms to organise and innovate production and marketing functions (Oyeleran-Oyeyinka, 2004).
- iii. Innovative firm performance – this entails how a firm creates, manages and implements change in its product, processes, services and organisation (Bell & Figueiredo, 2012).

1.7. Structure of the thesis

This thesis has eight chapters and is organised as follows: This first chapter is the introduction followed by the second chapter which is Background. Chapter three is literature review which leads to the research methodology chapter. Six appendices are part of this research methodology chapter. The next three chapters, that is five, six and seven are the study's findings chapters. The first finding chapter is chapter five: Level of Technological Capabilities among Potato Processing Firms. The second findings chapter is six: Learning Mechanisms among Potato Processing Firms in Kenya. The third and last findings chapter is seven: Relationship between Capability Building and Firm's Innovative Performance. The last chapter is eight: Summary and Conclusions. This wraps up the thesis highlighting the main findings and the take home messages. It also discusses the study's theoretical, empirical and policy implications.

CHAPTER TWO

POTATO CRISPS PROCESSING AND MARKETING IN KENYA

2.1 Introduction

This chapter is divided into four parts. This brief introduction is followed by a presentation of the historical development of potato production Kenya from the colonial days to the present. The third section focuses on a discussion of the potato crisp processing industry in Kenya. The growing importance of the potato crisps processing is demonstrated by among other things the steady increase of potato processing firms especially in major urban centres in Kenya. The growth in the sector is therefore demonstrated while at the same time the unfulfilled potential is noted. This is followed by a section on the market for potato crisps in Kenya. The fifth section summarises the key messages arising from the chapter.

2.2 Historical Development of Potato Production and Processing in Kenya

Colonial settlers introduced potatoes (Irish potatoes - *Solanum tuberosum*) to the favourable Kenyan agro-ecological conditions of Kiambu, Muranga and Nyeri in the late 19th Century. As it was the practice then, African farmers were not allowed to farm it until the 1920s. The introduction of the crop faced numerous challenges due to viral and bacterial diseases. Seed availability was another challenge. This forced the colonial government to initiate a number of interventions to address this. The first was the establishment of National Laboratories in Kabete in 1903 and a plant breeding station in Njoro in 1927 (Durr & Lorenzl, 1980; GoK, 2016b). During the Second World War, the British government was faced with a serious challenge of supplying food to its troops who were stationed in Northern Africa and Asia. This was to be a turning point for potatoes in Kenya as it marked the beginning of setting the foundation for the processing now being witnessed. The colonial government set up dehydration plants in Kerugoya in the then Kirinyaga District and Karatina in Nyeri. It is documented that in 1945, about 5,000 tonnes of potatoes were dehydrated every six months (Durr & Lorenzl, 1980).

As potato consumption in Kenya has grown over time, its production has since grown to include other areas away from the traditional Kenyan highlands. This has also been helped by the availability of heat tolerant varieties as well as irrigation.

The growing consumption of potatoes in Kenya is linked to changes in consumption habits, mainly in urban centres, where chips and crisps have become a more popular part of the diet in the last couple of decades (Kaguongo et al., 2014; Walingo et al., 1997). Urbanisation,

income growth, international influences, and modernisation of the urban society have changed the food consumption patterns. As a result, maize which is the number one staple food is gradually being substituted by wheat, rice, and potatoes.

Potato chips and crisps processing has been the determining factor of growth in demand for potatoes. To demonstrate growth in potato consumption, it was estimated that three quarters of urban households consumed potatoes regularly in the early 2000s. It was further estimated that these households consumed on average 5 kilograms per adult at a cost of 0.5 euro per month (ECAPAPA, 2006). Recent statistics indicate that this has gone up considerably. Available information from the Ministry of Agriculture Livestock and Fisheries indicate that the per capita consumption is at 30-40 kilograms with the urban centres recording higher rates of 100 kilograms per month (GoK, 2016b). This is a high increase an indicator of the potential potatoes hold in the country.

The potato industry has therefore been growing in importance and in 2014 it was estimated that there were over 800,000 potato farmers utilising about 161,035 hectares of farmland. It was further estimated that all these growers provided about 3 million metric tonnes of potatoes which was worth about Kenya Shillings 50 billion at farm gate prices (GoK, 2016b) as shown in Table 2.1. This is a significant contribution to the national economy. In addition, because the potato industry is labour intensive, it is estimated that the potato industry employs 3.3 million people along its value chain. Beyond this, potato is the second most important stable after maize in Kenya. It has very high nutritional value which is very important in meeting the dietary requirements of consumers. The crop can grow in both high and low altitude and has a very high production per unit area and time given that farmers can achieve up to three crops in a single year.

Table 2.1 Estimated Production of Selected Food crops, 2010-2014

Crop	Unit	2010	2011	2012	2013	2014
Maize	Million bags	35.8	34.4	41.9	40.7	38.0
Beans	Million bags	4.3	6.4	6.8	7.9	6.8
Potatoes	Million tonnes	2.7	1.6	1.5	2.1	2.3
Sorghum	Million bags	1.8	1.8	1.9	1.7	1.9
Millet	Million bags	0.6	0.8	0.8	1.6	1.4

Source: KNBS (2015:154)

This growth notwithstanding, there is an argument that the potato industry in the country is still operating below its potential. For instance, in Kenya the average yield is about 20 tonnes per hectare while the world average is about 40 tonnes per hectare. With proper strategies, the industry can therefore grow two fold. Historically, the availability of seeds has been a major challenge for the industry and has invariably been a major policy concern. Secondly, potato farming is predominantly small scale. It is estimated that 83% of 800,000 potato farmers in Kenya are small holders farming on between 0.2 and 0.4 hectares of land. The remaining 17% are medium and large scale farmers dedicating between 2 to 10 hectares to the crop (Kaguongo et al., 2014).

The lacklustre performance has also been attributed to a lack of a clear policy framework. This is historical because whereas crops such as maize, wheat, tea or pyrethrum attracted a lot of attention and government intervention, potatoes did not receive as much attention (Durr & Lorenzl, 1980). Potatoes were classified as a horticultural crop and did not enjoy government extension services of the Ministry of Agriculture. It was classified as a minor crop and received only sporadic interventions with a view to promote it. But perhaps the future may change. Among other efforts, there is now the Ministry of Agriculture's National Potato Strategy 2016 – 2020 which articulates the importance of the crop terming it one of the promising enterprises that will play a very important role towards the realisation of the set objectives of Kenya Vision 2030 because of its substantial contribution to food security in Kenya. The strategy lists seven strategic objectives one which is to improve potatoes' post-harvest handling, value addition and marketing (GoK, 2016b:iii). The strategy also maps the key stakeholders in the industry and calls for better coordination among them.

2.3 Potato Crisps Processing in Kenya

A potato crisp is an outcome of potato processing. It is a snack made from deep frying sliced potatoes. The processing process begins with raw potatoes from the farm. These are washed and then peeled before being sliced into thin and uniform slices. These slices are fried using edible oils. Edible salt and other permitted food grade spices, colour, and flavours may also be added. After frying, excess oil is drained and the crisp is packed in readiness for consumption (Abong' et al., 2010a; FAO, n.d.). Depending on the processor and their technological capabilities, there are many different types of crisps which target different consumer preferences (Abong' et al., 2010a).

One of the earliest documented research on potato processing in Kenya was done in the 1970s by Durr & Lorenzl (1980). At that time, it was noted that potatoes were consumed fresh and value addition by way of processing had very limited importance. Crisps were the only processed product which was packed and distributed to schools, kiosks and retail shops. This was accomplished by five processors with a combined capacity of about 40 tonnes of fresh potatoes a week (Durr & Lorenzl, 1980). Since that time, potato crisp processing in the country has undergone tremendous growth moving from five processors in the early 1980s to at least 15 in 1995 to more than 20 by 2004 (Abong' et al., 2010a; Walingo et al., 1997), and more than forty by 2014 (Kaguongo et al., 2014). During the same period, processing capacities have also increased from about 40 metric tonnes of fresh potatoes per month to about 243 metric tonnes of fresh potatoes per month. Furthermore, apart from crisps there is also now a growing market of fresh cut chips.

A lot of the growth is attributed to growing demand which as we have already noted, is due to changing lifestyles and eating habits particularly of urbanised Kenyans. Apart from this, expanding tourism over the past decades has also spurred demand for processed potatoes in Kenya (Walingo et al., 2007). In addition, several large companies are also processing frozen chips for sale in leading supermarkets for product diversification (Walingo et al., 1997, 2007).

After the pioneering 1980 study on potato processing in Kenya, there was a lull until the late 1990s. During the lull, little information was available on the potato processing industry in country and there were no records on the characteristics of, constraints to, and trends in potato processing (Walingo et al., 1997). This inspired studies such as (Walingo et al., 1997) and other follow up studies such as (Abong' et al., 2010a; Walingo et al., 2007). Most of these were initiated to analyse the requirements of potato processors in terms of their preferred varieties, the availability and price of raw material, pre-processing storage practices, and constraints facing the industry. For instance, Walingo et al., (1997) note that their work clarifies the factors that influence the choice of varieties for processing in the hope that doing so will improve the screening methods used to assess the processing quality and potential markets for new varieties.

The exception is Abong' et al., (2010) which surveyed 23 processors drawn from Nairobi and Nakuru. This offered a useful glimpse into the potato crisp processing industry in Kenya at that time. A majority of the studied firms (61%) were small employing less than five

employees. In addition to crisps, the study also revealed that many firms diversified their product portfolio to also include the following: peanuts, chevda, potato sticks, banana crisps, and arrow roots crisps. On constraints, the firms cited proper equipment, sufficient supply of quality raw potatoes and finances to increase their production capacities. Supermarkets emerged as the preferred market outlet at 83%.

From that study, a picture starts to emerge of the nature of the potato crisp processing industry in Kenya at that time. It is a picture of an industry witnessing growth in terms of numbers of processors and processing capacity but also dominated by small firms. It also paints a picture of an industry where more firms are keen to diversify their product portfolio perhaps as a survival strategy in a risky and uncertain business environment. Such survival strategy particularly among small and micro firms in Kenya has been noted by studies such as McCormick, (1988). Similarly, a picture begins to emerge of firms struggling with key issues such as raw materials availability and difficulties in accessing recommended equipment due to financial limitations. Lastly, whereas in the 1970s and 1980s, schools and kiosks were the preferred outlet options, supermarkets seem to have since grown in importance and are now the preferred option.

A number of these issues had been flagged by earlier studies. A case in point concerns equipment and the general status of the technology in the industry. This was discussed by Walingo et al., (1997) who noted that in the 1990s, the main weaknesses found in the industry was technical. Most processors used batch processing as opposed to a case where the processing is automated. The equipment used was also rudimentary and purchased from local *jua kali* fabricators. This leads to poor quality final products compared to those processors who used modern commercial equipment. Similarly, availability of technical staff in the industry was a major challenge because the study noted that only one food technologist was encountered in the industry during the fieldwork. The overall analysis was a case where the technological capabilities in the industry were found to be very low.

Kaguongo et al., (2014) offers the latest glimpse into the sector. In keeping to what was found already about the sector in terms of size, the study divides the firms into two segments: large scale processors and cottage processors. A number of distinguishing characteristics are used to differentiate the two. Starting with size, large processors employ 20 employees and above while the cottage ones employ less than 20 employees. While this categorisation may be unique with the potato processing industry, it is important to point out that it differs with

the usual conceptualisation of firm sizes in the literature. For instance, the latest Kenya Micro Small and Medium Enterprises survey (GoK, 2016a) categorised firms as follows: micro enterprises employed between 1-9 employees while small enterprises employed between 10-49 employees. Medium enterprises are those which employ 50-99 employees while large ones are those that employ 100 and more employees (GoK, 2016a).

In general, many Kenyan firms tend to be small (Wamalwa & McCormick, 2015). There are fewer medium sized firms and even fewer large firms. The Micro, Small and Medium (MSME) study (GoK, 2016a), established that 92.2% of licensed enterprises are micro enterprises employing between 1 to 9 employees. Clearly this is a very large majority. Small enterprises employing between 10 and 49 employees come second at 7.1%. On the other hand, medium enterprises which employed between 50 and 99 employees come last at 0.7% (GoK, 2016a).

With regard to the processing capacity, Kaguongo et al., (2014) notes that the large scale sector processes about 240 metric tonnes of potatoes per month and sources their potatoes mainly from contracted farmers. They use the recommended Dutch Robyn potato variety. The cottage industry has a lower capacity, three metric tonnes of potatoes in a month, buys its potatoes from the retail markets and uses the lower priced Shangi potato variety. On equipment, the large scale processors use modern automated machinery. Due to cost implications, many firms in the cottage industry do not have standard premises and processing infrastructure. They still rely on locally fabricated equipment and fry their crisps on open fires using charcoal and firewood. Many of the employees engaged by large processors have technical skills required in the industry. These range from food production skills; skills needed to operate machinery; sales and marketing; and administrative skills such as accountancy, and human resources. On the contrary, most of the employees engaged by the cottage industry have minimal technical skills.

Whereas the large processors have a capacity of five metric tonnes per day and above, the cottage industry processes less than five metric tonnes per day. There are also differences in the quality of the final products. Since many large processors rely on contract farmers, they are able to demand and get the desired quality of potatoes. This relates to maturity and post-harvest handling among other requirements which in turn increases the quality of their final products and makes them very competitive. Comparatively, many cottage industry players do not have direct contact with farmers. They source from potato retail markets. They therefore

have to make do with what they get on the market. This is also determined by their purchasing ability. This therefore limits their ability to end up with quality products which would boost their competitiveness.

While the growing processing capacity particularly among large processors is something worth celebrating, there is another side to it that needs to be acknowledged. This has to do with installed capacity utilisation. There is no doubt that overall, the crisps industry is growing steadily. In 2004 the total volume of potatoes that were processed into crisps were estimated to be about 9,171 metric tonnes. Ten years later in 2014, this number went up to 35,214 metric tonnes representing an annual increase of 14% (Kaguongo et al., 2014). However it is observed that the local processors (especially the large processors) were operating at less than 50% of installed capacity. This raises a number of concerns. The main challenge seems to be lack of consistent supply of raw materials and this is widely documented (Abong' et al., 2010b, 2010a; ECAPAPA, 2006; GoK, 2016b; Wiersema et al., 2013). But could this also be a pointer to another challenge, the lack of appropriate technological capabilities?

That is an important question to pose because it has been noted in the past that many firms in Kenya set up production facilities without doing feasibility studies to determine the needs and the levels of investments required to meet those needs. They instead rely on owners' entrepreneurial hunches (Biggs et al., 1995). Secondly, most processing equipment especially for large processors is procured abroad. That presents a number of challenges. There is likelihood that the equipment bought may not be suitable for local conditions. It has been documented for instance that many leading manufacturers in the Europe and North America are now days preoccupied with faster, more automated and less-labour intensive machines (FAO, 2014) yet such machines may be unsuited for the low volumes of products that are processed in developing countries. Capacity challenges aside, without maintenance support over an agreed period of time, such machinery is prone to constant mechanical breakdowns because some of their components such as electronic monitoring devices which are not suited to the tropics. This may designate such investments expensive 'status symbols' unable to operate to capacity and prone to frequent mechanical breakdowns (FAO, 2014).

2.4 Market for Potato Crisps in Kenya

The discussion on the status of crisp processing leads to the next point of concern which is how potato crisp are marketed in the country and beyond. This in turn makes us to highlight

the issue of supermarkets and other retail options available to processors. Abong' et al., (2010) revealed that supermarkets were emerging as the preferred retail options among small as well as large processors. However, it is important to note that many processors still sell to other options such as kiosks, wholesalers and even institutions.

The preference for supermarkets is an emerging trend not only in Kenya but also in many developing countries. FAO (2014) highlights the growing importance of modern retailers especially supermarkets. However, this growing concentration has consequences especially for small processors. For instance, it emerges that not all processors across the board are getting equal attention from the supermarkets in Kenya as the following illustration indicates. All the supermarkets sampled by Kaguongo et al., (2014) sold a total of 2,736 metric tonnes of crisps in a year. Out of these, 2,345 metric tonnes representing 86% was supplied by the large processors compared to the cottage industry which supplied only 49 metric tonnes representing a paltry 2%. The cottage processors with their rudimentary processing capabilities were surpassed by importers who bought the remaining 13% or 342 metric tonnes.

But it also has to be noted that supermarkets in Kenya are not homogenous. There are leading supermarkets with branches across the country and there are also small estate-supermarkets. So, there are various ways in which the supermarkets can be categorised. While noting that crisps consumption is influenced by income levels and other socio-economic characteristics, Kaguongo et al., (2014) stratified supermarkets by the category of income groups they mainly serve. This resulted into three groups: high income, middle income and low income. But such a classification in Kenya is problematic since some of the so-called high income supermarkets are now expanding to areas that are perceived to be middle and even low income. Another classification is the one presented by Thomsen, Kamau, & McCormick, (2017) which groups Kenyan supermarkets into three categories of large diversified retail chains, small retail chains, and individual small markets (see table 2.2).

Table 2.2 Kenya's Domestic Supermarkets by Type

Retail Name	Ownership Type	2011 Food sales (US\$)	Outlets (N)	Locations
Large Diversified Retailer Chains				
Nakumatt Holdings Ltd	Local	270 million	37 ¹	Kenya (30); Uganda (4); Rwanda (2); Tanzania 1)
Tuskys Ltd	Local	169 million	36	Kenya (32); Uganda (4)
Uchumi, Ltd	Local	104 million	26	Kenya (20; Uganda (5); Tanzania (1)
Naivas Ltd	Local	106 million	21	Kenya (21)
Smaller Retail Chains				
Chandarana Supermarkets, Ltd	Local	22 million	8	Kenya
Wagon Shopping Ltd	Local	n.a.	online	Kenya
Quickmart	Local	n.a.	7	Kenya
Eastmatt Supermarkets	Local	n.a.	6	Kenya
Society Stores	Local	n.a.	6	Kenya
Tumaini Supermarket	Local	n.a.	3	Kenya
Cleanshelf Supermarkets Ltd	Local	n.a.	3	Kenya
Individual Small Supermarkets				
No list available	n.a.	n.a.	1-2	Kenya
Source: Thomsen, et al., (2017)				

The categorisation by Thomsen et al., (2017) excludes foreign supermarkets which are a recent phenomenon in Kenya but it offers a fair representation of the supermarket structure in the country. The large diversified retail chains have many branches across the country with the leading three also having branches in the neighbouring countries. The small retail chains have fewer branches and are all located in Kenya. Many are found in residential estates. The

¹ Note: By December 2016, Nakumatt had increased its outlets to 64 across East Africa (45 in Kenya, nine in Uganda, five in Tanzania and three in Rwanda). However, around the same time the retailer started experiencing financial problems leading to a closure of many of these outlets. As of March 2018, only 17 were still open (Kamau & Omondi, 2018)

last group consists of individual small supermarkets many of which are also to be found in residential estates. Many of these have between one and two outlets.

2.5 Summary

This chapter has delved into the potato crisp processing contextual background in Kenya. It started by demonstrating the growing importance of potato processing subsector in Kenya. It traced the development of the potato production and processing starting with the introduction of the crop in the late 19th century by white settlers to the thriving industry being witnessed at present. The growing importance of the crop was seen by the fact that in 2014 there were over 800,000 potato farmers producing 3 million metric tonnes of potatoes annually worth over KES 50 billion. Additionally, the entire potato value chain employed 3.3 million people in the same period.

However, the chapter also demonstrated that despite this growth the industry could do better. Some of the issues that have made the industry to underperform are policy related such as the historical classification of potatoes as a minor horticultural crop which denied it promotion efforts. We nevertheless observed that this seems to be changing and is being corrected by the launching of the National Potato Strategy 2016 -2020 which has duly recognised the crop for its importance in line with meeting of Vision 2030 objectives.

On the matter of potato crisps processing, the chapter established that this has grown from five processors in 1980s doing 40 metric tonnes of fresh potatoes to over 40 in 2014 doing about 243 metric tonnes of fresh potatoes in a month. On the other hand, some of the emerging issues in processing include the dominance of small processors or what is also called the cottage industry. Others include raw material challenges, low technology levels, technical deficiencies and under-utilisation of installed capacity especially among large processors.

Turning to the market for potato crisps, a major issue highlighted was the growing importance of supermarkets as a favoured retail option of choice. It was also established that the supermarkets were not homogeneous but instead had categorisations depending especially on their sizes. But of note was the continued existence of other traditional retail options such as kiosks, shops, wholesalers and convenience stores. While large processors had a fairly easy time accessing supermarkets, it was established that the cottage industry did not enjoy a similar advantage due to such factors as the inability to meet set standards and volumes.

CHAPTER THREE

LITERATURE REVIEW: TECHNOLOGICAL CAPABILITIES BUILDING AND LEARNING MECHANISMS AMONG FIRMS

3.1 Introduction

This literature review chapter is divided into nine parts. It starts with a broad review of literature on how firms increase their competitiveness by building their technological capabilities aided by various learning mechanisms. It then narrows down to a review of what constitutes technological capabilities, the learning mechanisms supporting building of technological capabilities, and finally the relationship between capabilities and firm performance. This is then followed by the operationalisation of the three concepts. The final part summarises the discussion and advances three propositions.

3.2 Technological Capabilities Building and Learning Among Firms - Theoretical

Literature Review

This study adopts the technological capabilities building approach which is part of the larger innovation theory. There are different theories of innovation including interactive learning theories and evolution theories. This study had its grounding in the evolutionary theory of innovation which says that technological change is an evolutionary process (Edquist, 1997). The study follows in the footsteps of empirical studies about the development of indigenous technological capabilities which have emerged since the late 1970s. It is noted that many of such studies particularly the micro level ones have been inspired by the evolutionary approaches to economic change (Romijn, 1999). In this evolutionary view, firm level change results from a continuous learning process through activities to absorb, adapt and create technology (Romijn, 1999). As a result, the growth and competitiveness of firms are a function of the organisational routines firms build resulting from the learning processes. Even though the firms may learn by doing, most learning requires purposeful commitment and allocation of resources.

In the innovation studies literature, there is an argument that technological capabilities constitute the foundation upon which non-technical capabilities are built. Technological capabilities are the technical, managerial, and institutional skills that allow productive enterprises to utilise equipment and technical information efficiently (Dahlman et al., 1987; Lall, 1992). They are a collection of firm specific assets including elements with intensive

scientific and technological content and tacit knowledge about production processes, as well as elements that enhance the ability of a firm to benefit from the presence of the technical components (Marcelle, 2005). Non-technical elements of a firm's technological capability are components that support acquisition of technological knowledge and learning, both at the individual and firm-wide level. These are a firm-specific form of institutional knowledge made up of the combined skills of its members accumulated over time. Three main constituent elements of technological capabilities - embodied, non-embodied and organisational integration - are all necessary for firms to realise benefits for strategic competitiveness.

The term Technological Capabilities was first coined in the early 1980s by researchers probing intra-firm technological dynamics in developing countries (Caniels & Romijn, 2003), where firms operate far from the world's technological frontier. These firms encounter frustrations associated with transfers of technologies and knowledge from abroad due to tacitness associated with new knowledge and the fact that foreign technologies are often less than perfectly suited for local environments (Caniels & Romijn, 2003; Kragelund, 2005; Lall, 1992; Lall & Pietrobelli, 2002; Pack & Westphal, 1986). Accumulating technological capability requires time and resources to assimilate, adapt and improve known technologies, and ultimately create new technologies in-house if at all (Caniels & Romijn, 2003). The acquired capabilities help firms improve their economic performance, and by assumption regional and national performance as well. Making reference to East Asian firms, Pack & Westphal (1986) argue that industrial development is a process of acquiring technological capability in the course of continual technological change. They note that rather than creating radically new technologies, most of the technological changes are minor in a cumulative manner sometimes leading to increases in productivity by 100 percent propelling firms to international competitiveness within a decade.

Morrison, Pietrobelli, & Rabellotti, (2008) argue that the Technological Capabilities approach represents a radical alternative to the neoclassical framework, which rests upon the well-known conceptualization of technology as freely available, absorbed without any risks and costs and efficiently used by every enterprise. As a necessary consequence, learning is not required and any inefficiency is due to government interventions, or externalities. Technological Capabilities approach draws upon the evolutionary approach of Nelson and Winter (Nelson & Winter, 1982) and stresses the importance of learning in markets that are prone to imperfections and populated by firms with weak industrial bases. Taking this

further, Marcelle, (2005) posits that the capabilities approach is characterised by three main arguments. The first is the notion that technology includes tacit elements: the skills, technical knowledge, and organisational coherence required to make technologies function in a firm. The second is that the tacit elements cannot simply be transferred, but have to be learnt and that learning process requires conscious effort. Third, the industry level and national level environments in which firms operate affect their decisions and ability to invest in developing new technological capabilities.

The second aspect of the technological capabilities approach focuses on the learning mechanisms that support the technological capability building among firms particularly in the context of developing countries. A key consideration therefore becomes what is learning in this context of building technological capabilities. Drawing on Bell (1984), Bell & Figueiredo (2012) define learning as the various costly and deliberate processes by which additional technological skills and knowledge are acquired by individuals and by the organisation. Further drawing on Malerba (1992), the definition acknowledges that the learning is cumulative and increases the firms' stock of knowledge (or capabilities) which, in turn, permits firms to undertake innovation activities.

This is lauded as a comprehensive approach to learning that encompasses all ways in which a firm may acquire knowledge, skills and other cognitive resources needed to engage in innovative activity. This is because it covers both external sourcing and internal knowledge creation by several mechanisms, including research and development. Bell & Figueiredo (2012:18) note further that this approach is largely consistent with what is used in the technological learning literature as outlined in the following studies (Bell, 1984; Bell & Pavitt, 1993, 1995; Dantas & Bell, 2009; Dutrénit, 2000; Figueiredo, 2003; Kim, 1997, 1998; Lall, 1992; Marcelle, 2004; Mathews & Cho, 1999; Mytelka, 2006; Scott-Kemmis, 1988). In these studies, a framework is built which puts learning at the forefront of factors which are helpful in explaining the variation in the depth of and continuity of the accumulation of their capability. Learning is identified as a necessary investment that firms must engage in. This learning process is a conscious, purposive and costly rather than an automatic and passive one (Biggs et al., 1995; Lall, 1992; Malerba, 1992).

The technological capabilities approach also recognises that how a firm accumulates its capabilities is affected by a number of factors. These include firm specific factors; industry level factors; economy level institutions and even global level factors (Bell & Figueiredo,

2012). However, the approach identifies and places learning at the centre of all that as the most proximate variable influencing the capability accumulation.

This then leads to the final aspect of the technological capabilities approach which is the nature of the relationship between technological capabilities and a firm's innovative performance. The approach acknowledges that even though there are other factors which influence a firm's performance, how the firm goes about building its technological capabilities determines to a large extent its performance. This leads to an analytical framework which maps the relationships that govern a firm. The framework proposes that a firm learns in order to build its technological capabilities. The technological capabilities in turn affect the firm's innovative performance.

3.3 Technological Capabilities Building and Learning Among Firms – Empirical

Literature Review

The technological capabilities building framework was first applied in Latin America and later in Asia in the 1980s. During those pioneering studies in the 1980s, researchers started to scrutinise the nature and dynamics of the various learning mechanisms by which firms built up or failed to build their innovative technological capabilities (Bell & Figueiredo, 2012). As opposed to the previous conception where it was thought firms in the developing countries passively received and adopted technology from the first world, these studies unveiled aspects of technological dynamism and technological creativity among firms drawn from the developing world (Bell & Figueiredo, 2012). The studies highlighted the role of learning mechanisms in determining how latecomer firms built and accumulated capabilities eventually catching up with front runners. In the 1990s the studies focused primarily on the fast growing and fast industrialising East Asian countries and Latin America (Bell & Pavitt, 1993; Figueiredo, 2014; Lall, 1992). This was repeated in the 2000s where many studies paid attention on organisational learning and how that was a source of a firm's innovative performance (Marcelle, 2005; Bell & Figueiredo, 2012).

All these studies were critical in shaping the technological capabilities analytical framework. However, it was observed that many of them had focussed too much attention on world leading firms in fast industrialising economies. These were firms that operated at or near the international frontier of innovation (Bell & Figueiredo, 2012; Marcelle, 2005). Such firms tracked their innovative performance using patent citations and or research and development expenditure overlooking the role of learning in creating firm capabilities. The focus therefore

was on what firms already knew and how that could be used to push their capabilities forward as opposed to how the firms accumulated those capabilities in the first place which is critical for firms in latecomer economies (Bell, 2006; Bell & Figueiredo, 2012).

Lall, (1992) inspired a useful categorization of TC based on two classificatory principles: the functions they perform and their degree of complexity. On the basis of the first taxonomy, it is possible to single out 'investment', 'production' and 'linkage' capabilities, which are different although they can be interrelated, partly overlapping and often strongly interdependent (Morrison et al., 2008). Drawing on the same literature, the Bogota Manual 2001 (Jaramillo et al., 2001) proposes a similar typology but adds 'innovation' capabilities. As per the manual, investment capabilities include project management (the organisation and monitoring of the activities involved in installing and expanding productive capability, or project engineering), provision of the information required to make the technology operational in a specific context, purchase of necessary equipment and services, abilities to implement start-up, and reach predetermined operational standard, training of workforce, and prefeasibility studies. Investment capabilities also include the ability to recruit and train skilled personnel required.

Production capabilities include productive management (the ability to monitor and improve the operation of installed plants, or production engineering), procurement and use of the information required to optimise operations, maintenance and repair of physical capital, and the discovery of new uses and markets for current products (Jaramillo et al., 2001). Morrison et al. (2008) add that process, product and industrial engineering capabilities are part of the subset of skills needed under production capabilities. They note further that among the large number of operations that require adequate skills are the assimilation of technology, its adaptation and improvement, quality control, inventory control, the monitoring of productivity, the coordination of different production stages and department and finally, the process and product innovations related to basic research activity. Linkage capabilities are required to receive (and pass on) information, experience and technology from components and raw materials suppliers, subcontractors, consultancy firms, service firms and technological institutions. Morrison et al., 2008 argue that linkage capabilities are useful because of high transaction costs in inefficient markets, where the setting up of extra-market linkages is often an efficient strategy necessitating special skills to establish technology linkage among enterprises, between them, with service suppliers and with science and

technology institutions. Lastly, innovation capabilities consist of creating new technical capabilities and putting them into economic practice.

In each of the categories described above there are technological capabilities with different degrees of technological complexity, which are used for routine, adaptive and replicative activities or for innovative and risky actions. These correspond to basic, intermediate and advanced levels of technological capabilities as shown in Table 3.1. It has been argued that the different degrees of complexity of technological capabilities explain the diverse levels of industrial performance across countries (Morrison et al., 2008).

Table 3.1 Technological Capabilities Typology based on function and level

Forms of TC	Production capabilities	Investment capabilities	Innovation capabilities	Linkage capabilities
Levels of TC				
Advanced				
Intermediate				
Basic				

Source: Morrison et al., (2008)

The capabilities have an impact on the firm’s productive efficiency and innovative capability as well as on the intensity of technology diffusion at a macroeconomic level and the degree to which industrial structure is reinforced. Most innovative activity in developing countries consists of modification or improvement of existing technologies. Nevertheless, these may lead to significant growth in productivity in certain areas. To be truly competitive, it is argued that firms need to master the capabilities from across the typology.

3.4 Literature gap

Operationalising technological capabilities is fraught with challenges which have been documented in literature. De Mori, Batalha, & Alfranca (2016) have endeavoured to explain some of these challenges. First, they note that in the literature, the definition of technological capabilities concept paints a picture of a very abstract content. Secondly, the technological capabilities content is closely tied to the analysis scope that is being used at any given time. In line with this, three definition and measurement streams could be identified. The first one is where the definition is tied to structural elements. The second one is where technological capabilities are tied to structural as well as functional elements. The third stream is where the

definition is directly related to internal and specific aspects of the company while the fourth stream has the definition inserted in a broader external analysis context of the firms.

Another issue of contention relates to the sequencing of the technologies. Bell & Pavitt (1995) have argued that even though it had been suggested that firms in developing countries have accumulated technological capabilities through definable stages and that this sequencing can provide guidelines for both firm-level strategies and government policy, there is need for caution. They noted that while such sequencing did reflect the general realities such as the fact that firms and industries build on what already exists, to imagine that all firms must follow particular sequences may be misleading. This is because the rate at which a firm proceeds in the accumulation of capabilities and the level of complexity seems to vary from one firm to another. They therefore called for care and clarity in choosing strategies for accumulation of technological capabilities at the firm level especially in Africa where very few guidelines exist (Bell & Pavitt, 1995).

In our case, there are very few studies applying the concept of technological capabilities which focus specifically on food processing. The exception could be Biggs, Shah, & Srivastava, (1995) who have analysed the Kenyan context. As a result, we do not know much about how firms go about building their capabilities. Global value chain analysis studies have enabled us to know about the needed capabilities and organisational forms which can enable a firm to compete locally but also globally (Ouma & Whitfield, 2012). What is less known is how the firms go about developing those capabilities. This is partly explained by the fact that for a long time, many studies have focussed more on the structural and regulatory that hinder the development of industrialisation in Sub Saharan. On the other hand, very few studies have focussed on firm specific strategies and how firms interact with structures and institutions in their context in their quest to build their capabilities and emerge competitive (Ouma & Whitfield, 2012). This is the knowledge gap which this study set to address by seeking to understand how firms in Kenya build their capabilities, the nature of the mechanisms that support the building of such capabilities, and the relationship between the capability building processes and the firms' competitiveness.

So, in order to address the first question on the nature of the technological capabilities in our research project, the functional approach which analyses the technological capabilities based on the main functional categories in a firm was used. However, between the investment, production and linkage functional categories, the study focussed on the production and

marketing functions. These were analysed to establish the various skill levels of basic, intermediate and advanced.

This focus on production capabilities is because it has been argued that the mastery of production functions is the heart of effective building of a firm's capability. In light of what Bell & Pavitt (1995) have said regarding sequencing, Dahlman, Ross-Larson, & Westphal (1987) point out that the usual sequence that firms follow in the development of technological capabilities with a new technology starts with innovation then moves to investment and then production. But when it comes to developing countries, they argue that this sequence changes to reflect their reality. This is because most developing countries purchase already existing technologies. These firms must therefore master the use of these technologies in their production processes first. This then becomes a foundation for them to develop their investment and later innovation capabilities. Once they have built experience in their use of the technology, they can know what more to purchase. In this way, they build their investment capabilities. Lastly, mastery of production and investment capabilities leads them to appreciate what is wanted and what is possible in terms of new products and processes. This leads to innovation and building of innovation capabilities.

3.5 Operationalising Technological Capabilities

To operationalize the production capabilities, Frito-Lay's potato crisps production process was used as a benchmark giving rise to an original set of production capabilities relevant for the analysis of potato processing firms in Kenya. *The National Geographic* did a feature on Frito-Lay in 2012. Under the series called "Ultimate Factories", Frito-Lay was featured alongside other leading global brands including Heineken, Ducati, Bacardi, Lego, Mack Truck, and Porsche Panamera (The National Geographic, 2012). For the benchmarking purposes, this study therefore focused on the potato crisps production segment which outlines the key production steps. These are: sorting of raw materials, washing, peeling; slicing, draining of water; frying; cooling and removal of excess oil; brown spot detection and removal; seasoning; and then finally packaging. These therefore constituted eight production technological capabilities. Each firm's production technological capability was then analysed and three levels were used to grade each firm's level of capability. These are advanced, intermediate, and basic.

This study analysed the production capabilities together with the marketing ones. This is because marketing is closely linked to production. Ideally, a market for the firm's product

must exist before production commences. Marketing capabilities are a bundle of interrelated processes a firm has in place to facilitate successful development, evolution and execution of marketing mix strategies against competitors (Sok et al., 2013). For small and medium sized firms, effective development of such capabilities is usually hindered by various factors such as cash flow problems as well as lack of necessary expertise. Such constraints notwithstanding, Sok et al., (2013) argue that small and medium firms still pay attention to marketing and actually make it one of their key competitive points. This is because their small size enables them to target small market segments allowing them the opportunity to pay greater attention and provide tailored products to meet specific needs. In the end such efforts can boost the firm's performance.

A lot of SME marketing is also predicated on the owner/manager. It is based on the continual development of the experiential knowledge gained by doing business (O'Dwyer, Gilmore, & Carson, 2010; Calza & Goedhuys, 2016). Thus the owner/manager's characteristics such as managerial style, independence, ownership and the firm's limited resources, scale and scope of operations define how such firms go about their marketing activities (O'Dwyer et al., 2010; Calza & Goedhuys, 2016). Therefore, instead of solely focussing on the traditional marketing mix of 4Ps (product, price, place, and promotion) such entrepreneurs put emphasis on promotion and word-of-mouth. They put a lot of emphasis on networking as a source of market intelligence. Participation in social, business and trade activities provide such networking opportunities. This is because unlike big firms, small firms cannot compete using economies of scale. Their competitive advantage must therefore lie in developing innovative products which is reliant on accurate market and customer information (O'Dwyer et al., 2010; Calza & Goedhuys, 2016).

Looking at a firm, one can therefore tell whether it has strong marketing capabilities or not. A firm with stronger capabilities is adept at identifying customers and keeping them. It anticipates customers' needs and delivers them. It is on the lookout for factors which determine customers' choice. It scouts the environment including what competitors are offering and invests in getting quality feedback by building a strong relationship with its customers. This is a very complex undertaking but eventually it pays off (Dutta et al., 1999). Additionally, since the marketing experience varies from one firm to another, it is difficult to enumerate all possible marketing capabilities (Fahy et al., 2000).

In an empirical study which sought to find out which marketing capabilities were worth emulating and therefore used in a benchmarking exercise, Vorhies & Morgan (2005) built on the classic marketing mix and discussed the following marketing capabilities: product development, pricing, channel management, marketing communication/promotion, and selling. Others included marketing information management, planning and implementation (Vorhies & Morgan, 2005:82). The managers in the study identified these capabilities as contributing most to their business performance and therefore worth benchmarking. Product development entails all activities that go into the development and offering of a product or service. Pricing is what the firm does in order to get an optimal value from its products or services. Channel management is how a firm establishes and maintains the channels for the distribution of products to end-user customers (Vorhies & Morgan, 2005:82).

It is useful at this point to review the concept of channel management. In Chapter Two we saw that there exist multiple channels through which a firm can access its end-customers. This situation is not unique to Kenya. It is a reality in many markets. A question therefore becomes what is the optimal distribution intensity that a firm has to adopt. Put another way, how intensively should firms be present in each of the identified channels where the ideal distribution intensity entails making a brand available widely enough to satisfy, but not exceed, target customers (Bruggen et al., 2010).

A processor therefore ought to have a strategy of how to settle on the preferred retail options. There exist various useful and tested insights on how to go about this (Lynda, 1993; McKinsey, 2015). Two relate very well with the discussion at hand. First a company must create what is called a bespoke route-to-market model by geography and channel. McKinsey argues that an effective distribution is the single most important determinant of success in the African consumer market. Second and closely related to the first is the need to invest in a well-equipped sales force due to the fragmented nature of the retail sector on the continent (McKinsey, 2015).

In the case of Kenya, a processor would have to map the retail sector by geography and channel. The geography may include considerations such as rural versus urban or upmarket versus low income. The channel considerations include the various supermarket options we have discussed as well as other retail options such as wholesalers, shops, kiosks and convenience stores. All these cater for different customer segments with different purchasing habits (Nandonde & Kuada, 2016). A well-developed route-to-market implies that as a

processor, you would need to have mapped all these various options available. This is what leading international brands such as Diageo, BAT, Coca Cola and Frito-Lay have effectively done to leverage their sales. They have geographically mapped the various retail outlets and send their armies of salespeople to all these outlets.

Marketing communication or promotion entails how a firm manages the way its customers value and perceive its products while selling has to do with how a firm goes about securing orders for its products or services. The remaining three capabilities (i.e. marketing information management, planning and implementation) build on the first five and entail how a firm goes about gathering information about the market, conceives strategies and eventually implements the same.

Such a categorisation was useful in helping us operationalize and analyse the marketing capabilities among our study firms. The study therefore sought to identify the key marketing capabilities the firms used in getting their products to the end-user customers. The analysis identified and discussed the marketing capabilities under two broad categories: product design and channel management.

3.6 Operationalising Learning Mechanisms

Learning mechanisms constitute a wide range of mechanisms through which firms acquire knowledge to build their technological capabilities. Firms can draw this knowledge from external and internal sources. Several empirical studies have sought to understand the nature of learning mechanisms that allow firms to build their technological capabilities. These include Biggs et al., (1995); Hill & Stewart, (2000); Kabecha, (1999); Levy et al., (1994); Oyeleran-Oyeyinka, (2004); and Wignaraja, (2002). Two of the studies cover more than one African country and these are Oyeleran-Oyeyinka, (2004) and Biggs et al., (1995). Kabecha's paper covers Kenya though it focuses on the metal working industry as opposed to our focus on the food processing industry.

On the main theme of the nature of learning mechanisms supporting the development of technological capabilities of firms, the mechanisms are classified into two broad categories. These are internal versus external mechanisms (Biggs et al., 1995; Levy et al., 1994). These build into a framework which postulates that learning mechanisms constitute the dynamic element of technological capabilities enabling firms to change over time the levels of the said capabilities. These learning mechanisms enable the firms to acquire new capabilities or improve those already at their disposal. This in turn determines a firm's future

competitiveness as well as survival. Since the different mechanisms have different influences on the technological capability accumulation, it follows that the choice on which mechanisms to rely on has a bearing on the growth trajectory of individual firms.

Improvements of a firm's technological capability have three main influences (Biggs et al., 1995; Levy et al., 1994). The first are broad factors such as an individual government's policy towards education. Policies which promote science and engineering are very crucial because they ensure that technical staff will be available to work in firms. The second set of influence is internal firm efforts to promote learning. These efforts include on-job training as well as efforts in research and development. The last set of influence is what is called the availability of micro-level learning support mechanisms which are external to the firm but which the firm can draw on to build its capabilities. These external support mechanisms are classified further into private or collective. The private ones entail learning that comes about because of a firm's interaction with its buyers, suppliers, competitors. It can also be due to learning that comes to the firm via private consultants or private research and development institutes. The collective ones entail learning as a result of interactions with specialised government institutions, or as a result of a firm's participation in business associations, conferences or exhibitions.

It has been demonstrated that firms initially meet their technological needs internally or as a consequence of external business transactions or by way of subcontracting with providers. Once firms are unable to fulfil their needs privately, they shall then demand for collective support mechanisms (Biggs et al., 1995; Levy et al., 1994). Furthermore in situations "where firm capability endowments are low, and where information environments are not rich because vertical and horizontal links between firms are weak or missing, and where firms are technologically isolated from the rest of the world and where collective support services are non-existent or poorly delivered, activist strategies aimed at developing both private and collective channels to support learning are required" (Biggs et al., 1995:21).

The following factors determine demand for collective support. First, demand is likely to be higher in firms in industries requiring complex production technologies and lower in those using craft-based technologies. Secondly, demand is likely to be greater for all firms when the country is technologically isolated from the rest of world and when private technology networks and linkages available to firms are weak or missing. Third, demand for collective support channels will be low when industry competition is low and production incentives

distorted. Finally, within industries, demand is likely to vary across firms according to the current availability of private learning channels open to them.

From Levy et al., (1994) we also learn that these mechanisms vary in their influence to learning across countries and sectors. After studying successful SMEs from a range of sectors drawn from Colombia, Indonesia, Japan and the Republic of Korea it was found out that in general, private mechanisms were more important. The range of these private mechanisms was very wide from subcontracting relationships, equipment suppliers, similar firms, expatriate employees, technical literature, foreign and local buyers, international exhibitions, formal technology transfer and foreign professionals. The question therefore becomes, from such a wide range, which mechanisms are more useful to the kind of firms found in Sub Saharan African countries such as Kenya.

A review of empirical literature reveals that some of the following mechanisms have been highlighted in this context. These include subcontracting relationships, learning from suppliers, learning from industry associations, and training (Biggs et al., 1995; Kabecha, 1999; Kinyanjui, 2000; Oyeleran-Oyeyinka, 2004; Wignaraja, 2002). On subcontracting relationships, concerns have been raised in countries such as Kenya which have historically had a fragmented business systems (Elkan, 1988; Pedersen & McCormick, 1999; Wamalwa & McCormick, 2015). Because of this fragmentation, the linkages which are meant to enhance firms' learning from each other are very weak denying the firms an opportunity to exploit them.

Learning from suppliers stands on its own as a mechanism even though it is related to the discussion of subcontracting above. Oyeleran-Oyeyinka (2006) has demonstrated the primacy of suppliers as sources of new knowledge for manufacturers across several African countries. His study of SMEs drawn from Nigerian, Ugandan, Kenyan and Zimbabwean manufacturing clusters revealed that despite considerable emphasis placed on financing public sector service, the most important source of technical information was the private sector. As shown in Table 3.2, the private sector received the highest rating for the provision of technical support in all the countries compared to the government. In addition to suppliers, the private sector category also has industrial associations and consultants.

Table 3.2 Sources of Technical Information

Sources	Zimbabwe	Nigeria	Kenya
Machinery suppliers	20.4	31.3	53.7
Publications	24.5	34.5	50.0
Consultants	18.4	16.5	29.6
Trade fairs	6.1	32.2	24.1
Industrial associations	8.2	34.4	59.3
Government R&D Export	-	15.8	18.5
Agents	14.3	14.9	7.4
Raw material suppliers	6.1	30.6	25.9

Source: Oyelaran-Oyeyinka (2006)

Concerning learning from industry associations, it has also been established that the associations are rated highly by SMEs as seen in Oyelaran-Oyeyinka (2006). Beyond being a source of technical information, SMEs were also motivated to join associations to share information, benefit from training, and improve welfare among other benefits as outlined in Table 3.3.

The usefulness of industry associations has been corroborated by other studies such as Moyi (2014) who studied 202 MSEs associations drawn from Nairobi, Mombasa, Nakuru and Kisumu. But Moyi (2014) also found out that most of the associations were too weak to provide tangible services. This was attributed to low retention rates, financial constraints, lack of market information and government support.

Table 3.3 Importance of Private Associations in Clusters

Reasons for joining association	Nairobi (Kenya) Clusters (%)	Suame (Ghana) Clusters (%)
Share information	13.5	17.0
Small Producers Advocacy	21.6	38.0
Improve welfare	40.3	4.0
Access to credit	37.8	1.0
Assist each other	27.0	17.0
Secure business site	24.3	3.0
Income generation	18.9	15.6
Benefit from training		14.0

Source: Oyelaran-Oyeyinka (2006)

Another important learning mechanism is training. Under training questions that come up include why train, what is the nature of the training, and who is trained. In general some of the reasons advanced to necessitate training among manufacturing firms in Africa include to improve performance and to correct inefficiencies (Gershenberg, 1987; Elkan, 1988). Inefficiencies are attributed to various factors including low technology knowledge as well as managerial skills necessary to run an industrial firm. The training can target the entrepreneur owner or employees. In both cases, the training is supposed to equip the recipients with managerial as well as technical skills to run the enterprise efficiently. While paying particular attention to on-the-job training, King (1984) notes that on-the-job training in whatever form is very important in developing the technological capacity of firms in developing countries. He says that for both the informal and formal sectors of such economies, learning at the enterprise level constitutes a very large proportion of the total skills and competencies acquired by workers.

Bell (1984) puts a premium on the active component of learning on-the-job. He proposes a situation where firms invest time and effort to secure training opportunities for their staff. He uses various examples drawn from Brazil and Korea to illustrate this. In the Brazilian case, he uses a 1978 study on Usiminas steel company. In the study, Dahlman & Fonseca (1978) bring to the fore the importance of technological training efforts undertaken by the company. During the investment stage, Brazilian engineers were assigned to work alongside their Japanese counterparts. The Brazilian engineers visited Japan to be acquainted with the state of steel industry, they participated in the design of the steel plant, they participated in the building of the plant and in its operations once it had started. It is reported that before the Japanese handed over the plant to Brazil at the end of the technical assistance in 1966, “531 Japanese engineers and technicians of different degrees of specialization passed through Usiminas with the responsibility of attaining the pre-established indexes and training the Brazilian team” (Dahlman & Fonseca, 1978:49).

But we also learn from literature that firms of different sizes prioritise training differently. Size is highlighted at this point because it is of particular significance to our study. Most firms in Kenya belong to the micro, small and medium categories. Faced with resource constraints, it has been established that many small firms have prioritised other needs and bypassed efforts at building their human resource development endowments. Picking on training, Hill & Stewart (2000) makes the point that human resource development (HRD) in the context of Small and Medium Enterprises (SMEs) mirrors the characteristics of SMEs

themselves. That is both SMEs and their HRD activities are essentially informal, reactive, and short term in outlook.

We learn therefore that HRD manifests differently in small firms as compared to large ones. In the case of small firms, it is likely to be the case that many owner/managers will be reluctant to invest in HRD activities if they cannot see an immediate link between such activities and the firm performance (Saru, 2007). Similarly, many of them are likely to be reluctant about training their employees lest they lose them to competitors once they become competitive (Saru, 2007). Furthermore, due to the uncertainty that defines their environment mainly due to resource constraints as well as time to manage the environment, many of them only react to changes instead of preparing for them (Hill & Stewart, 2000).

Table 3.4 provides an organising framework for all the various learning mechanisms discussed in this section. To a large extent, this study used this framework to operationalize and analyse the learning processes within the case study firms, with only a few modifications. Under the original framework, internal mechanisms had three categories. These are on-job training; the organisation of technological knowledge and function within the firms; and efforts at research and development. In the application of the framework, the study left out the organisation of technological knowledge and function within firms. This is because this category did not manifest itself in any firm apart from one. Secondly, in the original framework expatriate and technical personnel are discussed together with research and development. In the application of the framework, this study separated them and discussed each separately. Turning to external mechanisms, under private mechanisms, the study left out commercial labs from this discussion. Again, this was because this mechanism did not manifest itself much in the study.

Table 3.4 Learning Mechanisms

Internal mechanisms	External mechanisms
1. On-job training	<i>Private mechanisms</i>
2. Expatriate and technical personnel	1. Buyers
3. Research and development	2. Suppliers
	3. Inter-firm spill overs of knowledge
	4. Consultants, commercial labs, private R&D institutes
	<i>Collective learning</i>
	1. Government or public research institutes
	2. Business association, conferences, exhibitions

Source: Adapted from Biggs et al., (1995)

3.7 Operationalising the Firm's Innovative Performance

In order to operationalize firm innovative performance for this study, it is important to understand what it entails in the first place. Innovative performance broadly entails creating, managing and implementing change in a firm's product, processes, services and organisation (Bell & Figueiredo, 2012). In other words, how is the firm going about its innovation activities? Whereby innovation in firms, according to the Oslo Manual (OECD, 2005), refers to planned changes in a firm's activities with a view to improving the firm's performance.

The innovation concept outlined by the Oslo manual is characterised by a number of features. The first feature is that innovation is associated with uncertainty over the outcome of innovation activities and due to this it is not possible to know beforehand what the result of the innovation activity will be. An enterprise would therefore not be able to tell beforehand precisely how much time and resources will be needed to implement a new production process and or marketing and how successful that will be. The second feature is that innovation involves investment which may yield potential returns in the future.

The third feature is the fact that innovation is subject to spill overs. Innovations often end up diffusing to other firms at times even before the firm that developed them fully appropriates their benefits. It therefore means that for some innovation activities, imitation costs are substantially lower than development costs. This therefore calls for an effective appropriation mechanism to provide an incentive to innovate otherwise no firm may wish to do the initial investment.

The fourth feature of innovation is that it involves the utilisation of new knowledge or novel use of existing knowledge. This knowledge can be available internally within the firm or it can also be acquired from external sources. The use of this knowledge requires conscious innovative efforts.

The last feature characterising innovation which directly addresses our discussion on performance, is that the goal of innovation is usually to improve a firm's performance in different ways. This feature is about innovation outcomes. It is about the firm's operational and business performance plus wider outcomes comprising economic, environmental and social outcomes (Bell & Figueiredo, 2012).

To improve a firm's outcomes, innovation can help an enterprise gain a competitive advantage. Alternatively, innovation may help a firm maintain its competitiveness. Second, innovation can also help a firm to shift its products' demand curve. This can be accomplished for example by increasing product quality; offering new products; opening up new markets or groups of customers. Third, innovation may enable a firm to change its cost curve, for example, by reducing unit costs of production, purchasing, distribution or transaction. Fourth and last, innovation may help a firm to improve its competitive position by improving its ability to innovate. This is achieved by increasing its ability to develop new products or processes or gain and create new knowledge.

This study tracked innovative performance by enumerating the various innovations introduced by the firms during the study. The innovations ranged from product, process, to marketing innovations. Again drawing on the Oslo Manual (OECD, 2005) product innovations are defined as significant changes in the capability of good or services whereby both new goods and services as well as significant improvements to existing products are included. In our case, we only limited ourselves to product innovations leaving out services due to the nature of the firms under study. Process innovations on the other hand represent significant changes in the production and delivery methods while marketing innovations entail the implementation of new marketing methods. This can include changes in product design and packaging, product promotion and placement. This can also entail changes in the methods of pricing of the goods and services.

3.8 The Study's Analytical framework

Figure 3.1 summarises the technological capability building analytical framework and how each major component of the relationship is operationalized. The framework focuses on how

learning is central to technological capability building in firms which in turn is central in determining a firm's innovative performance and ultimately its outcomes. The framework acknowledges that the firm's innovative performance and outcomes are also influenced by other factors and these include firm specific factors, industry-level factors, economy level institutions and due to globalisation also global level factors. Due to the scope of the study, the adaptation of the framework left out the outcomes component and instead paid attention to the innovation performance.

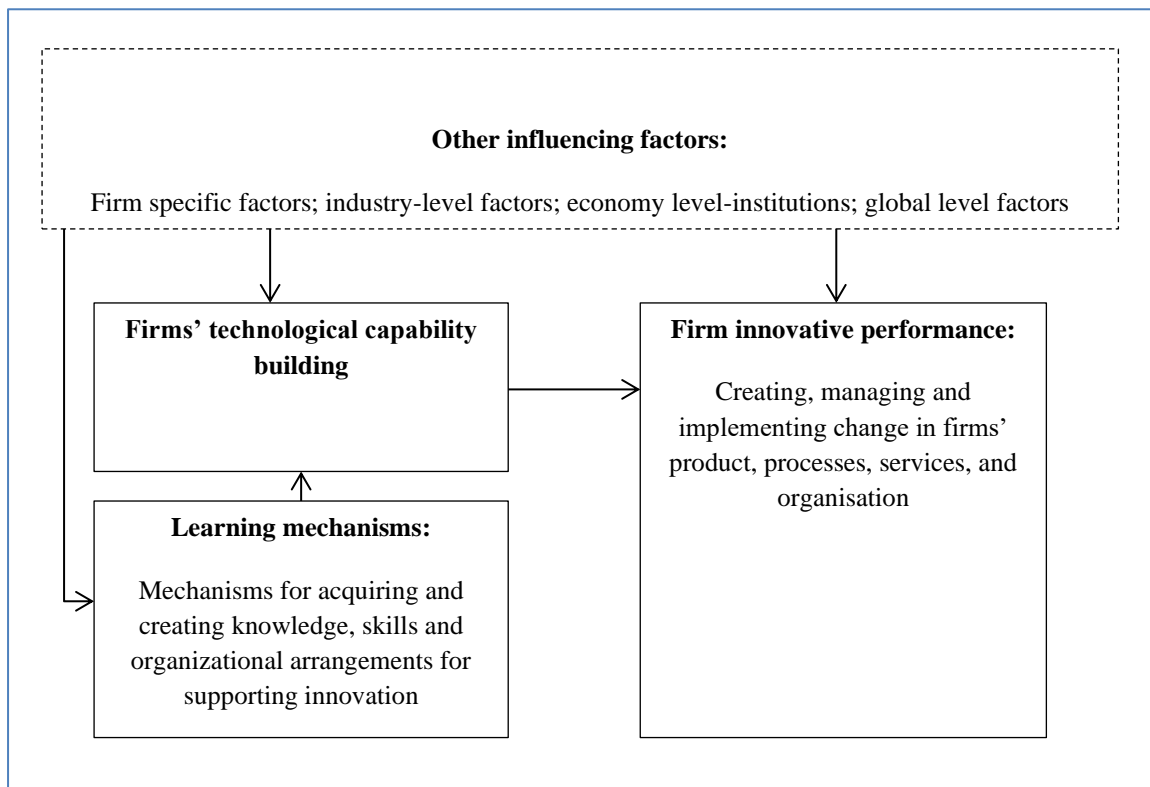


Figure 3.1 The study's technological capability building analytical framework

Source: Adapted from Bell and Figueiredo 2012.

In summary therefore we gather from literature that a firm's capability is what mainly allows it to take advantage of market opportunities. Furthermore, we have also established from the literature that knowledge about these capabilities and the firm's efforts to increase them is very crucial in understanding its present and future performance. Similarly, a firm's capabilities are the heart of its decision to design strategies to introduce changes, improvements and or innovations (OECD, 2005:141).

Secondly, from Marcelle (2005) we learn that firms have multiple motivations for technological capability building but two common ones are either offensive or defensive. A firm may need to respond to external shifts in sources of technological knowledge. It may also initiate competitive objectives to create new products or change processes ahead of competitors. Better still, a firm may wish to improve its operational efficiency and quality levels (Marcelle, 2005). She therefore notes that the variations in technological capabilities building activities across firms are not fully explained by country level factors. They are instead also influenced by factors within a firm. It is therefore very crucial for a firm to match its technological capability building activities with the objectives it is pursuing, whether defensive or offensive. Secondly, though it is impossible to achieve a perfect match, a firm that has a better coherence between its overall strategic objectives and the capability building activities has a higher chance of accumulating the capabilities and such integration is at the core of differentiation in performance seen among firms (Marcelle, 2005).

In our case given the context and the nature of the firms under study, under marketing innovations, particular attention was paid to channel management. How well has each firm aligned itself to achieve an optimal configuration of distribution channels to meet its needs? How have firms mapped their access to the various retail options open to them? Here we drew empirical lessons from top performers in the food processing industry. Reviewing empirical literature, we established that Frito Lay which is a global leader in food processing has spent many years to develop a very strong capability where the firm works very closely with each retailer to understand their product needs (Chase & Erikson, 1988; Leinwand & Mainardi, 2016; Lynda, 1993). Based on this and aided by an army of salespeople, the firm makes direct and customised deliveries as per specific requirements. The firm also works closely with each retailer to undertake promotional activities. In this way, Frito Lay has increased its market share to 60% in the US snacks food sector. In addition, the company continues to grow its business in emerging markets and has been overseeing annual introduction of new products (Leinwand & Mainardi, 2016).

3.9 Summary and propositions

This chapter has discussed the technological capabilities building conceptual framework to lay groundwork for the analysis of the level of technological capabilities among firms, the learning mechanisms that supported the building of the same, and finally the relationship between the capability building and the firm's innovation performance. It has reviewed theoretical as well as empirical literature on how this framework is understood and applied

with a particular reference to a developing country set up. The framework puts learning at the heart of technological capability building process. The framework in turn puts technological capability building at the heart of a firm's innovation performance.

From literature we have learned that one way of improving a firm's competitiveness is by progressively building its technological capabilities. These are the technical, managerial, and institutional skills that allow productive enterprises to utilise equipment and technical information efficiently. In view of this, an important consideration to explore is what factors underlie the differentiation in how firms build these capabilities. Answering this question is very important in understanding how firms can be helped to boost their efforts at building their capabilities and improve their competitiveness.

To address the first question on the level of the technological capabilities among the case study firms, two sets of capabilities were identified for analysis. The first is production and the second one is marketing. As for the second question which focuses on the learning mechanisms to help firms to build their capabilities, two analytical categories were used: those mechanisms internal and those external to firms. Finally on the last question on the relationship between capability building and the firm's innovative performance, each firm's innovative performance was used in analysis.

Based on the discussion, three main propositions were advanced. With regard to the first question on the level of the technological capabilities, it was expected that being in a developing country set up where many firms operate further away from the technological frontier, the general level of the capabilities tend to be low. We also expected that due to the differences in the nature of the firms studied such as in terms of size, it was expected that there shall be marked variations in the level of the capabilities from one firm to firm to next. It was also expected that the production capabilities would be more developed than the marketing capabilities because we had established from the literature that many firms in developing countries first develop production capabilities before developing the rest of the capabilities.

As for the second question on the learning mechanisms it was the expected that learning mechanisms used by firms would vary from one firm to the next. Nevertheless, it was also expected that internal mechanisms would be the most important and widely used. This would be followed by the private external mechanisms and finally collective external mechanisms. Under specific mechanisms, training was envisaged to come out very strongly as a favoured

mode of capability accumulation. Similarly, size was expected to feature very strongly as an explanatory variable determining how each firm undertook its learning processes.

Lastly on the question of the relationship between capability building and firm's innovation performance it was expected that the various levels of the capabilities would be a good indicator of individual firm's innovation performance.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter outlines in detail the design and methods adopted for the study. It situates the study in the broad qualitative research approach and narrows down to case study design as the primary research design used. The study interviewed in-depth six potato processing firms drawn from the Nairobi Metropolitan Area over a period of four years, 2013 to 2016. The cases were purposively selected to reflect some of the issues arising from the literature review such as firm size and the nature of technology utilised across the firms.

The rest of the chapter is organised as follows: section 4.2 introduces and discusses the scientific nature of the qualitative research approach and then zeroes in the case study research design and why it was chosen as the primary design for this study. The next section discusses the steps taken to improve reliability and validity of the research findings. Section 4.4 documents how the study's research site was accessed while section 4.5 discusses how the data was analysed before moving to section 4.6 which gives a summary of the chapter.

4.2 Research Design

This study embraces a qualitative research approach. It uses a case study research design as its main qualitative approach to inquiry. But what is qualitative research? Qualitative research is understood as an alternative approach to quantitative research. Where quantitative research emphasises quantification in the collection and analysis of data (Bryman, 2004), qualitative research emphasises words rather quantification in the collection and analysis of data. In the same way, while quantitative research approach embraces a deductive approach to the relationship between theory and research where the import is placed on testing theories, in contrast qualitative research endeavours not at testing but rather at the generation of theories. Epistemologically, qualitative research rejects the practices of the natural scientific model, especially positivism, and instead emphasises on ways individuals interpret their own reality. It embodies the "view of social reality as constantly shifting emergent property of individuals' creation" (Bryman, 2004: 21). However, Bryman cautions that it is important to understand that despite the said differences, the distinction is not a hard-and-fast one. Furthermore, it is possible to combine the two strategies in on study.

Though no single study may exhibit all of them, (Creswell, 2009) outlines nine characteristics of qualitative research. First, qualitative research uses a natural setting. As opposed to say an experiment where units of analysis are in a controlled environment, in most cases units of analysis in qualitative research are in their natural settings. Researchers have a face-to-face interaction with respondents over time. Secondly, the researcher is the key instrument. Creswell notes that “qualitative researchers collect data themselves through examining documents, observing behaviour or interviewing participants” (Creswell, 2009: 182). Thirdly, many times, qualitative research relies on multiple sources of data. These include interviews, observations, and documents. Fourthly, qualitative research embraces inductive data analysis. Here researchers build their patterns, categories, and themes from bottom up, by organising data into increasingly abstract units of information. The research works back and forth in between themes until he/she has established a comprehensive set of themes. Another characteristic of qualitative research according to Creswell is on whose meanings matter. Qualitative researchers keep a focus on the meaning that participant’s hold about the problem or issue and not the meaning that the researchers bring to the research or writers express in the literature.

In addition to the preceding characteristics, Creswell says qualitative research’s design is emergent. The research plan keeps evolving. Once the researcher enters the field, questions may change, forms of data collection may shift, individuals studied, or sites visited may be modified. Though this may happen all the time, qualitative research also uses theoretical lens to view their studies. Lastly, qualitative research is also interpretive in nature and gives a holistic account.

4.2.1 Justification for the use of Case Study as the Primary Research Design

This study used the case study design in trying to understand the extent and how potato processing firms in Kenya have acquired technological capabilities to be competitive. In defining what a case study is Yin (2014) uses two criteria. This also demonstrates a case study’s scientific nature. The first is scope while the second is features. On scope Yin says that a case study is an empirical study that investigates a contemporary phenomenon in depth and within its real-world context especially when the boundaries between the phenomenon and context may not be clearly evident. The question posed in this study called for a research design that would explore in depth how firms interacted with other actors in their economic context in their quest to build their technological capabilities, a phenomenon which has been

lauded as useful in improving their competitiveness. So, a case study research design was a natural choice.

On features, Yin notes that “a case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest and as a result relies on multiple sources of evidence, with data needing to converge in a triangulation fashion and as a result benefits from the prior development of theoretical proposition to guide data collection and analysis” (Yin, 2014: 17). This is certainly true to a large extent with our current study. The research has relied on the innovation theory which develops a conceptual framework that guides the analysis of the relationships that govern a firm. That a firm builds its capabilities by learning and in doing this it can improve its competitive position. The framework proposes an analytical framework to guide the analysis of the various technological capabilities in a firm, the learning mechanism used to develop these capabilities, and the firm’s innovation performance giving rise to various outcomes. These were useful starting points for the study.

Yin (2014) also proposes several other considerations as guidelines for choice of different research methods. The first consideration is the form of questions asked. For instance, is the researcher asking what questions or how questions? The second consideration is how much control a researcher has over the unit of analysis. The last consideration relates to whether the research is investigating contemporary or historical events. Based on these three considerations, a researcher may determine to use experiment, survey, archival analysis, history, or case study.

Regarding the form of research question, this study poses “what” as well “how” questions. In the case of “what” questions, Yin (2014) points out that any of the five research methods can be used especially if the study is exploratory in nature. Of the five, the study settled on the case study research design. This is because the study’s first specific question is exploratory in nature. It explores and documents the current technological capabilities among the six firms studied to identify similarities as well variations. Similarly, it explores the relationship between the capability building efforts and how a firm performs.

With regard to “how” and “why” questions, Yin (2014) points that out that these are more explanatory in nature and deal with operational links needing to be traced over time. In such a case, three research methods stand out as the most preferred. These are case study, history, or experiment. An important component of this study has been to establish how the firms have

built their technological capabilities to be competitive. This is accomplished by examining the various ways in which the firms learn by drawing on internal as well as external mechanisms. Though the study draws on some aspects of each firm's history it also relies on interviews about the present and the future. That therefore rules out history as the main research design.

The study could not adopt an experiment because of the inability to have a direct control of the units of analysis. Ferrand (1999) offers a useful reflection on the difficulties of trying to use an experiment in a study such as this. As opposed to natural sciences, he notes that the focus of empirical social science study is the social system and not the individual. This study focussed on the firm owner, the firm's staff and how they interact with the technology system around the firm. In a situation like this, Ferrand notes that it is difficult to separate the phenomena under study from the system making replication of the real situation impossible. After looking at all these considerations, the case study therefore emerged as the best option for this study.

4.2.2 Multiple Cases

The expected variations between firms with regard to the nature of their technological capabilities and the mechanisms used to build them make multiple cases useful for the understanding of the issues underlying the research questions. It has also been argued that evidence from multiple cases is generally seen as being more reliable and the research as a whole is then considered to be more robust (Vera-Cruz, 2000). This study concurs with the following three reasons advanced by Vera-Cruz for settling on multiple cases. The first is to increase the research reliability by minimising errors and biases in the study. This could involve misjudgement of the representativeness of a single case, or informant and observer biases deriving from incomplete information and understanding of the phenomenon being studied. The second reason is to augment the external validity of the research. The third reason is to strengthen the study's results by increasing the opportunities to learn about issues of central importance to the purpose of the research by comparative means.

4.2.3 Case selection

This study therefore explored in depth six crisp processing firms drawn from Nairobi and Kiambu of the larger Nairobi Metropolitan Area in Kenya. Several considerations were made in purposively selecting the multiple cases in order to bring to light similarities as well as variations in the levels of technological capabilities, the firms' efforts at learning to build the

said capabilities, and the firm's performance. One selection parameter was very useful at this point and this was firm age. Firm age is critical in tracking innovation because of the concept of observation period. There has to be a time lag between when an innovation is introduced and when it is feasible to analyse the outcomes arising from the same. It therefore means that a firm must have been in existence for some time before you can ask about its innovative performance (OECD, 2005). Furthermore, we have seen that learning to build technological capabilities is a lengthy process. This together with the fact that many Kenyan firms die prematurely compelled us to only work with firms that were in existence for at least five years by the time of first interview.

The second selection parameter that was used was firm size. Arising from the literature review, we gathered that size was an explanatory factor in how a firm builds its technological capabilities. A conscious decision was taken therefore to include firms of various sizes while also taking into account the context of firms in Kenya.

4.2.4 The Research Site

Potato processing firms in the Nairobi Metropolitan Area (NMA) were the primary units of analysis in this study. The respondents were owners and senior managers in firms. The Nairobi Metropolitan Area (NMA) as it was previously constituted had 15 local authorities including Nairobi, Mavoko, Thika, Kiambu, Ruiru, Limuru and Machakos. See Figure 4.1 for the map. The implementation of the new constitution in Kenya in 2010 scrapped local authorities and now we have county governments in their place.

This study area was selected because it captures a large and diverse firm population. Kenyan industry is disproportionately located in Nairobi and its environs. According to Government statistics, 56% of all formal medium and large enterprises are located in Nairobi and its surrounding areas (GoK, 2006). The remainder are in the Coastal region (20%) and other towns (24%).

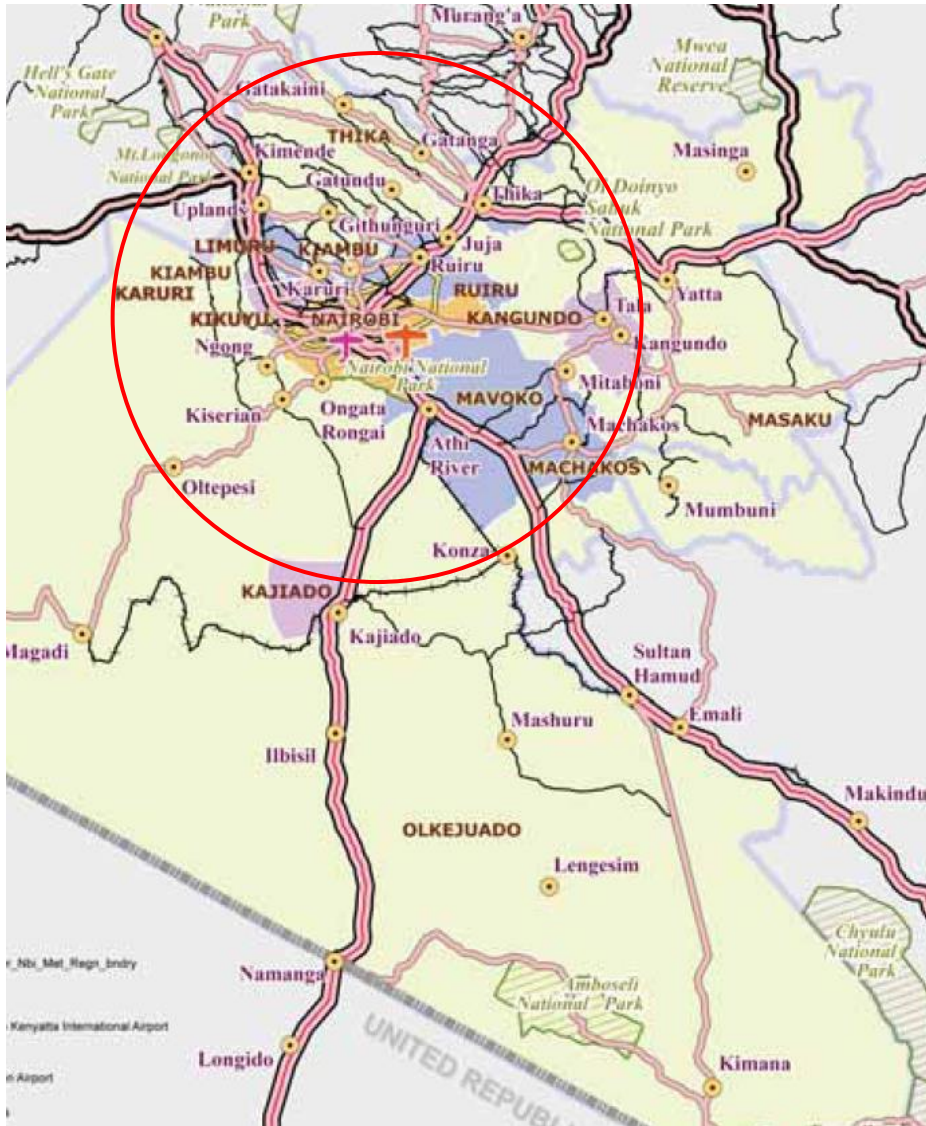


Figure 4.1: Nairobi Metropolitan Area (NMA) map

Source: Google maps <https://www.google.com/maps>

4.2.5 The research process

The research process progressed in three main steps even though the process was not linear but rather circular. These steps were preliminaries, data collection and then data analysis. For instance, during the mapping stage, significant data collection was taking place. During data collection, some level of analysis was also taking place. Each of these three steps is expounded in the next section.

4.2.6 Preliminary steps – research permit and mapping

To gain entry, the study's research design progressed in two phases. The first was securing a research permit then followed by a mapping exercise. An application was made to the Kenya National Commission for Science, Technology and Innovation (NACOSTI) March 2012 and the permit granted in July of the same year. This was followed by an introductory and mapping phase. This included literature study, solidifying of the theoretical and conceptual framework, and mapping within the food industry to identify potato processing firms.

The mapping exercise proceeded in three stages. Key informant interviews were done first. The aim was to familiarize with the range of activities in the food processing sector and obtaining lists of firms. This mapping phase began in May 2012². Officials from the Ministry of Industrialization, the Ministry of Agriculture, the Kenya Industrial Research and Development Institute (KIRDI), the Kenya Bureau of Standards (KEBS) and the District Agriculture Officer-Ruiru were interviewed. A visit to the Agricultural Technology Development Centre-Ruiru was also conducted where the Centre Manager was interviewed. In the second phase, field visits to industrial clusters and local authorities within the Nairobi Metropolitan Area to obtain their lists of registered businesses in the food processing sector was done. The following municipal councils were visited: Limuru, Thika, Ruiru, Kiambu, Kikuyu, Mavoko, Machakos and Ol Kejuado. Similarly, industrial clusters visited included Baba Dogo, Kariobangi, Kamukunji, Kenya Industrial Estates and Nairobi Industrial Area. Additional lists were also obtained from KEBS, the Nairobi City Council and the Kenya Association of Manufacturers (KAM). Relevant firms were isolated from the various lists to form full sectoral lists, namely grain milling; bakeries; sauces, juices and jams; and snacks.

In August 2012, all available lists were scrutinised to identify relevant firms. Out of a range of grain milling; bakeries; sauces and jams; and snacks, a decision was reached to focus on snacks. The study further zeroed in on potato snacks, in particular crisps. This is because from the mapping exercise, the study established that the snacks subsector and in particular crisps processing was experiencing exponential growth. This was largely attributed to changing lifestyles and eating habits of Kenyans especially in urban areas. Apart from local Kenyans, the expanding tourism sector over the past decades had also contributed to this growth (Abong' et al., 2010a; Walingo et al., 1997, 2007).

² This mapping process was done as part of the larger DANIDA funded Successful African Firms and Institutional Change (SAFIC) research project. This PhD study is part of the SAFIC research project. The mapping exercise was therefore done with the full participation of four other SAFIC team members.

The scrutinising exercise done in August 2012 yielded 90 potato processing firms. However, some firms on the list lacked important items of firm information. These included contact information, firm location, ownership, and firm size. I also needed to verify the firm’s actual existence. Thus the next phase of mapping exercise involved establishing this information before field interviews with the identified firms. Field visits, web searches, telephone calls were used to verify this information. In the month of August 2013, 59 retail outlets in Nairobi, Juja, Thika, and Ongata Rongai were visited. These included leading supermarket chains such as Nakumatt, Uchumi, Naivas, and Tuskys. In addition, mini supermarkets within estates as well as provisions stores were also visited.

The retail outlets visited are organised in Table 4.1 using a modified categorisation building on one proposed by Thomsen, Kamau, & McCormick (2017). The categorisation organises supermarkets in Kenya into three main groups: large diversified retail chains with many branches, small retail chains with fewer branches and individual small supermarkets. Large diversified retail chains are well known in Kenya and include Nakumatt, Tuskys, Uchumi and Naivas supermarkets. Examples of small retail chains include Chandarana, Quickmart, Eastmart, Tumaini and Cleanshelf supermarkets. We modified the last category because whereas the one proposed by Thomsen et al., (2017) featured only supermarkets, we included in this category provision stores where a provision store is equivalent to a grocery store. Table 4.1 is a summary of the outlets visited. The full list is in Appendix 5.

Table 4.1 Summary of Retail Outlets Visited in 2013 to Check Crisps Brands Stocked

Large diversified retail chains	Small retail chains	Individual small supermarkets and 3 provision stores
Nakumatt – 4 outlets	Ukwala – 2 outlets	35 outlets
Uchumi – 4 outlets	Tumaini – 1 outlet	
Tuskys – 9 outlets	Cleanshelf – 1 outlet	
Naivas – 2 outlets	Eastmart – 1 outlet	
Subtotal – 19	Subtotal – 5	Subtotal – 35
Total 59		

Source: Field notes, 2013 - 2016

The task during this retail outlet visits was to list down all crisp brands on the shelves together with the information about their manufacturers. This exercise yielded 39 firms with over 50 different crisp brands.

4.2.7 Data Collection

After the mapping exercise, the data collection proceeded in two stages. The first was a survey of 14 firms followed by qualitative interviews of six firms. This was done over a period of four years starting in 2013 and ending in 2016.

- **The survey**

Between December 2013 and January 2014, the first round of interviews was done for firms who had at least five employees and were established by 2007. From a list of 39 which had been identified as a result of the mapping process, I was able to access and interview 14 firms. Out of the 14, only 8 met the criteria I had set above. In addition to these 8, I included an additional firm that was young (Firm F established in 2012) but appeared to demonstrate immense potential. Three smaller firms that had been interviewed earlier were dropped because of various reasons. Two did not wish to divulge financial data and one was planning to relocate from Nairobi to Western Kenya. This left us with six firms. One of the six firms (Firm A) was large, one (Firm B) was small, while the remaining four were micro.

This first round of interviews was very structured. The standard Community Innovation Survey (CSI) questionnaire adapted to suit developing countries innovation realities was used to accomplish this (see Appendix 1). It was the foundation for data acquisition during this phase. The questionnaire had 12 parts including general information about the firm, product innovation, process innovation, organisational and marketing information, on-going and abandoned innovation activities, innovation activities and expenditures. It also had sources of information and cooperation for innovation activities as well as effects of innovation activities, factors hampering innovation activities, intellectual activities. The last three parts probe for intellectual property rights, specific innovation by enterprise and creativity and skills within the firm. This tool was very long and administering it took a lot of time particularly as far as firms were concerned. In the subsequent interviews, I had to explain upfront that we would be using a different tool because respondents were reluctant to do repeat interviews.

- **Qualitative interviews**

The subsequent in-depth interviews were less structured. Semi-structured interviews were used. I also had a chance to do factory visits for all six firms interviewed and observed first-hand the production activities. See Appendix 4 for a sample of pictures taken during the factory visits. To aid in note taking and interview transcription, I was accompanied to all interviews by one of three research assistants who had been trained for this purpose. The language used during the interviews was primarily English. The first round of case study interviews was conducted between October and November 2014. The second and last round of case study interviews was conducted between August and November 2016.

Building on the existing data from the first phase of fieldwork, the first round of qualitative interviews pursued the following themes: resources, technological capabilities, and firm performance. Resources were further divided into human capital, capital equipment and networks. Technological capabilities comprised investment, production, linkage and innovation capabilities. Networks focussed on how firms financed their activities and how they pushed their products unto the market. Firm performance was used to track success of the firm. To gauge firm performance, three indicators were used. The first was the owner's assessment of the firm compared to the industry average. The second indicator was the firm's change in turnover while the last the last one was the earnings before interest and tax (EBIT). All these were summarised in a matrix which was used to make an interview schedule for each firm (see Table 4.2). Information that was available from the previous interview session was documented while what was missing was sought after during the interview. See appendix 2 for the interview guide that was used for each of the six case study firms.

The six interview guides were not identical because they built on the survey results and were therefore meant to fill gaps that had been identified. So they varied from firm to firm based on what had initially been collected in the previous interviews.

Table 4.2: Themes Pursued During the Case Study Interviews

Theme	Resources/ human capital	Resources/ human capital	Resources/ human capital	Resources/ Capital equipment	Resources/ Capital equipment	Resources/ Networks	Technological capabilities	Performance	Performance	Performance
	Educational background of most responsible person	No of employees with university degree	Nature and of on job employee training/learning	Range of capital equipment available	Expenditure on acquisition of machinery and software	Size and composition of network	Investment, production, linkage and innovation capabilities	Owners assessment of the firm compared to industry average	Change in turnover	EBIT
Firm A										
Firm B										
Firm C										
Firm D										
Firm E										
Firm F										

Source: Field notes, 2013 - 2016

During the second round of qualitative interviews, the same themes were pursued. However, for technological capabilities the focus narrowed down to two categories: production capabilities and marketing capabilities. To capture how the firms went about building these capabilities, the study explored further their learning mechanisms. These built on many aspects of the linkage capabilities that had been documented earlier during the first phase of the case study. They also built on several aspects of the resources theme that had been documented earlier. See appendix 3 for the interview guides that were used during this second round of qualitative interviews. At the end of this round of qualitative interviews, I felt that I had gathered enough data and had therefore reached a saturation point. A decision was made therefore to stop further data collection.

Table 4.3 outlines the data needs for each of the research questions. To restate here, the main question was to what extent and how have potato processing firms in Kenya built their capabilities to be competitive? The unit of analysis was the firm. In this case these were six crisp processing firms drawn from the Nairobi Metropolitan Area

Table 4.3: Data needs table for each question

Question	Data needs	Instruments
1. At what level of technological capabilities do the firms operate?	Identify the manifestation of functional technological capabilities among the firms i.e. production, marketing, linkage, and innovation capabilities; Categorise the capabilities according to technological complexity including basic, intermediate; and advanced.	<ul style="list-style-type: none"> • Standard Community Innovation Survey (CIS) questionnaire – parts 2, 3 & 4 • Use of open ended interview guides
2. What are the learning processes that have supported the development of the technological capabilities?	Identify the various learning mechanisms firms use to build their technological capabilities	<ul style="list-style-type: none"> • Standard Community Innovation Survey (CIS) questionnaire – parts 6 & 7 • Open ended interview guides

Question	Data needs	Instruments
3. What is the nature of the relationship between the capability building process and the firm's innovation performance?	Document firm performance by looking at: 1- Innovation performance – product, process, organisational and marketing innovations	<ul style="list-style-type: none"> • Standard Community Innovation Survey (CIS) questionnaire - parts 2, 3 & 4 • Open ended interview guides

Source: Field notes, 2013-2016

4.3 Strategies to Improve Reliability and Validity of the Study's Findings

This section gives a brief reflection on the reliability and validity of the study's findings. Regarding external validity or the generalizability of case study research, I was guided by the general case study philosophy on the same. As Bryman (2004) notes, case study researchers do not delude themselves that it is possible to identify typical cases that can be used to represent a certain class of objects be they factories, the media, or in my case potato processing firms. A case study is not a sample of one of these. Thus, the purpose of case study research is not to generalise to other cases or to populations beyond the case. Rather as Stake (2000) points out, the purpose is to capture cases in their uniqueness. At the end of the day, the study therefore values distinctiveness and in doing so pays attention to the variations among the cases.

On the other hand, this study pays close attention to the validity of its findings in the sense of determining whether findings are accurate from the standpoint of the researcher, the participant and to an extent the reader. Creswell (2009) outlines several strategies that a researcher can use to increase the accuracy of their findings. These include triangulation, member checking, rich descriptions, clarification of bias, presentation of negative or discrepant information, spending prolonged time in the field, peer debriefing and use of an external auditor to review an entire project. Some of these strategies were employed in this study and the next section offers some examples.

The first strategy employed to check validity of the findings was prolonged time in the field. This strategy borrows heavily from ethnographers who are known to spend long periods in the field ranging from four months to even a year. The strategy is useful in many ways

including confidence with research respondents which may lead to building a rapport. This is helpful in as far as they may then be at ease to share information with the researcher. Repeated field visits may also help a researcher to solidify their evidence because it allows them an opportunity to crosscheck data against their observations. It also offers them a chance to take note of any changes. Each of the six case study firms was visited at least three times during the study period. These visits happened between September 2013 and November 2016. These amounted to 22 research days.

Firm A had the highest number of visits at five. At the end of the interview sessions, the chairman of the company, the assistant production manager, the research and development manager and quality managers of the firm had been seen. This was followed by four visits for firms B and F. At firm B, the main respondent was the productions manager. However, the researchers also had a chance to talk to one of the directors and the firm's accountant. At firm F, three of the four interviews were done with the three founding directors of the firm. The fourth interview was held with an employee in charge of production. Firms C, D, and E had the least number of visits at three. For these three, the firms' owners were the main respondents' during all the interviews sessions. Table 4.4 gives a summary of these, while Appendix 6 gives the full breakdown which includes the sites of the interviews and who were the respondents for each of the interviews.

On average, each of these visits lasted an hour and half of interviewing as well as observation of the firm's activities whenever interviews were done at the firms' premises. In this way, I was able to observe what can be termed as highs and lows of the firms studied. For instance, in some firms there was growth in product portfolio and investments in capital equipment. In others I observed the reverse. These multiple visits enable the study to be in a position of giving a fairly accurate picture of the firms studied. It may enable a researcher to observe some changes over the entire study period which was discernable only because the firms were visited more than once. In our case the first discernable change was firm size. Some firms increased the number of their employees while others remained the same or declined. Product portfolio is another area where there were considerable changes for some firms during the study period. Some firms increased their product portfolios by introducing new products while others reduced the number products on offer.

Table 4.4: Summary of the Number of Interviews Done For Each Firm

Firm	Number of interviews done
Firm A	1. Five interviews in total 2. December 2013, October 2014, July 2015, October 2016, November 2016
Firm B	1. Four interviews in total 2. Two interviews in January 2013, June 2015, August 2016
Firm C	1. Three interviews in total 2. December 2013, October 2014, August 2016.
Firm D	1. Three interviews in total 2. January 2014, November 2014, August 2016.
Firm E	1. Three interviews in total 2. January 2014, October 2014, August 2016
Firm F	1. Four interviews in total 2. September 2013, December 2013, October 2014, August 2016

Source: Field notes, 2013-2016

Member Checking, Peer Debriefing and Rich Description

The second strategy employed to improve the validity of findings is member checking. In this strategy, a researcher goes back to the respondent to check whether the data captured, its interpretation and narrative arising out of the same is a realistic and accurate representation of the situation on the ground. A focus group discussion with research respondents is the most popular strategy of achieving this (Creswell & Miller, 2000). In my case, each subsequent interview started with a summary of the findings from the previous one. This enabled the respondent to clarify any misrepresented information as well as bring to the fore any new developments.

Away from the respondent, this study also employed peer debriefing. In this strategy, a researcher gets feedback from peers who are familiar with the data and research process being used. They play the devil's advocate as well as acting as a sounding board for the researcher. In this way the researcher gets to see their research from multiple viewpoints, a helpful undertaking in clarifying many issues around the study (Creswell & Miller, 2000). I

was privileged to use this strategy throughout the study process. This is because along the way, I had numerous opportunities to share the findings with colleagues who were part of the larger study as well as PhD colleagues at the University of Nairobi and beyond. This happened during PhD seminars and conferences.

The last strategy adopted was rich description. This is where the researcher describes in great detail the setting, the participants and the themes of the study. When a reader goes through the account, they are able to picture themselves in the research setting (Creswell & Miller, 2000). I went to great lengths to employ this strategy in this study. It is therefore my belief that the accuracy of this study's findings has been greatly bolstered by the use of these multiple strategies.

4.4 Gaining Access to the Research Site

Gaining access to firms was a major challenge throughout the entire study. A number of firms turned us away. Once entry had been secured, the challenge was getting the respondents to answer questions. There was reluctance to disclose certain information especially financial information. I went to great lengths to convince the respondents that I was neither a government official nor a competitor out to spy on the firm. The research permit and the introductory letter from the University helped in allaying some of these fears. But over time, I was able to win their confidence. This is because I visited each firm at least three times between 2013 and 2016.

A question that arises at this point is whether the challenges that I faced, access and suspicion, are unique to this study. It emerges that this is actually a fairly common occurrence. Some authors such as Ferrand who have done fieldwork in Kenya have attributed this to the practicalities involved in the research process (Ferrand, 1999). On access he noted that participation in research offers no tangible and immediate benefit to the respondent. On the other hand, participation has a cost implication. The respondent will spend time away from the normal tasks and will be inconvenienced as a result. In the interview process, there is also the risk that sensitive organisational information may end up in the wrong hands. This partly explains why many respondents will be wary about disclosing written information.

In the same breath, Ferrand raises the issue of over-research. Though he singles out the micro enterprises segment, he points out that as far back as in the 1990s there were emerging signs of over research in Kenya (Ferrand, 1999). To some extent, I encountered this during the fieldwork exercise. At one firm, after I had introduced myself as a PhD student from the

University of Nairobi, the respondent told me that just a few days past, he had been interviewed by another team from the University. He did not give me a chance to explain myself out that I was from a different department with a different research focus. I was therefore denied access on that account. Nevertheless, once access to a firm had been secured and the firms had been assured of confidentiality, it was relatively easy to do subsequent interviews. Aware of the attendant disruption, great effort was taken to minimise this by always scheduling the interviews ahead of time at a time that was most convenient for the respondent.

4.5 Data Analysis

Compared to quantitative data analysis, qualitative data analysis presents more difficulties. Some of the reasons for this include the fact that over time the quantitative approach has codified clear rules and guidelines on how analysis is to be done. On the contrary, qualitative analysis has not reached this degree of codification of analytic procedures and what exists are broad guidelines (Bryman, 2012:565). Yin (2014) presents four analytic strategies while noting that they should not be considered mutually exclusive. These are relying on theoretical propositions, working your data from the “ground up”, developing a case description, and examining plausible rival explanations. This study made use of a combination of the first two strategies. These are theoretical propositions and working data from the ground up. As Gibbs (2007) notes, most researchers move back and forth between the two approaches. The technological capabilities theoretical framework provided a good starting point. However, along the way, emerging data from the field also steered the study.

Data analysis in this study was therefore an on-going process from the beginning of the data collection process until the end. After the first interviews which were very structured, analysis paid attention to innovation activities (technological capability building activities), an approximation of the investment that went into these technological capability building activities and the sources and cooperation for the said activities. Analysing all these gave a preliminary idea of the learning mechanisms (internal to the firm as well as external) individual firms put in in place to build their technological capabilities.

Based on the analysis of the first round of interviews and using some of the categories arising from the technological capabilities building conceptual framework we analysed the first question on nature and level of the firm’s technological capabilities. The conceptual framework adopting the functional approach to the analysis of technological capabilities

gives rise to several categories of capabilities including investment, production and linkage capabilities. But for this study attention was paid to only two sets of capabilities: production and marketing. Under production capabilities, Frito-Lay's potato crisps production process (The National Geographic, 2012) was used as a benchmark giving rise to an original set of eight production capabilities relevant for the analysis of potato processing firms in Kenya.

For comparison purposes, each firm's production capabilities were therefore analysed. The eight capabilities are: sorting of raw potatoes; washing; slicing; removal of excess water; frying; draining of excess oil; brown spots detection; seasoning; and packaging. During analysis, three levels were used to grade each firm's level of capability. These are advanced, intermediate, and basic.

The marketing capabilities focussed on access to markets. The study analysed how each firm accessed each of these various channels by using modified categorisation originally developed by Thomsen et al., (2017). This grouped supermarkets into three categories starting with large diversified retail chains with many branches, small retail chains with fewer branches and individual small supermarkets. This last category also included kiosks, and convenience stores.

For purposes of bringing to the fore the variety of learning mechanisms used by the case study firms in their quest to build up their technological capabilities, the analysis drew on the analytical framework which classifies and breaks down the learning mechanisms into two broad categories. These are internal and external mechanisms. Internal mechanisms comprised on-job training, use of expatriate and technical personnel, and research and development. On the other hand, external mechanisms were further classified into two subcategories. The first was private mechanisms. These included learning from buyers; suppliers; inter-firm spill overs of knowledge; consultants; commercial labs; and private research and development institutes. The second subcategory was collective learning mechanisms. These included learning from government or public research institutes; business associations; conferences; and exhibitions.

Finally to address the last question of exploring the relationship between the capability building process and the firm's innovation performance, the study analysed the technological capability levels particularly those on market access and the competitive position of the firms by looking at the firm's innovative performance.

4.6 Summary

This chapter has outlined the research design followed in undertaking this study. The chapter started by discussing why the study settled on the case study design as the primary research strategy. Such aspects as multiple cases, the case selection and the research site are discussed. The chapter then discusses in detail the research process which comprised preliminary steps then leading to the actual data collection. The data collection was accomplished in two steps with the first being a survey. The second step of the data collection entailed several rounds of qualitative interviews per each firm. These two distinct phases notwithstanding, the chapter noted that the data collection was not a linear process but a circular one.

After this, the chapter moved into a discussion of several aspects of the research process including strategies employed to improve reliability and validity of the study's findings. One such strategy was prolonged time in the field. Each firm was visited at least three times during the entire research period. Other strategies included member checking, peer debriefing and rich description. The chapter concludes by discussing how the analysis was done. The analysis was an on-going process throughout the entire research period and technological capability building was the analytical framework used. The framework says that firms learn so as to build technological capabilities which in turn affect their innovation performance.

CHAPTER FIVE

LEVEL OF TECHNOLOGICAL CAPABILITIES

5.1 Introduction

This chapter addresses the study's first question which is to document the firms' technological capabilities. The chapter therefore maps the current level of the firm's technological capabilities. To do this, attention was paid to two sets of capabilities: production and marketing. Sections 5.1 and 5.2 map the firms' production and marketing capabilities respectively. Section 5.3 gives a summary of the chapter.

Before delving into the firms' technological capabilities, the following are the basic characteristics for each firm. These are firm age, size, the owner's assessment of each firm's performance compared to the industry average, and the firm's turn over for year 2012. This is summarised in Table 5.1.

Table 5.1: Basic Firm Characteristics

Firm	Size	Year of Estab.	Owners' assessment	Turnover in 2012 in KES
A	240	1973	Well above industry average	735,672,142
B	34	1990	Industry average	144,000,000
C	8	2003	Somewhat below industry average	6,600,000
D	5	2004	Industry average	700,000
E	5	1994	Somewhat below industry average	960,000
F	10	2012	Industry average	7,000,000

Source: Field notes, 2013-2016

As far as size is concerned, firm A with 240 employees is clearly above the medium designation and is instead a large firm. Firm B with 34 employees is in the small enterprise category. The remaining four firms with employees ranging from five to ten in are micro enterprises. As for age, firm A is the oldest while firm F is the youngest having been established in 2012. The last two characteristics relate to firm overall firm performance. Two

indicators were used to tease out this: the owner's assessment of how the firm compares with the others in the industry and its turnover in 2012.

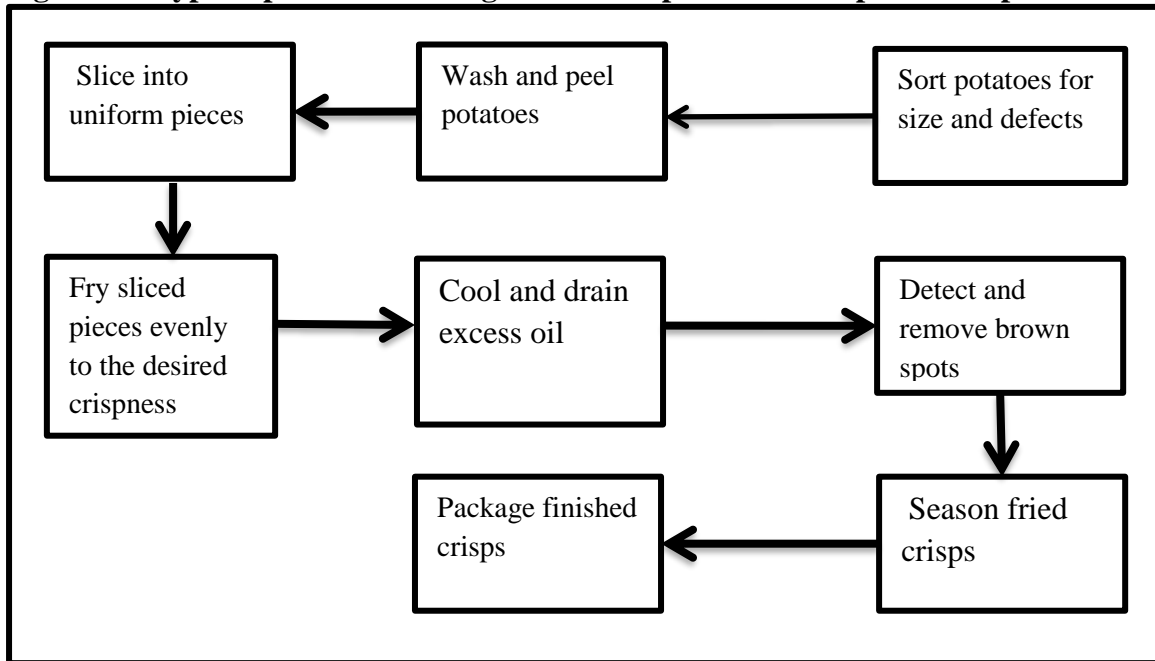
Starting with the turnover, firm A led with close to a billion Kenya shillings in 2012 at KES. 735,672,142. This was followed by firm B with almost 150 million at KES 144,000,000. Firm F and C followed reporting KES 7,000,000 and KES 6,600,000 respectively. This leaves firms D and E. Each of these two posted a turnover of less than a million Kenyan shillings in 2012. Firm E posted KES 960,000 while firm D had KES 700,000. Firm D was struggling with lost market access after seven individual supermarkets it was supplying to ceased operation due to growing competition. As a result, the firm's sales plummeted and this explains the negative change in turnover experienced during the research period. In August 2014, the firm witnessed a further low point when its premises located in Kariobangi Light Industries were gutted in a night inferno which destroyed equipment worth KES, 230,000.

With regard to the owner's assessment of how the individual firm was performing, firm A leads with a rating of "well above industry average". Firms B, D, and F rated themselves at "industry average". Two firms, C and E chose "somewhat below industry average". An analysis of this indicator reveals a number of insights. Firm A is clearly above the rest and is an industry leader in the sector. So the owner's assessment is on point. However, this is not so for a firm such as D. The owner of firm D rated the firm at industry average yet the firm recorded the lowest turnover in 2012. So it would appear that the owner clearly overrated the firm. In the same breath, we could say that firm C was quite modest in its own assessment. Its turnover was much higher than firm D but the owner determined that the firm was somewhat below industry average. Thus it is clear that there were variations in how each firm owner understood and interpreted the industry average measure.

5.2 Production Capabilities

The production steps outlined in Figure 5.1 constitute eight different capabilities. These are: sorting of raw potatoes; washing and peeling; slicing; frying; cooling and draining of excess oil; brown spots detection and removal; seasoning; and packaging before the products are distributed. As we have established, these are the standard production steps gathered from the empirical literature review. We now start the discussion of each of them beginning with the sorting capability.

Figure 5.1 Typical process flow diagram for the production of potato crisps



Source: Author's conceptualisation based on empirical literature review

5.2.1 Sorting Capability

Firm A is the only one that is keen to sort the raw potatoes by size. This is because the washing and peeling is automated and the machine is adjusted based on sizes. The firm is keen to procure potatoes of the same size so as to minimize frequent changes to the calibrations of the machine. Firm A had the following to say about this:

We are very fussy because our products are going to America, UK. Other companies sell locally and are not fussy like us. The farmers find it difficult to deal with us because we need specific sizes of let us say peanuts. We want bananas, arrow roots of a certain size. A lot of our processes are also automated hence we cannot keep turning machines on and off to suit the various sizes.

Source: Field interview with firm's Chairman, July 2015

Despite effort to make sure that the firm procures potatoes of a similar size, they still end up with some that are too small. To weed these out from the production line, the firm has an electric grader. When the potatoes are delivered at the processing plant, they are loaded onto the grader. The small potatoes fall off the grader and are discarded. Similarly, soil and other dirt fall off the vibrating grader. The grader then moves the remaining potatoes into the washer before they are moved automatically into the peelers.

The rest of the firms were not keen on this type of sorting by size largely because they deployed different mechanisms for peeling which did not require uniform size considerations

like it was the case in firm A. The sorting they engaged in was basic. In most cases this is done to remove damaged or bruised potatoes. Furthermore, this is done by hand as opposed to Firm A's machine operated process. Based on this, we conclude that there are only two levels of capability with regard to sorting. These are advanced capability which applies to Firm A, and basic capability which applies to Firms B, C, D, E and F. See Table 5.2.

Table 5.2: Sorting Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Sort raw potatoes for size and defects	A	BH	BH	BH	BH	BH	Firm A automatically sorts by size and removes dirt. The rest of the firms sort by hand to remove dirt and defects

Codes: A = automated; BH= by hand

Source: *Field notes, 2013-2016*

5.2.2 Peeling Capability

Three different levels of capabilities to peel potatoes in readiness for slicing can be observed among the six case study firms. The basic level is where knives are used to peel washed potatoes. This can be seen in two firms: D and F. The second level which we call intermediate is whereby firms deploy an electric peeler. These peelers are usually manufactured by local artisans. Three firms are at this level: firms B, C and E. The third and highest level is where the peeling is automated. We call this the advanced level. This was observed in firm A. When the potatoes leave the washing machine, they are moved to a peeler via a conveyer belt system. After being peeled the potatoes are sliced as seen in Table 5.3.

Table 5.3: Peeling Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Peel raw potatoes	AP	EP	EP	K	EP	K	Firm A has an automated system of peeling the potatoes. Firms B, C and E have electric peelers assembled in Kenya to peel washed potatoes. Firms D and F use knives.

Codes: K=by knife; EP = by electric peeler; EPK=both electric peeler and knife; AP= automated peeler

Source: Field notes, 2013-2016

5.2.3 Slicing Capability

Regarding the capability to slice peeled potatoes into uniform pieces, three levels can be observed. We categorise them as advanced, intermediate, and basic. The advanced level is automated slicing. This is where slicing is part of a continuous process in the crisp processing. Firm A uses this. The second level, intermediate, is electric slicing. This is a standalone machine powered by electricity that slices potatoes into uniform pieces in readiness for frying. Firms B, C, and F use this machine. The basic level is where handheld slicers are used to accomplish this task. This is a manual and slow process where you must slice one potato at a time thus time consuming. The two remaining firms, D and E, use this slicing method.

A major consideration where it comes to slicing is uniformity. The slices must be of a uniform thickness to ensure that the final product is of the same quality. It is therefore imperative that the slicing blades are adjusted to ensure this uniformity. It is generally accepted that individual potato slices having a thickness of about 0.03 to 0.1 inch are adequate (Wicklund & John, 1981). This is therefore a matter of quality. It does not matter that you are using an automated system as in the case of firm A, an electric slicer as in the case of firms B, C, and F or handheld slicers in the case of firms D and E. All of the processes must have the ability for adjustment to ensure required thickness is achieved.

Firm A lists the ability to ensure uniform thickness of sliced potatoes as a quality parameter as indicated by the quality manager in the following quote.

So we check in the products as we are producing as well and depending on the section you are in like the slicing section for us to check on quality we ensure that the blades are set in a certain way. So we measure the thickness of the chip as it is coming out of the slicer unit. So we check on that.

Source: Field interview with the Quality Manager, October 2016.

There is a further reason proper slicing is a high priority feature in firm A’s processing. The firm combines slice thickness, shape of the sliced chip and packaging type as a distinguishing feature for its final products. Thicker wavy crisps are packed in foil/matte packaging. Normal size crisps are packed in transparent packaging. The thicker and wavy type retail at higher prices than the normal ones as was explained by the research and development manager in the following transcript.

I don’t know if you realized we have a clear category and we have foil category which is completely different. In the past, in the foil it was exactly the same product as in our clear category. But when we removed that old ugly foil, we came with up waves category. So we have slightly changed our product. It is the same papers but the crisps in the waves category have a wavy cut just to differentiate it from the clear pack.

Source: Field interview with the Research and Development Manager, October 2016.

This capability to have a differentiated slicing endows firm A with advanced slicing capabilities compared to the rest of the firms who are yet to venture into wavy cut crisps production. See Table 5.4 for the variations in the slicing capabilities observed among the case study firms.

Table 5.4: Slicing Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Slice peeled potatoes in uniform pieces	AS	ES	ES	HS	HS	ES	Firm A has automated slicing. Firms B, C and F have electric slicers. Firms D and E deploy handheld slicers.

Codes: HS= hand held slicer; ES= electric slicer; AS= automated slicer

Source: Field notes, 2013-2016

5.2.4 Frying Capability

Frying is a very important component in the production of crisps. In most cases, this is accomplished by immersing the sliced crisps in cooking oil for a period of from about 45 to 120 seconds and at temperature of from about 149 to 204 Degrees Celsius (Wicklund & John, 1981). When frying is done well, the final product will be of good quality and thus appealing to end consumers. The capacity of the fryer also determines the quantities that can be done at any given time and this in turn determines whether a firm is able to meet its production needs. Three levels of capabilities can be observed among the firms under study. These are categorised as advanced, intermediate, and basic.

The first capability, basic, is where firms deploy an electric deep fryer. Here deep fryers with a capacity of between 2.5 to 5 kilograms of crisps per session and powered by electricity are used. This was observed in firms C, D, E and F.

The second level, intermediate, observed among the firms is the use of a diesel powered batch fryer. This was found in firm B and the round shaped fryer could cook up to 160 kilograms of crisps per session. Sliced crisps are poured into the fryer and are continuously turned around and stirred using large sieves for a period of time until they are cooked. They are then scooped using the same sieves for the next process which is de-oiling.

The third level, advanced, is where a firm deploys an automatic fryer which is part of a continuous production line. Firm A uses this fryer which has a capacity of over 150 kilograms per hour. After crisps have been sliced and excess water drained, they are moved into the fryer for a predetermined period of time. Table 5.5 summarises these.

Table 5.5: Frying Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Fry sliced potatoes evenly to the right crispness	AF	DF	EF	EF	EF	EF	Firm A uses an automatic fryer that is part of a continuous production line. Firm B uses a diesel powered fryer. Firms C, D, E and F use electric fryers.

Codes: AF= automatic fryer; DF=Diesel fryer; EF: electric fryer

Source: *Field notes, 2013-2016*

5.2.5 Oil Draining Capability

Once the crisps have been fried, they must be cooled and excess oil drained before packaging. There is not much variation to be observed among the studied firms when it comes to this capability. Firm A uses an automated method. As the crisps exit the fryer, the conveyer belt that moves them to the seasoning component allows the oil to drip off. The rest of the firms use varied types and sizes a meshed tray which allows the crisps to cool while the excess oil drains and is collected in a container. Thus, only two levels could be observed here: advanced which applies to firm A and basic which applies to the remaining five firms as seen in Table 5.6.

Table 5.6: Oil Draining Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Cool and drain oil from fried crisps	AD	MT	MT	MT	MT	MT	Firm A uses automated draining while the rest of the firms use meshed trays

Codes: AD= automated draining; MT= meshed tray

Source: *Field notes, 2013-2016*

Excess oil draining is a matter of quality in crisps production. Due to health concerns and the growing awareness and prevalence of the so-called lifestyle diseases, some consumers shy off excessively oily food products. This is why the companies make effort to drain off excess oil after the frying process.

5.2.6 Brown Spot Detection Capability

A brown spot on the finished product lowers its aesthetic value and thus its quality. It is a sign of a defect. Brown spots are a result of many factors including bruised potatoes, use of immature or over mature potatoes which have been stored for a considerable time before processing. As a quality check therefore many crisps processors put considerable effort to detect these brown spots and remove the affected crisps before packaging.

All six case study firms do this process manually. There is therefore only one level, which is the basic level as seen in Table 5.7.

Table 5.7: Brown Spot Detection Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Detect brown spots and other effects in fried crisps	MDR	MDR	MDR	MDR	MDR	MDR	All six firms manually detect brown spots and manually remove them

Codes: MDR = manual detection and removal

Source: Field notes, 2013-2016

In October 2016 during a fieldwork session at firm A, we observed a production employee removing crisps with brown spots from the conveyer belt before they go into the seasoning component of the processing line. The defective crisps were collected and put away as waste. Among some small processors, these crisps with brown spots are not thrown away as waste but are considered as ‘grade 2’ upon which they are flavoured and sold at a slightly lower price. This was observed in firm E.

The variation that exists among the six processors is how the manual process is done. In firm A, the crisps with the brown spots are picked off a conveyor belt. In the other firms, the defective crisps are picked off meshed trays as they are de-oiling and cooling just before seasoning process. It is also during this time that any other foreign matter is removed. During an interview with the owner of firm E in August 2016, she noted that they take a lot of care to ensure that no foreign matter goes into the crisp packet. This is because she had one unfortunate incident where an end-user customer discovered a hair pin in her products. She had to call up the customer, apologise and replace the defective package. So again this is a matter of quality which is important for all processors.

Firm A was planning to change the way brown spot detection and removal was being done. The firm’s quality manager in an interview in October 2016 pointed out that the company was at an advanced planning stage to introduce an optical sorter as a way of eliminating the manual process and in the process improve the company’s automation process. The sorter would remove crisps with brown spots and also those that are burnt. The manager was very proud of the fact that the company was pioneering this technology in the entire country.

5.2.7 Seasoning Capability

Seasoning is the second last component of the crisps production line. Salt and a range of flavours are used in seasoning crisps. Two main levels of seasoning capabilities are observed among the case study firms. The first, advanced, is automated seasoning which is part of a continuous production line. This is observed in firm A.



Figure 5.2 A Production Employee Operating a Seasoning Machine at Firm A

Source: Fieldwork pictures, 2016

In Figure 5.2, a staff from firm A can be seen operating a seasoning machine. The machine is fed with the particular flavour range as per the production plan for the day. Once in operation, the blue round drum fitted with blades rotates while spraying the flavour on the crisps which are coming from the frying component of the production line. The flavoured crisps are then moved into the packaging component of the processing line. The second level of capability, basic, is where flavouring is manual achieved by hand. The seasoning is spread on the crisps on a meshed tray before the packaging process. This was observed in firms B, C, D, E and F as seen in Table 5.8.

Table 5.8 Seasoning Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Season fried crisps with salt and/ or one or more flavours	AS	MS	MS	MS	MS	MS	Firm A does its seasoning automatically. The rest of the firms do seasoning manually.

Codes: AS= Automatic seasoning; MS= manual seasoning *Source: Field notes, 2013-2016*

5.2.8 Packaging Capability

This is the last component of the crisps production line. The ability to pack processed products using appropriate packaging material is a key technological capability for firms in the crisps processing sector. There are basic considerations about keeping the food products safe and away from contamination. In this way, packaging extends the shelf life of food products. But beyond these basic considerations, packaging also serves other purposes especially in branding products. According to FAO, (2014), advances in packaging will not only lead to improved food quality and safety but also livelihood enhancement of small producers through enhanced market access and integration in sustainable value chains.

Two main levels of packaging could be observed among the six case study firms. The first is advanced packaging seen in firm A while the second capability level, basic, is manual packaging. The manual packaging was seen in the remaining five firms. See Table 5.8.

Table 5.8: Packaging Capability

Capability	Firm Production Method						Comments
	A	B	C	D	E	F	
Package finished crisps	AP	MP	MP	MP	MP	MP	Firm A has an automated packaging facility. Firms B, C, D, E and F do manual packaging.

Codes: AP= automated packaging; MP= manual packaging

Source: Field notes, 2013-2016

5.2.9 Production capabilities wrap-up

This section has explained in detail the firms' production technological capabilities. The eight production steps were analysed individually with each representing a capability. They ranged from sorting of raw potatoes, peeling them, frying, seasoning and packaging. Table 5.9 summarises all these as they were observed among the firms.

Table 5.9: Production capabilities summary

Production capabilities Levels	Sorting	Peeling	Slicing	Frying	Oil draining	Brown spot detection	Seasoning	Packaging
Advanced	A	A	A	A	A	-	A	A
Intermediate	-	B,C,E,	B,C,F	B	-	-	-	-
Basic	B,C,D,E,F	D,F	D,E	C,D,E, F	B,C,D,E,F	A,B,C,D,E,F	B,C,D,E,F	B,C,D,E,F

Source: *Field notes, 2013-2016*

A number of key points emerge from the summary of the production capabilities analysis.

1. For the sorting capability, only two levels of capabilities can be observed among the case study firms. Firm A is at the advanced level while all the remaining five firms are at the basic level. For firm A the focus is on ensuring that the potatoes are of the correct and uniform size and are free of defects and dirt. For the rest of the firms size is not a major consideration but rather defects and dirt. The defects have to be kept at a minimum because they affect the quality of the final product.
2. The same trend of two levels is seen among three more capabilities: oil draining, seasoning and packaging. Once more, firm A is at the advanced level while the remaining five firms are at the basic level. Packaging is point of concern especially when you consider international competition. This is where imported products may have an edge over most local crisps manufacturers.
3. Three levels were observed among the case study firms when it comes to the peeling capability. Firm A was at advanced while firms B, C, E and F are at the intermediate level. At the basic level are two firms: D and F.
4. This trend of three levels is repeated in the slicing and frying capabilities. Under slicing, firms B, C, F appear at the intermediate level while firm A is at the advanced level. Two firms feature at the basic level: D and E.
5. When it comes to the frying capability, four firms feature at the basic level. These are C, D, E, and F. One firm appears in the intermediate level and this is firm B. Firm A is at the advanced level.
6. The capability with just one level is brown spot detection. All the six firms appear at the basic level. It is the only capability where firm A appears at the basic level. In all the other capabilities, it appears at the advanced level. But firm A is in the process of acquiring an optical sorter which will propel it to the advanced capability level.

7. The final point concerns what the summary can tell us in relation to how the firms compare to each other overall. To establish this, the advanced level was assigned a score of three points, intermediate level two points, while the basic one point. Computing them gives an overall score of 22 for firm A, 11 for firm B, and 10 for firm C. Firms E and F tie at 9 points while firm D had the least points at 8. Deriving from this therefore we can gather that firm A ranked highest and had a wide margin between itself and the rest of the firms. On the other hand, the remaining five firms were in actual sense very close to each other as can be seen in Table 5.10.

Table 5.10 Production Capabilities Scores and Overall Ranking

Firm	A	B	C	D	E	F
Capability level						
Advanced	21	0	0	0	0	0
Intermediate	0	6	4	0	2	2
Basic	1	5	6	8	7	7
Score	22	11	10	8	9	9
Overall rank	1	2	3	6	4	4

Source: Field notes, 2013-2016

5.3 Marketing Capabilities

Marketing capabilities in this study were discussed in two broad categories of products design and channel management. Product design addresses how a firm is able to market its products through two mechanisms: seasoning and branding. Under seasoning, the firm appeals to its market by having various flavours. Under branding, the firm appeals to its market through innovative packaging. So while seasoning and packaging have already been discussed under packaging capabilities, they are also discussed here under marketing capabilities because the two mechanisms can enhance a firm's marketing efforts.

The second category is channel management. We saw from the literature review that a firm must design a process through which its products reach the final consumer. We also saw that there are multiple channels available to a firm including kiosks, wholesalers, and supermarkets. We now discuss the marketing capabilities adopted by the six case study firms.

5.3.1 Product design capability

A firm has to be able to design its product to meet its customers' requirements. There are two considerations under this capability in the case of the firms in our study. The first has to do with seasoning while the second has to do with branding.

All firms combined reported a total of seven different flavours. These are salted; tomato; lemon; chilli lemon; salt and vinegar; cheese and onion; and *nyama choma*³. We could derive two levels among the firms: advanced and basic. Firm A had all seven while firm B had six. We put this together in the advanced capability level. Firms C and F had three flavours while firm E had two flavours. Firm D had one. All these four are categorised under the basic capability. See Table 5.11 for the variations of the flavours among the six cases.

³ *Nyama choma* is Kiswahili for roast meat. In this case, it means that the crisp has a roast meat flavour

Table 5.11 Variations in Crisps Flavours among Cases

Case	No. of crisps flavours	Comments	Capability level
A	7	Essentially seven flavours [salted; tomato; lemon; chilli lemon; salt and vinegar; cheese and onion; and nyama choma] but packed in three combinations as follows: 3 mass market variants [chilli lemon; salt and vinegar; tomato] 6 premium market variants [cheese and onion; chilli lemon; nyama choma; salt and vinegar; salted; tomato] 6 “Normal” market variants [Salted; lemon; salted and vinegar; tomato; cheese and onion; chilli lemon]	Advanced
B	6	Salted; tomato; cheese; garlic; chilli lemon; salt and vinegar. Used to be eight but beef masala and chilli onion were dropped as they were not popular	Advanced
C	3	Salted; cheese and onion; barbecue. Has experimented with chilli lemon but was not fast moving so abandoned it.	Basic
E	2	Salted and chilli	Basic
F	3	Salted; tomato; chilli	Basic
D	1	Salted	Basic

Source: Field Notes, 2013- 2016

The second design consideration concerns branding which is largely achieved through packaging. Beyond the mode of packaging, there are variations in the type of packaging material to be used. This is also a matter of quality and competitiveness. The aesthetic appeal of a product’s packaging may make it have a competitive edge against another. The type of packaging materials used determines this. The two main packaging materials used by the case study firms are the aluminium foil packaging also called matte finish, and transparent polythene bags. Aluminium foil packaging is the recommended design, but it is costlier. Of all the 6 firms, only firm A uses this kind of packaging material. But it also combines it with the polythene packaging. The rest of the firms use polythene packaging.

Based on the preceding discussion, we observed two levels of capabilities among the case study firms: advanced and basic. Firm A does both aluminium foil and transparent polythene bags. We designate it advanced capability. Firms B, C, D, E and F do only the transparent polythene packaging. These therefore are designated basic capability. See table 5.12 for a summary of the packaging materials used by each firm.

Table 5.12: Packaging Materials Used by the Firms

Firm	Polythene	Combination of polythene and Aluminium packaging	Capability level
A		✓	Advanced
B	✓		Basic
C	✓		Basic
C	✓		Basic
D	✓		Basic
E	✓		Basic

Source: Field notes, 2013-2016

5.3.2 Channel Management Capability

Concerning distribution channels, it was observed that there are significant variations in the choices the six firms made in deciding how to distribute their products to the final customers. This is due to the fact that there are now multiple channels open to a firm. These include kiosks, wholesalers, convenience and provision stores, minimarts, and supermarkets. For a firm, the challenge therefore becomes how to achieve an optimal distribution density to make sure that all of its end customers can find the products at the various channels they patronise.

To analyse how the six firms used the various channels, we used a slightly modified classification categories originally proposed by Thomsen et al., (2017). According to this classification, there are large diversified retail chains such as Nakumatt, Tuskys, Uchumi and Naivas. The second group comprises small retail chains and examples here include Ukwala, Tumaini, Cleanshelf, Eastmatt and Quickmart. The third category is individual small supermarkets. These are many and are mainly found in residential estates. In this category we also include minimarts, kiosks, provision and convenience stores. The last category is educational institutions. Two firms supplied their products to secondary schools and colleges

within Nairobi and Kiambu. See Table 5.13 for a breakdown of the distribution channels each firm used.

Table 5.13: Distribution Channels Used by the firms

	Large diversified retail chains	Small retail chains	Individual small supermarkets, provision stores, convenience stores, minimarts, kiosks	Educational institutions
Firm	A & B	A, B, & C	A,B,C,D,E & F	C & E
Capability level	Advanced	Intermediate	Basic	Basic

Source: Field Notes, 2013-2016

Based on this, we can conclude that there are three levels of capabilities when it comes to channel management among firms. The first level is advanced and only two firms feature here. These are firms A and B. The two firms supply to the leading supermarket chains. These retail outlets impose a number of standards especially on packaging. In addition, they require large volumes because they have many branches. This locks out many small processors who are unable to meet the standards as well supplying in the needed volumes.

The second capability level is intermediate. Here we saw three firms featuring firms A, B and C. These are firms who are able to supply to the second category of the retail channels: small retail chains. Some of these supermarkets do not impose very strict packaging standards compared to the large diversified retail chains. Since they do not have many branches, they also do not require huge volumes. This is why firm B which has lower packaging quality and production capacity is able to access such. But the retail options still stock products from firm A.

The last capability level is basic. This features firms which supply to the last two categories of the retail options. Firms D, E and F are to be found here. But so do firms A, B, and C. Due to the range of retail options under these category, it accommodates all the case study firms. On the other hand, some firms seem to have some particular niches in addition to the individual supermarkets. For instance, firms C and E supply to educational institutions. These include schools and university campuses. Firm F distributes to convenience shops at Total and Shell service stations. At Total it sells to the Karen, Spring Valley, Hurlingham and Limuru outlets while at Shell it sells to the Hurlingham and Nakuru outlets.

5.3.3 Marketing capabilities wrap-up

This section has discussed the case study’s marketing capabilities under two main capabilities: product design and channel management. For each capability, three levels were used to demonstrate the similarities as well as variations among the firms. These are basic, intermediate and advanced levels. Table 5.14 gives a summary of how each firm fared as far as these capabilities are concerned.

Table 5.14 Marketing Capabilities summary

Marketing capabilities Levels	Product design (seasoning)	Product design (branding)	Channel management
Advanced	A,B	A	A,B
Intermediate			A,B,C
Basic	C,D,E, F	B,C,D,E,F	A,B,C,D,E,F

Source: Field Notes, 2016

As in the production capabilities, a number of key points emerge from this analysis of marketing capabilities. They are summarised below:

1. The product design capability was analysed under two sub capabilities: seasoning and branding.
2. Under the seasoning capability, two capabilities were observed: advanced and basic. Under advanced, in addition to firm A, there is also firm B. Firms C, D, E and F fell under basic level.
3. Under the branding capability, again two levels are observed. But this time, only firm A features under the advanced level. The remaining five firms are at the basic level. How a product is packaged is becoming a major source of competition especially among high income customers. But this has a cost implication which locks out smaller firms who cannot afford packaging materials such as aluminium foils.
4. Channel management featured three capability levels. At the advanced level are firms A and B. At the intermediate level are firms A, B, and C. Lastly at the basic level there are firms A, B, C, D, E, and F. There are several advantages of operating at the advanced stage. Especially if a firm is working with large diversified supermarkets. First, because they have many branches, a firm has a chance to make visible its brand.

Second, since some of these diversified supermarkets have branches in the regional market, through them a firm can access the export market.

5. Channel management is also a unique capability in the sense that those firms with higher capabilities can work with all the channels starting from the supermarkets to kiosks. Products from such firms would be packed in small quantities and be supplied to such retail options. On the other hand, those firms with lower capabilities are not able to access some retail options such as large diversified supermarkets. Firm A is aggressively targeting the low-income consumers and is making deliberate efforts to modify its marketing strategy by including the informal market. This is therefore likely to change the distribution of their products among the various retail options. Whereas in the past the firm only supplied to supermarkets, wholesalers, and the export market, the firm is now looking at kiosks, corner shops, and convenient stores. This is in response to the growing realisation that the informal market holds potential in improving their revenue base.
6. Like we did in the production capabilities, based on the marketing capabilities wrap-up, we sought to determine how the firms compared to each other. Again, the advanced level was assigned a score of three points. The intermediate level was assigned two points while the basic score was assigned one point. After computing the scores, firm A had an overall score of 12 closely followed by firm B at 10. Firm C came third with a score of 5 while the remaining firms tied at the fourth position each with a score of 3. So, whereas in the production capability there was a wide gap between firm A and the rest, in the marketing capability this gap has been narrowed considerably. See Table 5.15.

Table 5.15 Marketing Capabilities Overall Ranking

Firm	A	B	C	D	E	F
Capability level						
Advanced	9	6	0	0	0	0
Intermediate	2	2	2	0	0	0
Basic	1	2	3	3	3	3
Score	12	10	5	3	3	3
Overall rank	1	2	3	4	4	4

Source: Field notes, 2013-2016

5.4 Summary

This chapter has explained in detail the firms' technological capabilities. This had been discussed under two broad categories of capabilities: production and marketing. Frito-Lay's production processes were used as a benchmark for the production capabilities observed among the firms. The eight production steps were analysed individually with each representing a capability. They ranged from sorting of raw potatoes, peeling them, frying, seasoning, and packaging. On the other hand, two marketing capabilities are discussed: product design and channel management. For each capability, three levels were used to demonstrate the similarities as well as variations among the firms. These are basic, intermediate, and advanced levels.

Summaries were made for each individual capabilities and key messages arising from the same discussed. The implications of these will be revisited and discussed in the summary and conclusion chapter. Nonetheless, looking at the two capabilities, whereas firm A dominated the advanced levels under the production capabilities, this monotony was broken under the marketing capabilities. Firm B featured at advanced level in three out of the four marketing capabilities.

CHAPTER SIX

LEARNING MECHANISMS

6.1 Introduction

This chapter addressed the study's second question which is: what learning mechanisms have supported the development of the current technological capabilities of the firms under study? In chapter three, we set out the technological capabilities building conceptual framework as the most appropriate framework for analysing this kind of data given that it is a study of firms which are removed from the technological frontier. While acknowledging that capability accumulation in a firm is affected by a wide range of factors, the conceptual framework puts learning at the centre of these factors. The framework is lauded for its comprehensiveness because it looks at a wide range of learning mechanisms that firms draw on in the quest to build their capabilities. These capabilities are the specific technological capabilities the firm has now. Table 6.1 outlines the various analytical categories among the two main learning mechanisms.

Table 6.1 Learning Mechanisms

Internal mechanisms	External mechanisms
1. On-job training	<i>Private mechanisms</i>
2. Expatriate and technical personnel	1. Buyers
3. Research and development	2. Suppliers
	3. Inter-firm spill overs of knowledge
	4. Consultants, private R&D institutes
	<i>Collective learning</i>
	1. Government or public research institutes
	2. Business association, conferences, exhibitions

Source: Adapted from Biggs et al., (1995)

The following sections discuss how each one of the firms learns based on the identified categories of learning mechanisms. For each mechanism, effort was made to bring out who

was learning and what was being learned in the quest to build the firm's technological capabilities.

6.2 Internal mechanisms

Internal mechanisms are grouped into three main subcategories. These are on-job training; expatriate and technical personnel; and research and development. We discuss each of them in turn.

6.2.1 On-job training

All the six case study firms reported to using on-job training. Various reasons were given on the need for training. These included filling skills gaps among recent employees in the firm. This was seen in firm A. The firm complained about the quality of graduates coming out of Kenyan training institutions who needed to be trained on-job to meet the firm's expectations. Particular departments, such as marketing, were singled out as the most affected at the firm as seen in the following quotation.

We have been struggling to get a marketing manager, there are graduates with some having MBAs but do not understand how FMCG works in the international environment. When I ask what a planogram is, they do not understand yet it is the most important because it determines where you are going to place the product so that it will be most exposed to the consumer at the supermarket.

Source: Field interview with Chairman of firm A, July 2015

For the other firms, most of the training was to orient the staff to the workings of the firms particularly the production processes at the firm.

The other consideration about on-job training is the nature of the training. Does the training happen within the firm or outside the firm? As training outside the firm has a cost implication particularly in terms of finances, we observed that in-house training was the most favoured and was observed in all the six firms. Outside training was only seen in firms A and B. In the case of firm A, these trainings have been organised locally by the Kenya Association of Manufacturers (KAM) and the Kenya Federation of Employers (FKE) with the content focussing on industry relations such as labour laws. Firm B has also supported production staff to external trainings on safety issues such as first aid and fire fighting.

Another important consideration is the content of the training. Here again there are observed variations. Most training focussed on production skills. For instance, employees would be

trained on how to use new production equipment. This was observed in firms A and B. In other cases, the training the training would focus on new production techniques. This was observed in all firms. We did not observe any specific training targeted at supporting marketing capabilities among any firm.

Finally, there is the question of who is trained. In firms A and B, the training was focussed on employees. But among firms C, D, E, and F it is the owners who would be trained. After the owners master the new skills, they in turn train the employees.

So, we gather that all firms are engaged in on-job training in their quest to build their technological capabilities. In all the cases the training aimed at either filling some missing skill gaps or to orient new staff to the workings of firm. We have also found out that due to cost implications in-house training was the commonly used. It therefore meant that what was learned in this case was limited to what was presently available at the firm as opposed to chances of gaining new knowledge from outside the firm.

In terms of who was being trained at the firm, again there were variations. In firms A and B, this training largely went to employees. However, in the case of firms C, D, E and E it was the owners who received the training and later trained their employees. The implication here is that the diffusion of the new learned knowledge takes longer among firms C, D, E and F compared to A and B. Last on the question of which technological capability benefited most from the training, clearly most trainings seem to benefit the growth of production capabilities compared to the marketing ones across all the six cases.

But overall, the fact that all firms are engaged in on-job training is an important one. It seems to follow what has already been observed that a lot of the training that happens within most African firms is enterprise-based training. We have already observed from literature that publicly provided on-the-job training in Sub Saharan Africa particularly in Kenya and Zambia was decreasing in size and was also becoming increasingly irrelevant. The firms are therefore left to shoulder the burden of this training as we have observed among the case study firms.

6.2.2 Expatriate and Technical Personnel

The second internal learning mechanism for analysis is expatriate and technical personnel. We start this section by focussing on expatriate personnel before focussing on technical personnel. For several decades after independence, many indigenous Africans struggled with

running large manufacturing firms. This led to an assertion that African businessmen are competent at running small firms, but lack the technical and organisational experience for running large enterprises (Elkan, 1988). To go around this constraint, many African firms employed expatriate managers. For countries such as Kenya, the tide seems to be changing for the better as absolute number of expatriate staff seems to have gone down considerably. For instance, the 2010 Census of Industrial Production (CIP) established that the industrial sector in Kenya employed 324,841 workers as of 30 June 2009 (KNBS, 2013). Majority of these employees were Kenyan citizens accounting for 99.5% of total employment within the industrial sector. Under manufacturing, those in the manufacture of food products were 99.9%.

So, while the absolute numbers have gone down, a considerable number of manufacturing firms still employ expatriates. When you talk to some of the firm owners, it emerges that some graduates leaving Kenyan educational institutions are lacking in several technical skills. Expatriate employees are therefore recruited to fill such gaps. For instance, the Chairman of firm A had the following to say about why the firm is engaging expatriate personnel:

Yeah, unfortunately the Kenyan institutions do not train and give the learners right skills, hands-on practice to meet the market demands. You can have someone with a degree but they do not know how to draw a straight line, hold a drill or operate a welding machine. They are not teaching the right skills and giving hands-on practical experience. That is why some institutions like Safaricom are training their own people in terms of mobile repairs services and customer care services.

Source: Field interview with the Chairman firm A, July 2015

He went on to elaborate using an example that relate to his particular sector.

For example, in our business we have Utalii College. They train the chefs but they do not have knowledge of spices. They are taught how to use it but do not understand the quality of the spice. Either they learn by themselves out of interest, or they do not know. Those are the problems we encounter.

Source: Field interview with the Chairman firm A, July 2015

The reference to Utalii College raises a number of issues with the main one being the nature of training of the graduates engaged by firms. This is because Kenya Utalii College was set up by the government to serve the hospitality and tourism industry in Kenya. On the other hand, we have many middle level colleges and universities in the country which train

students in food science. These include the University of Nairobi's College of Agriculture and Veterinary Services' Department of Food Science, Nutrition and Technology. One therefore wonders whether firms are choosing employees from the right educational institutions.

Coming back to the issue of expatriate employees, only firm A had them. It had four expatriate staff that were charged with research and development, sales, software development, and technical operations. These four expatriate employees were recruited to fill gaps existing in the firm. Each of them has local employees who work with them and are supposed to learn from them over time to ensure that there is transfer of skills. With a total employee population of 240, the four expatriates represent 1.7% of the total population. Conversely, it means that Kenyan citizens took up 98.4% of the employment slots. This is slightly less than the broad national manufacturing sector average of 99.9%.

We now turn to technical skills. When a firm hires technical employees, the employees come already trained in their respective areas minimising the need for on-job training. This increases the competitiveness of a firm. With more than half of the staff being university graduates, firm A has the largest concentration of highly qualified technical personnel spread over six departments. The firm has production and quality; sales and marketing; accounts; IT; administration; stores and logistics; and human resources departments. The production and quality department had 10 food technologists. On top of this it had tens of cooks, machine attendants, machine operators, and technical operators. The engineering department is manned by five engineers while the sales and marketing included 40 merchandisers who were direct employees.

Firm B has three departments: production, administration, and sales. Production has the highest number of employees but most of them are secondary school leavers. The sales department is headed by one salesperson who works together with merchandisers who are out in the field. The administration department includes directors together with a professional accountant who handles the firm's finances.

Firm C is building its technical staff slowly. The firm has been having an accountant. It recently recruited a salesperson. The remaining three firms rely on secondary school leavers to handle most of their production work while the firm owners handle the rest of the duties. They do not have departments such as what we have seen in firms A, B and C. They also do not have technical staff and consequently cannot benefit from them.

In summary, only firm A employs expatriate staff to complement the local technical staff. Since the expatriate employees are in various departments at the firm (research and development, sales, software development and technical operations), their contribution to the development of technological capabilities straddles production as well as marketing capabilities. However, employing expatriate staff comes with huge costs especially because such employees must secure work permits to work in the country. For a firm to engage them, it means that local employees are missing certain critical skills. It also means that it has the financial means to sustain such employees.

As far as technical staff is concerned, firm A has the highest number of technical people spread across seven departments. The contribution of these technical staff to the growth of technological capabilities at the firm cuts across production and marketing ones. This is followed by firm B which has three departments: production, sales and admin. Up to a certain extent, the firm has been able to develop its production as well as marketing capabilities. Firm C does not have clearly structured departments but beyond the production staff, it also has an accountant and a salesperson. Firms D, E and F rely on secondary school leavers who are trained on the job so their contribution to the development of technological capabilities is limited.

6.2.3 Research and development

Research and development is the third and last internal learning mechanism to be analysed. All the six firms surveyed indicated that they undertook research and development activities. These activities vary greatly among the firms and many of them do not really fit the definition of mainstream research and development. For the small firms, research and development typically involved looking at competitors' products in retail outlets for new product ideas. Such was the case for firms B, C, D, E and F as seen in the following example from the owner of firm C.

So research has been part of my business, even to date. I always go to the merchandisers they tell me about the best products in the market. I try to follow up and understand what is making it sell, more than my product. Once I get the results I effect the necessary changes in my business.

Source: Field interview with owner of firm C, October 2014

For yet others, research and development involved poaching staff from leading competitors. The poached staff would in turn share production techniques at a cost. This was reported particularly in firms C and E.

Better still, research and development for some of the firms in the case study also involved going to industry events organised by government agencies such as the Kenya Bureau of Standards (KEBS) or industry associations. Examples of such events include exhibitions featuring equipment manufacturers or seminar sessions on various processes such as packaging. The owner of firm C reported having attended several forums which were organised by KEBS. Similarly, production employees at firm A reported about attending trade exhibitions and meetings organised by the European Snacks Association (<http://www.esasnacks.eu/>); and the Snack Food Association (SFA) (<http://snacintl.org/>) based in America. Firm A is a member of both associations. At such forums which are held abroad, the employees get to know the latest industry standards which serve as a benchmarking measure. This is important for the firm because it is now increasingly exporting to the European and American markets.

Of all the six case study firms that we studied, we established that firm A is the only one that has a full-fledged research and development department. This department is headed by an expatriate. The firm spends 80% of its research and development efforts for new products and process while 20% on modification of existing products and processes. Most of these efforts are directed to packaging crisps in cardboard cans, nitrogen flushing, and foils. The efforts in packaging of crisps seem to have paid off as the firm now has some of the best packaged crisps on the market. Similarly, in the last couple of years, the firm has been able to come up with new products such as a crisp brand for the mass market among other innovative products. The research and development department recently spearheaded a product rationalisation exercise which led to the firm discontinuing a number of products which were consistently recording poor sales.

Based on this analysis, we conclude that there are four distinct manifestations of research and development that can be observed among the six case study firms as shown in Table 6.2. The first manifestation is very basic. This involves checking out competitors' products in various retail options to learn new ideas and implement the same at your firm. This is a very common practice in the manufacturing industry and is not limited to food manufacturing. Even leading manufactures such as Frito-Lay have acknowledged it by saying that they belong to an

industry where no one can think of a product that cannot be duplicated by competitors (Lynda, 1993). For manufacturers with limited resources, this form of research and development could be the only option they have. However, the downside is that it leads to imitation in the industry which in a way curtails the development of firms' technological capabilities. Other studies such as Kabecha (1999) have observed a similar trend among small scale metal workers in Nairobi. Kabecha noted that "... due to the rampant copying, production is not technologically inspired and hence competing on quality has not been adopted as a business strategy. Instead, technology has been used to maintain the market and not as a basis for the expansion of the market and hence sales revenue which could provide capital for further innovative efforts (Kabecha, 1999:124).

The second manifestation of research and development observed among the case study firms is poaching of staff from competitors. This is quite similar to the first manifestation and also perpetuates imitation. Firms C and E owned up to using this strategy quite often as a way of learning new production techniques. The poached employees (usually from competitors) train a firm's staff for short periods especially during weekends or when they are off duty. The third form of research development is going to industry events. The most common are exhibitions either held in Nairobi or abroad. Firm A has taken its staff abroad where they have learned about latest production techniques as well as scout for new equipment. Similarly, the owner of firm C has gone to several exhibitions held in Nairobi. This exposure to the external environment is very important since companies can benchmark and have an opportunity to learn about new ways of doing things. When enterprises only learn from internal sources, the danger of passing on bad practices is very real (Kabecha, 1999; Kinyanjui, 2000).

Table 6.2: Manifestations of Research and Development Observed Among the Case Study Firms

	Form of research and development	Content of learning	Firms involved
1.	Checking out competitors' products	Packaging and production techniques	B, C, D, E and F
2.	Poaching staff from competitors to train own staff	Production techniques	C and E
3.	Going to industry events	Production techniques, new equipment; benchmarking	A and C
4.	Having a research and development department	Production techniques, benchmarking	A

Source: Field notes, 2013-2016

The fourth and last manifestation of research and development observed but only in firm A is where this is done via a full-fledged research and development department. This is a costly undertaking given that in the case of firm A, the department is headed by an expatriate employee. Nevertheless, it appears as if the firm is poised to benefit from this investment. The firm has been able to effect a product rationalisation activity leading to discontinuation of non-performing products while focussing on those which have a highly profitable. Similarly, a lot of attention has been paid to packaging development which has seen the firm adopt the latest forms of packaging for all its product lines. Similarly new forms of product introduction to the market have been adopted.

Between production and marketing capabilities, which one gained most from research and development across the firms? Overall, production capabilities gained more as most of the research and development activities observed across all the firms seemed to support production activities. The exception is firm A where various research activities were directed towards creating new distribution channels and thus developing the firm's marketing capabilities in addition to the production ones.

6.3 External Private Learning Mechanisms

After discussing the various internal learning mechanisms, this section now turns a spotlight on the external ones (see Table 6.1). These are grouped into two categories: private mechanisms and collective learning mechanisms. Each of these two categories has further mechanisms as follows: under private mechanisms we have learning from buyers; suppliers; inter-firm spill overs of knowledge; and the use of consultants, commercial labs, private research and development institutes. On the other hand, collective mechanisms are just two: government or public research institutes; and business association, conferences, and exhibitions. The manifestation of all these among the six case study firms is now discussed starting with the private learning mechanisms.

6.3.1 Learning from buyers

The first form of private learning mechanism is learning from buyers. The buyers here include various channels through which the firms sell their products but also end-customers. All the case study firms listed supermarkets, wholesalers, convenience stores, kiosks as their buyers. Of all these, supermarkets were arguably the one source where the firms learned a lot. However, the learning is indirect. Supermarkets especially the large diversified ones impose certain standards that the processors must meet before they are allowed to stock their products. Two firms were directly affected by this.

In 2010, firm C was forced to upgrade its packaging due to pressure from its retail channel. Some of the bigger retail outlets had started stocking better packaged products. The firm's products were bypassed because its packaging was deemed to be of inferior quality. The firm's sales plummeted and according to the firm's owner, they almost resorted to going back to selling to small shops. The owner decided to upgrade the packaging process though it was marred by challenges. He invested KES 250,000 in purchasing a sealing machine. This process was problematic at first because he did not get the correct packaging paper leading to losses. Nevertheless, in the end, the firm was able to get it right.

Firm B has also faced a similar predicament. They had been supplying a range of products to a large and diversified supermarket chain in the country. The products included grains, spices, herbs, and crisps. However, the retail outlet stopped stocking their crisps line due to what the supermarket deemed inferior packaging quality. The firm is yet to upgrade the crisp packaging line so the products remain off the shelves of the said retailer.

Since all the firms sell through various retail options, very few of the firms interact with the final consumers directly. Nevertheless, all of them put contact information on their products. The owner of firm C pointed out anecdotal instances where customers have called him to congratulate about particular products. In other cases, callers have called in to complain about particular products. This feedback from the final consumers helped the firm to work at improving their products.

Firm B also pointed out two cases where the production manager had to intervene directly with aggrieved customers. The first instance involved cashew nuts that had bugs inside them while the second involved spoiled almonds. These two cases were attributed to poor quality raw materials. In both instances, the cases were solved amicably, and the offending products replaced at no cost to the customer.

In the same way, firm E has had to intervene occasionally based on feedback from end consumers. In one instance, a consumer complained through a supermarket outlet that the crisps were too salty. The firm took note of this and rectified. In another case, a customer found an alien matter in a pack of crisps. This was returned to the supermarket where it was bought. The firm followed up with the affected customer, apologised and refunded the crisp pack. From that time, the owner has intensified quality checks during the processing to curtail a repeat of the same.

These foregoing examples touching on firms B, C, and E tend to be reactive in nature. Firm A seems to be the only one that has put in place concerted and proactive measures to engage final consumers so as to learn from them. It uses various strategies to do this. First, the firm has a focus group comprising of top users of spices and herbs. This group meets regularly and it helps in enhancing the company's product range. This trend is likely to grow in importance as the manufacturing industry in Kenya matures. Leading snacks manufacturers have already adopted this as a way of getting ideas for new products. For instance, Calbee which is an industry leader in Japan provides consumers with an online platform where they are invited to participate in product development (Euromonitor International, 2015). Through the said platform, consumers are encouraged to give feedback on such aspects as packaging design and flavouring.

Secondly, firm A firm runs an updated Facebook page. In April 2016, the page had 16,686 likes. These had increased to 23,377 in mid-January 2017. The firm uses the Facebook page to conduct promotional activities and by getting direct feedback from final consumers on its

products. See the following post on the Facebook page by a consumer (identity withheld) in October 2016:

Firm A's X (product names withheld) products are real in taste unlike others in the market. I can testify on this. I'm a rooted loyal consumer of your products like XX, AA, BB and your YY is awesome just like the rest of your products.

Source: Firm A, Facebook page, March 2017

In the month of February 2017 during the Valentine's period, the firm ran a promotion where a number of customers found buying the firm's products in various retail outlets were awarded gift hampers.

Thirdly, the firm also exhibits at the Agricultural Society of Kenya's Nairobi International Trade Fair. During the 2016 event which ran between 3rd and 9th October, the firm was soliciting for opinion on a number of their products particularly a crisp flavour that was not doing well sales wise. The last strategy which is closely related to the third one is product activation. This is a strategy geared towards launching new products to the market. It is done at retail outlets in select supermarkets whereby a team from the firm would invite consumers to sample products for free and give feedback on the same. Depending on this feedback, the team would decide on how to move ahead with the new product. According to the Research and Development Manager at the firm, this strategy has been used very effectively to introduce new healthier products that were not very common to the Kenyan consumer.

In summary, there are three main mechanisms through which firms learned from buyers observed. The first mechanism is whereby buyers compel firms to meet certain standards. We saw this regarding packaging standards. By imposing packaging standards, the firms were forced to learn new processes. In this way the firms were able to develop their production and marketing capabilities. The second mechanism is whereby firms receive unsolicited feedback from buyers and their end-customers. All the case study firms receive feedback from the end-customers and act on the same. Through this feedback they are able to improve their production and marketing capabilities. The third mechanism observed is where firms actively seek feedback from buyers particularly end-customers. This was observed in firm A. The firm A has innovative ways of keeping in contact with the end-customers. For the technology savvy, the firm engages them through social media platforms especially Facebook. To test new products before they are launched, the firm conducts product activations at supermarkets. This helps the firm gather useful feedback which is incorporated in the product

development before a product is introduced to the wider market. In this way, the firm is able to improve its production as well as production processes.

6.3.2 Learning from suppliers

There are two main categories of suppliers to the firms. These are suppliers of raw materials and suppliers of equipment. Attention here is focussed on suppliers of equipment as they were the most important sources of learning for the firms. To give an idea of how much learning came through suppliers, all the six case study firms were asked to rate the importance of various sources of information which was useful for their innovation activities. Two indicated that suppliers are a highly important source. The remaining four did not rate suppliers as highly important but still learned from them. It is instructive to note that the two who rated suppliers highly invested heavily in equipment. In many cases, these investments ran into millions of Kenya shillings. Much of this equipment was imported and firms needed to familiarise themselves with the same. In the case of firm A, they imported the machines from Europe, USA, Australia, India, China, and South Africa. As a result, the firm engages technicians from the suppliers to train local staff on how to use and maintain the equipment in question. As most of this equipment is procured abroad, in some cases, the training will take place abroad. In other cases, the supplier would send technicians to the firm. The relationship also goes beyond training to be able to use the equipment. It also encompasses a firm suggesting some changes to the equipment in question perhaps to increase productivity.

During the October 2016 interview at the firm, we observed that a technician from a South African company that supplies firm A with the packaging machinery was at the firm training machine operators. The firm was also in the process of acquiring an optical scanner and the Research and Development Manager was scheduled to travel to China for training on how to use it.

In the case of firm B, the production manager was working very closely with a technician who was recommended by the supplier to maintain their coding machine. Over time, the production manager has been able to learn how to troubleshoot the machine and only calls the technician whenever the machine needs a major maintenance operation. The other four firms buy their equipment locally either from shops or the *jua kali*. This equipment includes locally fabricated potato peelers, slicers, cooking stoves, fryers and the like. The three directors of firm F indicated that they are trained on how to use equipment by their suppliers, especially those bought from the shops.

The exception among the four seems to be firm C. The firm has in the recent past made considerable investments by importing equipment from China. In the year 2015, the firm spent over KES 350,000 to import a rice milling plant from China. This consisted of a milling plant, a rice sorter, and power box to regulate power especially during power blackouts or fluctuations. Once the equipment was at the firm, the installation process took over three months. This is because the owner had to source for the right technicians from the local market. In addition, he had to work very closely with the Kenya Bureau of Standards (KEBS) with regard to the rice sorting machine so as to achieve an acceptable quality of the final product. At the beginning the rice had too many breakages and that had to be resolved by numerous test runs. By August 2016, the firm had submitted the final samples to KEBS for consideration for the award of permit.

What emerges is that all the six case study firms interact differently with their suppliers especially in relation to equipment used at the firms. Similarly, the intensity of the learning arising out of these exchanges varies considerably. But two streams can be deciphered. Firms A, B, and C make huge investments in the acquisition of equipment. Some of the equipment is sourced locally. Yet others are sourced from abroad. In all the three cases, the firms have had to learn from the suppliers on how to use as well as maintain the equipment. In some cases, the suppliers send technicians to the firms to conduct training on the use of the equipment. The second stream concerns the remaining three firms, that is D, E and F. These buy their equipment from local suppliers. Some of this local equipment could be imported machinery to be found in supermarkets or it could also be locally fabricated *jua kali* equipment also bought in supermarkets or directly from the producers. Most of this equipment is not very sophisticated so it needs less training effort on the part of the suppliers. Nevertheless, quite often, the suppliers train the owners who in turn train the rest of the staff charged with the handling the said piece of equipment.

The distinction made here in terms of the level of investment made to acquire equipment and where the equipment is sourced from has an important implication in terms of understanding how firms learn and build their technological capabilities in Africa but more specifically in Kenya. In terms of the level of investment, it was established that firms A, B, and C made very substantive investments in the purchase of the equipment. The investments ran into millions of Kenya shillings in the case of firms A and B while in the case of firm C it is in hundreds of thousands. On the other hand, the investments are much lower in the case of firms D, E and F. In terms of where the equipment is sourced from, we established that

supplies were sourced from China, India, South Africa, and UK. This is in addition to the local suppliers.

Starting with the level of investments, it has been observed that because many Kenyan firms are family owned, they start small by making small investments (Langdon, 1984). As the firms learn by doing, they gradually accumulate their technological knowledge as they matured and deepened their entrepreneurial experience. With this experience, they are in a better place to make further investments once their financial status has also improved. Concerning the sources of the equipment, it has also been observed that firms which unpacked their technology acquisitions had better chance of growing their technological capabilities than those who relied on single sources (Langdon, 1984). So it is good to note that the case study firms have a wide range of sources ranging from the local market, the African market, the Asian market as well as the Western market. They approach each of these market based on the need and the ability to pay. For those firms which expand gradually, the direct contact with overseas suppliers becomes very important in building their capabilities further.

6.3.3 Inter-firm spill overs of knowledge

Two main streams of inter-firm spill overs of knowledge linkages among the case study firms could be observed. The first stream could be termed formal and direct while the second could be termed informal and indirect. In the first stream, firms A and B have formal arrangements for subcontracting. In the case of firm A, it was contracted to do private label products for a leading supermarket chain. In this arrangement, firm A was able to use its excess production capacity to make products for the supermarket chain. Apart from making use of its increased capacity, the firm is also able to increase its volume of sales. A similar scenario was repeated in the case of firm B. Firm B was subcontracted by firm A to process a range of its spice products.

We call the second stream of inter-firm linkages informal and indirect. This was observed among firms D, E and F whose owners used to work for other established firms before resigning and setting up their own enterprises. In setting up their own enterprises, the owners banked on the experience gained while working in similar environments. The exception in this case was firm C. The owner of firm C was working in a different sector. He was working in the horticulture industry. He picked very valuable entrepreneurial capabilities at his former place of work. But he had to learn snacks production skills from a friend.

Two key conclusions can be made out of the two streams of inter-firm linkages observed among the case study firms. As sources of learning, the second stream is more relevant compared to the first one. See Table 6.3. The first stream is more useful to the firms involved in as far as using their excess production capacity is concerned than as sources of learning. This is because they hardly learn anything new in the process as the products processed for the contractors are exactly the same as their own. The only difference is that the products are packaged under different brand names. On the other hand, owners involved in the second stream were able to set up their own enterprises based on the experience gained in the industry. So they build their current capabilities in their previous jobs.

Table 6.3 Forms of inter-firm linkages observed among the case study firms

Form of inter-firm linkage	Nature of learning	Firms involved
Formal/direct (subcontracting)	Not much learning. Instead firms have a chance to use excess production capacity and increase their sales volumes	A and B
Informal/indirect	Owners build their capabilities and branch off to start own and similar enterprises	D, E and F

Source: Field notes, 2013 - 2016

Studies that have focussed on various African clusters have criticised this form of inter-firm spill over of knowledge. It has been argued that when entrepreneurs branch off and start similar enterprises, there is a high likelihood that bad practices learned in their previous work environments may be passed on and be perpetuated in their current work environments. While this may be true to a certain extent among the firms involved in the current study, there are various exceptions which may militate against this happening. The first one is that the current firms do not belong to a cluster in the geographical sense. The second is that their previous environments were highly formal as compared to cases where high levels of informality have been observed in the studied clusters. The firms involved in the said clusters were very inward looking with very minimal contacts with the outside or formal sectors. This does not hold for the three case study firms involved in this relationship.

6.3.4 Learning from consultants, and private Research & Development (R&D) institutes

Learning from consultants, and private R&D institutes is the last private mechanism under the broad external mechanisms we shall discuss. In this category, we discuss a broad range of private actors who work together with the firms and the government to improve various aspects of the snack industry in Kenya ranging from getting proper seeds for potatoes to improving the packaging of the final products. Proper seeds ensure that processors have the correct raw potatoes for processing. This is a major concern in the industry. During the fieldwork period which lasted between January 2013 and November 2016, a number of respondents drawn from among the six case study firms highlighted their interactions with a number of institutions which fall into this broad category. These include Technoserve <http://www.technoserve.org/>; the National Potato Council of Kenya (NPCK) <http://npck.org/index.php>; and the Institute of Packaging Professionals Kenya (IOPPK) <http://www.ioppk.com/aboutus>. Others include the United Nations Industrial Development Organisation (UNIDO).

In July 2015, the chairman of firm A mentioned that Technoserve is part of the stakeholders who were strengthening the potato raw materials program. At that point, Technoserve was mentioned together with German AID, USAID and the then Kenya Agricultural Research Institute (KARI)⁴. In the same breath there is the International Potato Centre. Firm A was part of all these institutions pulling together resources to ensure the consistent and sufficient availability of raw materials for the potato processing sector in Kenya.

The Production Manager at firm B mentioned the National Potato Council of Kenya (NPCK) which is a non-profit organisation composed of stakeholders in the potato sector in a similar breath during an interview in January 2013 (see Box 6.1). He was invited to a stakeholders meeting which had been convened by NPCK where the issue of seeds for potatoes among other issues was discussed. Like Technoserve, NPCK together with its stakeholders give a lot of weight in making sure that potato farmers have the right seeds for planting, minimise post-harvest losses, and access a ready market at fair prices. On matters of seeds they work with government research institutes especially KARI and the Kenya Plant Health Inspectorate Services (KEPHIS) as well as the Kenyan chapter of the International Potato Centre (IPC). The National Potato Council of Kenya lists USAID, IFDC, FAO, GIZ, Kingdom of Netherlands, and Syngenta among the development partners. Three potato processors

⁴ In 2013, through an Act of Parliament, KARI was transformed to the Kenya Agricultural and Livestock Research Organisation and given a wider mandate.

partnering with the council are Tropical Heat, Propack and Sereni Fries. The first two are industry leaders and focus on crisps production. Compared to the Propack and Tropical Heat, Sereni Fries is a new entrant and focuses on ready-cut crisps for the preparation of French fries.

Box 6.1 The National Potato Council of Kenya

The National Potato Council of Kenya (NPCK)

Incorporated in 15th September 2010 and launched on the 25th of Nov 2010

Registered by the Cap 486, company's Act laws of Kenya as a non-profit company limited by guarantee

Membership is by stakeholders associations

Has a Secretariat headed by a CEO who is answerable to NPCK Executive and the full Council

Offices are located at KALRO-NARL campus, along Waiyaki way

Website: <http://npck.org/index.php>

Objective

Responsible of planning, organizing, and coordinating value chain activities of the potato subsector and developing it into a robust, competitive, self-regulating industry.

The stakeholders

Farmers and farmer organizations; Traders, Processors & Agribusinesses; Research Organs- (Private, Government & International); National and County government Ministries (MoALF); The Academia Universities and Colleges; The Legal and /or Regulatory Agencies; and The Seed Multipliers- Farmers, Agencies & Companies

Three listed crisp processors

Tropical Heat (Deepa Industries) <http://tropicalheat.co.ke/> ; Propack <http://www.propack-kenya.com/> ; and Sereni Fries <http://www.serenifries.co.ke/>

Source: the National Potato Council of Kenya website: <http://www.npck.org/>

Firm C also reported about a chance encounter with a former employee of the National Potato Council of Kenya. The said former NPCK's staff paid him a visit at a time when the firm was really struggling with access to raw potatoes. At that time, the firm was relying on supply from Bomet County and due to the distance and the nature of the potato trade where brokers and other intermediaries have considerable leverage, the cost was very high. During that

chance encounter, he was made aware of a new variety of potatoes that is grown in the Kinangop area. Upon several trials, he was able to tinker his processing to be able to work with this new variety. In this way, he was able to salvage his crisp line that was really struggling at that time.

The next private actor under this category for analysis is the Institute of Packaging Professionals of Kenya (IOPPK). The owner of firm C indicated that he had benefitted from a packaging training that was facilitated by the Kenya Bureau of Standards (KEBS). This training which targeted SMEs with the view of improving their competitiveness through modern packaging techniques was organised in conjunction the World Packaging Organisation (WPO) and IOPPK. Many small processors are struggling with packaging as it is a costly venture leading some of them to settle for cheap unattractive options.

The packaging conundrum has also attracted the attention international players. For instance, since 2013 Messe Dosseldorf (a German trade fair organising firm) has been organising the annual Food Processing and Packaging Exposyumu in Nairobi. In 2013 there were 21 exhibitors. This increased to 65 in 2014 with the majority of them being international exhibitors. In 2014, the exposyumu attracted over 1,000 participants drawn from Kenya and the neighbouring African states. Through such forums, local processors in the region now have a chance to sample latest technology; international exhibitors have a chance to showcase their products as well as to understand local processing needs; while the government has an opportunity to understand how to support local processors. The said support is very important for small processors. Left on their own, many who have attended such exposyums are unable to afford the processing and packaging lines on offer. A case in point is firm C. The owner attended such an exhibition in September 2014 in Nairobi. According to him, there was so much to learn. However, the cost of the equipment on offer was way beyond the ability of his firm.

To sum up, this section has shown the involvement of various private actors who have teamed up with the firms and the government to address a number of issues affecting the potato processing industry in Kenya. Two main issues have been discussed. The first is the question of improving the quality of seeds. Firms A, B and C have worked with various private actors together with the government to pull together resources to address the challenge of potato seeds in the country. One such actor of note here is the National Potato Council of Kenya (NPCK). As a premier public private partnership initiative bringing

together stakeholders in the potato industry, its efforts are laudable. The only thing that the Council needs to do is to bring on board more potato processors. At the moment, only three are listed as members. Moving forward, the potato processors perhaps also need to form an association through which they can lobby the government and other stakeholder on various issues facing them.

The second issue concerns packaging. Here we have witnessed the involvement of local actors but also international actors who are showcasing modern packaging solutions targeting the local industry especially the small and medium firms. The only concern is that many of the technologies showcased have been found to be very expensive and beyond the ability of many small and medium players.

In sum, through the engagement with various actors, the firms have learned about new production technologies which can help them improve aspects such as packaging. Similarly the firms have also come to appreciate the existence of new variety of potatoes that can be used in processing.

6.4 External collective mechanisms

After analysing the four external private mechanisms, we now turn to the last category of external collective mechanisms (see Table 6.1). These are discussed under two broad categories: government or public research institutes; and business associations, conferences, and exhibitions. There is some overlap especially since exhibitions have been discussed briefly in section 6.3.4.

6.4.1 Learning from government or public research institutes

One of the major issues facing large scale processing of crisps in Kenya is the availability of quality raw materials in sufficient quantities throughout the year. Since potato growing in Kenya is largely done by small scale farmers who depend on the seasonal rain cycle, there are months in the year when the supply is diminished. This affects the processing of crisps. At such times, processors are forced to import from countries such as Tanzania. This increases the cost of production. As this particular challenge is beyond the intervention of processors, some have been compelled to work with other institutions in the country to find a solution. A similar interrelated issue is the question of seeds. For many farmers, the quality of their potatoes is poor because of poor seeds. To address this, the Kenya Agricultural Research Institute (KARI) [now called Kenya Agricultural and Livestock Research Organisation

(KARLO)] works together with the International Potato Centre (IPC) to supply farmers with the right potato seeds suitable for crisp processing. Potato processors are roped into this arrangement to provide a ready market for the farmers via a contract farming relationship. Funding and technical support is provided by various donors.

Firm A reported that it was part of this program. According to the firm's chairman, the program has helped them to address the raw materials challenge considerably even though the contracting bit seems to still face challenges. Under the arrangement, processors pay a standard price which has been agreed by all the stakeholders. However, some farmers are tempted to sell to the open market. This breaches the contract and ruins the relationship as seen from the firm's lamentation below:

We have twenty groups of farmers and together with our partners KARI. GERMAN AID, USAID and TECHNOSERVE sponsor the project. We all sit together and we work out on an average price which we should pay contracted farmers. So the price is good at all times. When the general market is good we pay three thousand five hundred but when the market is really good the farmers don't supply us. Instead, they give to the guy that pays four thousand. Being uneducated they don't really understand the basics of economics.

Source: Field interview with the firm chairman of firm A, July 2015.

Firm A has positioned itself as the one offering quality products. Apart from selling on the local market, the firm also sells to the American and UK markets. It is therefore keen to address these raw materials challenge. Apart from potatoes, firm A also buys cassava, arrowroots, bananas, chick peas, lentils and peanuts from local farmers. Since they cannot engage in contract farming with all the farmers supplying them with the raw materials, the firm has instituted quality checks at the point of delivery to the factory. In the case of potatoes, they must be the right variety. Dutch Robyjn variety is considered one the best for crisp production (Kaguongo et al., 2014). This is therefore given preference. Potatoes are also checked for size. They need to be of uniform size. This is because the processing is automated and if the potatoes are not of the same size, machines will need constant switching on and off to change the calibrations. This is time consuming and introduces inefficiency in the processing.

The firm also checks for spots on the potatoes. This is due to bruising as a result of poor post-harvest handling. This therefore explains why the firm has over time had to develop relationships with other players in the food processing value chain to address the raw materials challenge.

Apart from KARI/KARLO, the Kenya Bureau of Standards (KEBS) is another key institution in the crisps food processing industry in Kenya. KEBS is charged with the responsibility of developing standards for food and agricultural products to meet national as well as international requirements. The standards give specifications for the compositional requirements, microbial requirements, the tolerance limits for contaminants, packaging, labelling and the hygiene conditions necessary for manufacture of products (Oloo, 2010). These standards are developed by technical committees, numbering 32, with their secretariats at KEBS. The chairman of firm A is a member of the technical committee in charge of spices, KEBS/TC 024 – spices, culinary herbs, and condiments⁵. He reported that he was happy to play this role as he contributed in making standards that touch on his sector. However, he was not happy with the fact that KEBS does not enforce the rules that fall under its jurisdiction. As a result, there are a number of substandard products that now flood the market.

The remaining five firms seem to have an arm's-length relationship with KEBS. All their products have been certified by KEBS. There is not much interaction beyond that. The exception is firm C. The owner of firm C indicated that KEBS had invited him to various events targeted at building the capabilities of Kenyan SMES. He had a certificate that he received at a two day training session in October 2013. The training was on packaging and was titled “Competitiveness through Quality Packaging”. It was organised by KEBS with the support and sponsorship from World Packaging Organisation (WPO), and African Packaging Organisation (APO). It was held in conjunction with the Institute of Packaging Professionals, Kenya (IPPK) and had the following objectives:

1. Ensure SMEs goods reach their final destination in perfect condition;
2. Optimize functional requirements of packaging to deliver superior customer satisfaction;
3. Guarantee safety and traceability throughout the entire supply chain;
4. Provide packages that meet international, regional, and local regulatory constraints;
5. Communicate identity and unique product features; and
6. Provide distinct merchandising visibility, and on-shelf differentiation

All the six objectives are relevant and talk to the needs of the food processors in the country. For instance, firm C reported that crisps products are easily crushed during transportation as

⁵ Other related technical committees include KEBS/TC 006 – edible nuts and seeds; KEBS/TC 008 tubers and tuber products; and KEBS/TC 013 – processed cereals and pulses.

well as during handling at retail outlets. During the training, they were informed that this can be addressed by making sure that they use carton boxes during transportation. This minimizes breakages. However, this has a cost implication and in the end the firm has not been able to use them as seen from the owners sentiment's in the following quote:

That is an extra cost, I tried to follow it up by going to those manufacturers who make cartons but I was not able to fix that cost anywhere...so it was difficult. It takes a lot money

...

Source: Field interview with the firm owner of firm C, August 2016.

KEBS also invited firm C to a two-day processing, packaging and converting technologies exhibition that was held in Nairobi in September 2014. This exhibition which targeted SMEs drawn from the entire East African region was organised by the government of Kenya through the Ministry of Industrialisation and Enterprise Development. The government partnered with UNIDO and the East African Community secretariat to bring together international as well as local exhibitors to interact with SMEs from the region. Again, as was pointed above, the training session was very useful. Firm C's owner was able to benchmark his production technology and he now knows exactly what to purchase when he is ready to upgrade. The only problem is that the firm has not mustered enough capital to do this at the moment.

In summary, it is good to note the active involvement of several government institutions in the potato industry in Kenya. The government involvement observed here is at the level of potato seeds, packaging of processed potatoes and the development of processing standards for potato industry. The issue of seeds is big in Kenya because a major problem facing many potato farmers is access to potato seeds. This curtails their production which in turn affects the supply of potatoes to the processing sector.

KEBS is the other government agency that was singled out by two case study firms for active facilitation on a number of issues affecting the potato processors including training, standards and packaging. Table 6.4 summarises how the firms interacted with the said government agencies.

Table 6.4: Key Government Agencies Promoting Learning in the Potato Industry

Government agency	Nature of learning	Firms involved
KARLO	Knowledge on potato seeds and potato varieties for crisps processing	A, B, and C
KEBS	Knowledge on food standards	A
KEBS	Knowledge on processing and packaging technologies	C

Source: Fieldwork Notes, 2013- 2016

6.4.2 Learning from Business Associations

Two local business associations that are important for the food processors are the Kenya Association of Employers (FKE), the Kenya Association of Manufacturers (KAM) and the Kenya Private Sector Alliance (KEPSA). Firm A says the Kenya Association of Employers (FKE) of which it is a member had organised for training of which the firm had benefited from. They have also benefited from trainings organised by the Kenya Association of Manufacturers (KAM).

Firm B is also member of KAM. But the firm did mention any direct benefit that has come to it as a result of that membership. In addition to KAM, the firm is also a member of Ectoville Association. This is a neighbourhood association which helps in lobbying the local authority on matters such as infrastructure provision.

Outside the Kenyan borders, firm A is also part of European Snacks manufacturers Association (ESA) and the Snack Food Association (SFA) which is based in America. The firm had benefited from training that was organised by the European association. On the other hand, firm A's participation in the American based one is strategic. The firm has less experience of the American market as compared to the UK market. Through SFA, the firm therefore wishes to get to learn more about the American market so as to design a superior market access strategy.

The rest of the firms did not mention that they belonged to any association during the interview period. Firm E did mention that at some point in the past, the owner was introduced by a friend to Kamukunji Association of Traders. The association organised a seminar which she attended. But due to a busy schedule, the owner never made follow up and she is no longer a member of the said association.

The Kenya Association of Manufacturers (KAM) is always considered as catering for the medium to large firms leaving out small and micro enterprises. However, there is now the Association of Jua Kali Producers of Kenya. The government through KEBS has been supporting this. But since it is a new entity, it is possible that many small firms in Kenya do not know about it. Such an association would certainly benefit firms C, D, E, and F.

Two important findings can be drawn from this analysis on business associations. First, there are a number of business associations existing for the benefit of food processing industry. Of the six case study firms, it appears that firm A is the one that has actively reaped these benefits. The firm's employees have been trained by both the KAM and FKE. Similarly, the firm has also benefited from its association with European and American associations of snacks producers. The benefits include training opportunities as well as technological exposure and benchmarking. Firm B is also a member of KAM. However, the firm did not report any benefits accruing from the association.

During the study, it was established that firms C, D, E, and F were not members of any association. We discuss the second finding in that context. The message is that there needs to be concerted efforts to encourage firms especially the micro and small to be part of business associations. Granted, in Kenya, the current crisps' demand is yet to be satisfied. But there is no guarantee that this status quo will prevail for long. Already, based on our interviews, we gathered that a number of leading global players were showing a keen interest to set up production facilities in Kenya targeting the Kenyan and regional market. In the supermarkets, there are already imported crisps from South Africa, India and the UK. But the bigger worry may actually not be the global players. Instead, evidence is beginning to emerge that the main competition may come from small and medium enterprises run by Chinese entrepreneurs who are now edging out the small and medium Kenyan firms (Gadzala, 2009).

6.5 Summary

In this chapter we discussed the various mechanisms that firms use to build their technological capabilities. These mechanisms were discussed under two broad categories: internal mechanisms and external mechanisms.

The chapter has demonstrated that there are very many learning opportunities available to the case study firms. It has also demonstrated that there are marked variations in the way the six case study firms appropriate these learning opportunities. Overall, internal mechanisms were the most useful among the firms and thus widely used. These were followed by the private

external mechanisms and finally collective external mechanisms. Under specific mechanisms, training came out very strongly as a favoured mode of capability accumulation. Similarly, size featured very strongly as an explanatory variable determining how each firm undertook its learning processes. This partly explains why firm A demonstrated a very dynamic approach to the whole question of learning. Its size seems to place it at a very good position to make maximum use of all the learning mechanisms. Nevertheless, one common trend could be observed among all the case study firms. This is the keen intent to learn so as to build their capabilities and improve on their competitiveness. Based on this, we highlight the following as the key messages arising from the analysis.

The first message concerns on-job training as a learning mechanism. All the firms engaged in this. This is a pointer to the primacy of this mode of learning as a preferred mechanism among all the firms. On the other hand, not all firms were able to train their employees outside. From literature we gather that this finding is not totally unexpected. It was observed that training is now mostly enterprise based. It therefore means that firms have to shoulder whatever budget training entails. Due to resource constraints, many small firms are unlikely to invest in trainings contacted outside the firms and that is probably why only two firms in the study engaged in the same.

Poaching of staff was highlighted among the case study firms. This is not peculiar to crisp processing. Nevertheless, it always serves to deter firm owners from investing too much in their employees for fear that once the said staff are competitive, they will be poached by competitors. This is further compounded by the fact that investments in trainings may not guarantee immediate economic returns for the firm. It has to be appreciated therefore that how firms develop their human resources manifests itself differently among small firms as compared to the large ones.

The second key message arising from the analysis concerns availability of technical skills. Firm A reported the highest number of technical people and among these were expatriates. The issue of expatriates could be a pointer to the fact that the industry is lacking some key technical skills which are meant to drive it forward.

External learning mechanisms also reveal a number of key messages. All firms reported to have learned from buyers and suppliers. Among buyers, supermarkets emerge as a leading source of learning by imposing standards which force firms to improve on their capabilities. As for learning from suppliers, suppliers of equipment are the most important source. Firms

have to work closely with them to learn how to use the procured equipment. In the case of our firms, these range from foreign suppliers to local jua kali ones depending on the need and ability of a firm.

Similarly, all of them have learned via inter-firm spill-over of knowledge. Subcontracting was observed among two firms. This is an area which holds potential that needs to be exploited especially with the emergence of private labels where retailers are contracting processors to make private label products. The firms that stand to gain very much are the smaller ones because they could be pushed to improve their production capabilities to match the stated requirements.

The next key message relates to preference for either private or collective learning mechanisms. Looking at the analysis, we establish that on average most of the firms used more private mechanisms than collective mechanisms. This seems to confirm to what has been established in technological capabilities building literature that firms will only go for collective mechanisms if they have already fulfilled their needs privately. This seems to be the case with our case study firms.

Still on collective mechanisms, two key government institutions seem to be leading the way and were reported to be working closely with processors are the Kenya Bureau of Standards (KEBS) and the Kenya Agricultural and Livestock Research Organisation (KARLO) which was formerly called Kenya Agricultural Research Institute (KARI). KEBS worked directly with the case study firms in their capacity of food processors. It organised trainings and exhibitions which benefited some of the case study firms. KARLO on the other hand worked with other stakeholders to ensure that the processors had access to raw materials. Such efforts need to be replicated among other state agencies. It is also good to note that government through the Ministry of Agriculture has come up with the National Potato Strategy 2016-2020 which recognises the potato industry as key in playing a great role in the realisation of the set objectives of Kenya Vision 2030. The strategy maps all the stakeholders in the industry with the aim of enhancing better coordination among them (GoK, 2016b).

Such key stakeholders include industry and business association which were also analysed in this study. Two well-known local business associations are the Kenya Association of Manufacturers (KAM) and the Federation of Kenya Employers (FKE) who benefit especially the large processors. A smaller and less known business association targeting smaller firms is

the Association of Jua Kali Producers of Kenya. This holds potential for the smaller firms among the six cases who reported neither belonging to KAM nor FKE.

Finally, the chapter has reflected about how each mechanism benefits the development of either production or marketing capabilities based on what is learned in the various mechanisms. In summary, we established that most mechanisms seemed to develop production mechanisms more.

CHAPTER SEVEN

RELATIONSHIP BETWEEN CAPABILITY BUILDING AND A FIRM'S INNOVATIVE PERFORMANCE

7.1 Introduction

This chapter brings into focus the firms' innovative performance witnessed among the case study firms and how this relates with the technological capabilities so far reported. As we have already established from the literature, firms learn so that they can build their technological capabilities. The technological capabilities in turn help a firm to improve their innovative performance. This in turn helps the firm to improve its overall performance. The firms' innovative performance in this study looked at product, process, and marketing innovations recorded among the case study firms.

The key proposition for this chapter was that it was expected that the various levels of the capabilities would be a good indicator of individual firm's innovative performance. We start the analysis of performance by looking at the innovative performance. This is followed by looking each firm's innovation across the three categories of product, process and marketing innovations. Finally, an analysis of the nature of the relationship between the firm's technological capabilities and the firms' innovation performance is presented.

7.2 Firm's innovative performance

Each firm in this study was asked whether it had introduced product, process, or marketing innovations during the period 2007 to 2012. As can be seen in table 7.1, the results were mixed. But before delving into various types of the innovations, it is important to note that the innovations being discussed here are not new to the world. Instead, it was observed that many were either new to firm (NF) or new to the Kenyan market (NK).

Under product innovations, three firms indicated that they had introduced product innovations in the year under review. These are firms A, C and F. With regard to the nature of these product innovations again there was a wide range. In the case of firm A, the innovations were from other product types. These were cakes, spices, and githeri. Firm A indicated that it was the first firm to introduce rice cakes to the Kenyan market. On top of these, Firm A also introduced a new crisp product targeting the low end market. Firm C introduced new product categories: peanuts, popcorn and mandazi. All these innovations

were not new to the market but instead they were new to the firm. No innovations were noted in the crisp category. This was the same case with firm F which first introduced cashew nuts then followed by ground nuts.

The next category of innovations was process innovations. Here all six firms apart from firm E indicated that they had introduced innovations in the period under review. Firm A automated its production line and installed an enterprise resource planning system to manage the entire operations of the firm. These were huge investments which cost millions of Kenya shillings. But they improved the efficiency at the firm. Two firms mechanised various components of their production processes. Firm B mechanised the slicing of potatoes as well as the sealing of final processed products. Firm C acquired a machine to mix its dough for the preparation of mandazi. These process innovations also improved the production efficiency at the firm. As a strategy to cut down on costs, firm C purchased raw materials directly from the farmers. This was also observed in firm A which experimented with contract farming. None of these process innovations were new to the market. Instead, they were all new to the firms that introduced them.

Turning to marketing innovations, these were grouped into two main categories: those that involved changes in packaging of products and those around the sales or distribution of final products. Starting with packaging, firms A, B, C, D, and F reported innovations as far as this is concerned. Some of these involved new and better looking labels. This was observed in firm D and this was so as to appeal to customers especially those who did their purchases in supermarkets. Some of it involved better packaging materials. This was observed in firm C and was also meant to make the products appealing and in response to demands from buyers particularly supermarkets. Some of it involved using differentiated packaging materials. This was noted in firm A where less expensive materials were used for products targeting low end consumers. Firm A has traditionally been focusing on the premium market. This new focus on the low end market is meant to expand its end-customer base and increase the firm's revenues.

Regarding innovations relating to sales and distribution of products, all the six firms reported to have introduced innovations. One such innovation related to the way firms went about delivering their products to their customers. Three firms out of the six firms engaged courier companies to deliver their products especially to upcountry destinations. These were firms B,

D, and F. This was considered a cost saving strategy which also allowed the firms to concentrate on other tasks such as production.

Similarly, firm A had to reengineer its modes of delivery by acquiring small vans and three wheeler motorbikes to access the various retail points found at low end market neighbourhoods. The firm also deployed new promotional activities to introduce new products such as product activations at supermarkets, social media competitions, and exhibiting at agricultural shows. All these innovations were meant to introduce the firm's products to end-customers and in doing this also get feedback which is used in the product development process. Firm C also acquired motorbikes to help in delivering and following up on orders. This was a cost saving measure because previously the firm was using a van. The firms also engaged a sales person.

Several firms targeted educational institutions as a way of diversifying their distribution channels. This was observed in firms C and E. Firm D targeted upcountry supermarkets when it faced challenges with supermarket outlets in Nairobi. Some of these retail outlets were being closed down due to competition. The firm also introduced better labelling format targeting high income consumers. Firm F on its part targeted convenience stores located at petrol stations. The firm also introduced bar coding to make their products accepted at most retail options particularly supermarkets. None of all these marketing innovations discussed were new to the Kenyan market but rather new to the firms in question.

Table 7.1 Firms' Innovations for the Period 2007-2012

Firm	Product innovation	Process innovation	Marketing innovation	Innovation count
A	<ul style="list-style-type: none"> • Rice cakes (NK), • Githeri masala (NK), • Sea salt (NF), • Table salt (NF). • Crisps product for low end market (NF) 	<ul style="list-style-type: none"> • Automated crisps line (NF), • Installed enterprise resource planning system (NF), • Purchasing raw materials directly from farmers (NF). 	<ul style="list-style-type: none"> • Introduced new packaging for spices and snacks (NF), • Introduced new product activations, • exhibiting at shows (NF), • Using social media for product promotions (NF), • Using three wheeler motorbikes and small vans to deliver products to low end markets (NF) 	14
B	None	<ul style="list-style-type: none"> • Introduced mechanised slicing of potatoes (NF), • Mechanised sealing of products (NF). 	<ul style="list-style-type: none"> • Improved packaging (NF), • Courier service for distribution (NF) 	4
C	<ul style="list-style-type: none"> • Peanuts (NF), • Popcorn (NF), • Mandazi (NF), 	<ul style="list-style-type: none"> • Mechanised production of mandazi (NF), • Purchasing raw materials directly from farmers (NF), 	<ul style="list-style-type: none"> • Targeting schools (NF), • Hired a salesperson (NF) • Motorbike for delivery of products (NF) 	8

D	<ul style="list-style-type: none"> • Mandazi, • packed dried fish, • Simsim, • Mabuyu 	None	<ul style="list-style-type: none"> • Better labelling for supermarket customers (NF), • Targeting upcountry supermarkets (NF) • Courier service for delivery of products (NF) 	7
E	<ul style="list-style-type: none"> • Sweets (NF), • Mabuyu (NF) 	None	<ul style="list-style-type: none"> • Marketing to colleges and schools (NF) 	3
F	<ul style="list-style-type: none"> • Cashew nuts (NF), • Ground nuts (NF) 		<ul style="list-style-type: none"> • Introduced new packaging with bar coding (NF), • Targeting convenience stores at petrol stations (NF) • Courier service for delivery of products (NF) 	5

Codes: NF = New to the firm; NK= New to the Kenyan market

Source: Field notes, 2013-2016

Overall, based on the number of innovative activities reported, firm A leads the pack in its innovativeness. It recorded the highest number of innovations (14) across the three categories of product, process and marketing innovations. Some of the innovations reported by the firm, for instance rice cakes, were also new to the Kenyan market. The novelty of such an innovation therefore is very high. If the firms were to be ranked, firm A therefore would be number one. Next in line was firm C with a total of 8 recorded innovations. In 2016 the firm was in the process of introducing a new product line (rice production) but this has not been factored among the 8 innovations. The firm had also tried introducing a tea production line but this was abandoned. So clearly the firm is putting in commendable innovation efforts. Firm D recorded 7 innovations across the three innovation categories. This was followed by firm F with 5 innovations. Firm B recorded 4 innovations while firm E was last with three innovations. See Table 7.2

Table 7.2 Firms' Innovation Performance Ranking

Firm	Total innovation count	Overall rank
A	14	1
C	8	2
D	7	3
F	5	4
B	4	5
E	3	6

Source: Field notes, 2013-2016

Based on this, what can we therefore say is the link between capability building and the firm's innovation performance? We made a proposition that the nature of the firm's capability was a good predictor of the firm's innovative performance. After comparing the various ranking as outlined in Table 7.3, we can conclude that whereas this conclusion holds, it holds strongly for some firms but not all. Based on our findings, the proposition holds very strongly for firms A and F. It also holds but not very strongly for firms C and E. Firms B and D are the exceptions. In the case of firm B, whereas it has high scores for the production capabilities, it does not register a similar trend as far as innovation performance is concerned. Conversely, firm D seems to rank highly as far as innovation performance is concerned. However, this trend is not replicated under the technological capabilities.

The position of firm B calls for a discussion on the costs involved in undertaking innovations. Whereas the firm did not introduce any product innovations, it invested in two process innovations: mechanised peeling and sealing. These are investments taking up considerable firm finances. Similarly, the firm invested heavily in the packaging process by acquiring standard packaging materials. So whereas the firm's ranking based on the innovation count may be low, if one was to consider the nature of investment done by the firm, the overall innovation effort is above average. The cost element is therefore an important consideration as far innovations are concerned. Introducing new innovations calls for financial commitments from firms and some innovations such as process innovations or marketing innovations generally require more financial infusions than the product ones.

Table 7.3 Relationship between Firm Capabilities and Innovation Performance

Firm	Production capability ranking	Marketing capability ranking	Innovation performance ranking
A	1	1	1
B	2	2	5
C	3	3	2
D	6	4	3
E	4	4	6
F	4	4	4

Source: Field notes, 2013-2016

7.3 Summary

In this chapter we endeavoured to show the link between a firm's technological capability and the firm's innovation performance. We made a proposition that the nature of the firm's capability was a good predictor of the firm's innovative performance. To analyse the firm's innovative performance, we presented each firm's recorded innovations in three categories of product, process and marketing innovations.

From the Oslo Manual (OECD, 2005) we learned that a firm's capability is what allows it to take advantage of market opportunities. We also learned from the same manual that knowledge about these capabilities and the firm's effort to increase them is crucial in understanding its present and future performance. Indeed after analysing the firm's

innovative performance, we could observe connections between the firm's capability levels and the firms' innovative performance. Though not for all cases, firms that had superior capabilities also seemed to perform well as far as innovation was concerned.

CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

8.1 Summary

This study was designed to establish the extent and how potato processing firms in Kenya have built their capabilities to be competitive. It had three specific questions: first, at what level of technological capabilities do the firms operate? Second, what learning mechanisms supported the development of the capabilities? Third, what is the nature of the relationship between the capability building process and the firm's innovative performance? The study was guided by three propositions. The first one stated that there shall be marked variations in the level of the capabilities from one firm to firm to another. The second proposition stated that the learning mechanisms used by firms will vary from one firm to the next. The third and last proposition stated that the various levels of the capabilities will be a good indicator of individual firm's innovative performance.

From the literature, the study established that the food processing sector was very important to Kenya by way of contribution to employment creation, income generation, and foreign exchange earnings and the overall industrialisation process. However, it was also established that the sector tends to perform below expectations and seems to be stagnating. That was happening amid many changes in the global food industry occasioned by forces such as liberalisation resulting to immense competition. But the literature review also recognised the emergence of a few very successful and innovative firms in the sector in Kenya. This was attributed to improving internal firm capabilities which allowed the firms to be competitive locally and for some of them even in the regional market. What is partially evident was how such successful and innovative firms build their capabilities. By carrying out an in-depth study of the six case study firms drawn from potato processing industry in Kenya, this study sought to contribute to filling that knowledge gap.

The study therefore focussed on the six firms involved in potato processing drawn from Nairobi and Kiambu counties. Interviews were conducted on each firm severally during the fieldwork period which started in 2013 and ended in 2016. The main respondents were firm owners though in some cases, senior managers were interviewed. The technological capabilities building conceptual framework guided the study. First, the level of production and marketing capabilities among the firms was documented and analysed. Second, the learning mechanisms used to build the capabilities were analysed in depth. Third, the firm's

innovation performance was assessed and an analysis of the nature of the relationship between the capability building process and the firms' innovative performance was done.

8.2 Discussing the findings

8.2.1 Level of technological capabilities among the firms

Chapter five responded to the first specific question concerning the level of technological capabilities at which the firms operate. The proposition guiding the analysis of this question was that there shall be marked variations in the level of the capabilities from one firm to firm to next.

As suggested in the first proposition, the actual level of capabilities varied from one firm to the other and similarly the levels varied from one capability to another. When the six firms were ranked, according to production capabilities, firm A had a score of 22 and ranked at the first position. This was followed by firm B with a score of 11. Firm C had a score of 10 and ranked at position 3. Firms E and F tied at position 4 with a score of 9 each while firm D came last at position 6 with a score of 8. One feature that stands out from this analysis is size which uses the number of employees as an indicator in this study. It appears that there may be an association between the size and the overall level of production capabilities among the six firms.

Looking at the individual capabilities closely, we established that for the sorting capability only two levels of capabilities can be observed among the case study firms. Firm A is at the advanced level while the remaining five firms are at the basic level. Firm A sorts the potatoes before processing to ensure that they are of the correct and uniform size and are free of defects and dirt. On the other hand, the rest of the firms focus primarily on defects and dirt. Sorting ensures that the final product is of good quality and that it is also safe for the consumer. This is a major source of competitiveness. Especially in the face of growing importance of standards to ensure that processors adhere to appropriate processing practices. It can be argued therefore that firms which extend the scrutiny of raw materials to include how the potatoes were planted have a good chance at competing to secure and retain increasingly discerning final consumer.

Three more capabilities featured only two levels. These are oil draining, seasoning, and packaging. Once again, firm A is at the advanced level while the remaining five firms are at the basic level. Packaging is emerging as a major source of competitiveness. This

competition is both local and international. Some local retail chains turn away some processors on account of low quality packaging. This puts pressure on the firms that are appearing at the basic level. On the other hand, international brands with superior packaging are now featuring in local retail chains. This in turn puts pressure on local firms who may be rating highly among the peers but may compare poorly with international brands. The key conclusion here is that all firms have to put in a lot of effort to improve their packaging ability to improve their competitiveness.

Turning to the marketing capabilities, they were analysed under two main capabilities: product design and channel management. An analysis of how the firms scored reveals that the gap between the leading firm and the next firm was not as wide as it was witnessed in the production capabilities. Firm A had an overall score of 12 putting it at position one. Following closely was firm B with a score of 10. Firm C was at position 3 with a score of 5 while the remaining firms tied at position 4 with a score of 3 each.

When it comes to the individual capabilities, we also saw some differences in how the firms fared. Whereas in the production capabilities, firm A dominated the advanced level, among the marketing capabilities, it was joined by firm B in two of the three capabilities. These are seasoning and channel management. This leads us to conclude that between the two sets of technological capabilities analysed among the case study firms, the marketing capabilities appeared to be more developed than the production ones.

As already pointed out in chapter five, the product design capability was analysed under two sub capabilities: seasoning and product branding capabilities. These two are also emerging as sources of competitiveness among firms. The modern urban consumer is willing to experiment with various flavours. Therefore, a firm must be able to provide a variety of choices. On this score, firms A and B are poised to compete better as they have the highest variety of flavours. Product branding is also a source of competition among firms. Fancy packaging which combines the packaging materials, the layout of the design, and the themes of the graphics on display appeals to consumers especially the high income consumers. Such an aesthetic appeal therefore becomes a source of competitive edge for firm. On this score, firm A is well ahead of the pack, and it is continually innovating and changing its packaging. On the other hand, due to the cost elements, the rest of the firms are left to operate at the basic level. This clearly affects their competitiveness and as we have also established, it may be the reason for being denied access to some retail options.

It is also worth noting at this point that the flavours and packaging discussed here under the marketing capabilities also featured under the production capabilities. This is because beyond being a feature of production, as we have seen in the discussion of product design, these two capabilities are also a feature of marketing. As a result, they overlap between the two capabilities.

The channel management is another capability which is crucial to a firm. It determines how well a firm's product reaches the final consumer. The task therefore becomes how to achieve the optimal distribution density. In the past, many firms aimed at working mainly with large diversified retail outlets. But in the face of a multiplicity of channels, this has changed and now firms are targeting to access a variety of retail options including the smaller ones such as kiosks and corner shops. In this way, the firm will access consumers from all the income groups thus increasing its sales. This has been noted as a major competitive factor for many firms involved not only in food processing but manufacturing in general. Firm A was in the process of realigning its marketing strategy to achieve this fit. Firm B was already featuring at all the distribution channels. Firm C was locked out of the large diversified retail outlets but worked with small retail chains as well as the small individual supermarkets. Firms D, E and F focused on supplying to small individual supermarkets and other channels such as convenience stores and kiosks.

8.2.2 Learning mechanisms used by the firms to build their technological capabilities

As discussed in chapter six, the second findings chapter responded to the following question: what are the learning processes that have supported the development of the capabilities? This was guided by the proposition which stated that the learning mechanisms used by firms will vary from one firm to the next. Indeed, the findings revealed a number of results in line with the study's second proposition. The first was that there are very many learning opportunities available to the firms. The second was the finding that there are marked variations in the way the six case study firms appropriated these learning opportunities. Comparing internal and external mechanisms, it was found that internal mechanisms were the most useful among the firms and thus widely used. These were followed by the private external mechanisms and finally collective external mechanisms.

Internal learning mechanisms included on-job training, expatriate and technical personell, and research & development. Under external mechanisms, private mechanisms included buyers, suppliers, inter-firm spill overs of knowledge, consultants and private research and

development institutes. Finally collective mechanisms included learning from government or public research institutes, business associations and exhibitions.

Of the specific mechanisms, we established that all firms used training. Similarly, size emerged as a strong explanatory variable determining how each firm undertook its learning processes. We concluded that perhaps this partly explained why firm A demonstrated a very dynamic approach to the whole question of learning. Its size seems to have placed it at a very good position to make maximum use of all the learning mechanisms.

Having said that, we also established that all the firms had a keen intent to learn so as to build their capabilities and improve on their competitiveness. We now expound a number of key messages arising from the analysis.

Starting with on-job training as a learning mechanism, the study established that all the firms engaged in this indicating the importance of training a learning mechanism. But when we made a dichotomy of in-house versus outside training, the study established that only firms A and B trained their staff outside the firm. The rest of the firms relied on in-house training. As we saw from literature, this finding is not totally unexpected. Training is more enterprise based these days as compared to the past where governments were actively involved in supporting enterprise training that was relevant to enterprise needs. Furthermore, since the training investment is likely to compete with other needs at the firm, resource constrained firms are likely to bypass it altogether or just undertake trainings in-house. Most of such training will focus on production techniques at the firm and this was the case among the firms studied. Due to the uncertainty that is common with small firms, many also shy away from empowering their employees who are later poached by competitors. This dilemma also affects large firms but on a lower magnitude compared to the smaller ones. Again, this has been established in literature.

Still under the internal learning mechanisms, we have the issue of availability of technical skills. Compared to the other firms, firm A reported the highest number of technical employees. In addition to these, the firm also has expatriates among the technical staff. The other firms relied on form four leavers and in some cases even primary school leavers. This issue has been flagged by the reviewed literature at two levels. First, only large firms are able to hire skilled and technical staff. Secondly, the industry players have reported some skill gaps in the local market compelling some of them to turn to expatriates. This is policy issue which needs to be taken up. The current policy where the government imposes huge work

permit fees to dissuade hiring of expatriates is not helpful in a situation where there are skills gaps among the local labour. A useful point of reflection therefore is how well the Kenyan training institutions are equipping their graduates with relevant skills needed by industry. This point needs further interrogation.

About research and development, the main conclusion is that all the firms are making effort to undertake research and development though it manifests itself differently from one firm to the next. This varies from those who have a whole department dedicated to research and development. For others, research and development entails going to industry events to benchmark, learn new production techniques or check out new equipment. For yet others, research and development entails poaching staff from competitors particularly to train staff on production techniques. Finally for others, it entails checking out competitor's products on the market for ideas on packaging.

Turning to external learning mechanisms, there are several conclusions that we can draw from the findings. Looking at our firms, private mechanisms were more pronounced as compared to the external ones. For instance, all firms reported to have learned from buyers and suppliers. Among buyers, supermarkets emerged as leading sources of learning by imposing standards which force firms to improve on their capabilities.

Another private mechanism is inter-firm spill over of knowledge. We established that all firms benefited from this. Of particular interest was subcontracting which was observed among two firms: firms A and B. This is an area which holds potential that needs to be exploited especially with the emergence of private labels where retailers are contracting processors to make private label products. Kenyan retailers are following in a now well-trodden path of retailers from the developed economies. We argue that the firms that stand to gain very much are the smaller ones because by engaging in subcontracting relationships, there is likelihood that they could be pushed to improve their production capabilities to match the stated requirements.

As for collective mechanisms, a point already made drawing from literature review regards the weak channels which characterise manufacturing in Kenya. A high-intensity technological support is absent and the government and other private sector players have failed to offer an information rich environment where firms could tap from. Based on our findings among the six case study firms we conclude that support offered to firms seems to be improving gradually. We noted two key government institutions which are leading the way

and were reported to be working closely with processors. These are the Kenya Bureau of Standards (KEBS) and the Kenya Agricultural and Livestock Research Organisation (KARLO) which was formerly called Kenya Agricultural Research Institute (KARI) to address various concerns ranging from training, standards, access to good seeds as well raw materials. We make the argument that such efforts need to be replicated among other state agencies.

In this vein, we also argue that it is good to note that the government through the Ministry of Agriculture has come up with the National Potato Strategy 2016-2020. The strategy recognises the potato industry as key in playing a great role in the realisation of some of the set objectives of Kenya Vision 2030 and maps all the stakeholders in the industry with the aim of enhancing better coordination.

Concerning business associations, we established that some firms have interacted and benefited from the Kenya Association of Manufacturers (KAM) and the Federation of Kenya Employers (FKE). What stood out was that these two seemed to benefit large processors only. The study also established that there is a smaller and less known business association targeting smaller firms called the Association of Jua Kali Producers of Kenya. We argue that this particular one holds potential for the smaller firms such as those among our six cases who reported neither belonging to KAM nor FKE. This is a policy matter which needs to be addressed.

8.2.3 Relationship between capability building and a firm's innovative performance

The last findings chapter was guided by several established arguments in literature about the relationship between a firm's capability and its performance. Primarily, it has been argued that a firm's capability is what allows it to take advantage of what the market offers. The second argument is that knowledge about these capabilities and the firm's effort to increase them is crucial in understanding their innovative performance, present and in the future. As a result, a firm's capability level and the efforts to develop them are good predictors of how a firm performs.

An analysis of the relationship between capability building and firm performance resulted in two key messages. We noted that though there are marked variations, to a certain extent the firm's innovative performance closely matched each firm's capability level. We also noted that the firm size seemed to have a significant influence on level of technological capability

and a firm's innovative performance. Firm A was the largest of the six firms and also scored highly when it came to its capability levels. Firm B which was second in terms of size followed a similar trend. However, this influence was more pronounced among the production capabilities than in the marketing capabilities.

8.3 Key Implications

This study has several implications for theory, policy, and practice. We discuss them in that order in the next sections.

8.3.1 Implication for theory

This study contributes to an understanding of the link between technological capabilities, especially production and marketing capability building and a firm's innovation performance. In seeking to explain the competitiveness of the Sub-Saharan African firm, many studies have focussed on the structural and regulatory constraints that hinder industrial development in Sub-Saharan Africa. Very few studies have focussed on firm specific strategies and how firms interact with particular marketing structures and institutions. Yet we know that beyond constraints such as infrastructure, technological capabilities of workers and management in firms are more important in explaining why some countries take off industrially while others do not (Khan, 2010). While we have a fair understanding of the nature of the needed capabilities, what is less known is how those capabilities and organisational forms are built. Much literature has not dealt with the formation of new technological capabilities at the firm and industry level. This study fills that gap by extending the knowledge in the area by focussing on firm's technological capabilities, the learning mechanisms used to build the same and finally the relationship between the capability building process and the firm's innovative performance.

Regarding the technological capabilities among firms, the study keeps within the broad technological capabilities approach which theorises a continuum of technological capabilities in developing firms. This approach conceptualises the continuum to start with innovation, then investment, and then innovation later. On the other hand, we reversed this order to start with production then investment before innovation in line with the context in most developing countries. This study therefore prioritised production capabilities and has proposed a classification of production and marketing capabilities among firms based on their functional categories. These are then analysed based on their complexity into four levels.

Regarding the learning mechanisms, the study also kept to the technological capabilities approach conceptualisation which theorises a categorisation of different learning mechanisms that firms might adopt, and which might explain the accumulation of technological capabilities. The mechanisms are many but are broadly categorised into two, internal to the firm on one hand and external to the firm on the other hand. This study extends this theory by empirically applying it in a developing country context within a particular industry.

Finally, regarding the relationship between technological capabilities and the firm's innovative performance, the study also kept within the technological capabilities conceptualisation which says that firms learn in order to build technological capabilities. The technological capabilities in turn enable the firm to improve its innovation performance. This study therefore extends this conceptualisation by empirically applying the same in a developing country context within a particular industry.

8.3.2 Implication for policy

This study has several implications for policy. First, Kenya's Vision 2030 identifies food processing as a key sector in pushing Kenya's industrialisation forward. By focusing on the snacks segment of food processing, the study highlights an emerging and dynamic industry that holds a great deal of potential for jobs as well as innovation which is important in driving the industrialisation agenda. In doing this, the study also brings to the fore several other policy concerns which need attention. Prominent among these concerns is the need to have more government agencies coordinating various activities and initiatives meant to support private enterprise. Based on our case study findings, KEBS and KARLO are showing the way.

A second contribution comes from training which featured prominently among the case study firms. It was found that many firms heavily rely on internal training opportunities. Lack of resources to finance external trainings was sighted as a possible reason. But past research has also indicated that publicly provided on-the-job training programs were decreasing in size and were increasingly becoming irrelevant. This needs to be addressed.

The third contribution concerns the question of expatriates working in the industry. One firm justified the hiring of expatriates to lack of specific skills among Kenyan graduates. It therefore follows that imposition of heavy fees on work permits for foreign workers may be counterproductive in the face of skills gaps in the local labour. This concern needs to be addressed. This study argues that institutions such as the National Industrial Training

Authority (NITA) <http://www.nita.go.ke/index.php> ought to take up such policy concerns and working with other stakeholders in the educational sector find ways of addressing them. NITA is mandated to among other things ensure that there is adequate supply of trained manpower at all levels in the industry.

8.3.3 Implication for practice

This study also contributes to the empirical literature of the potato processing industry in particular. The detailed and in-depth examination of the technological capabilities among the six case study firms offers a fresh glimpse into the potato processing industry in Kenya. It enables us to have an in depth appreciation of the nature of the technological capabilities of the studied firms and the processes used to build the same. Many past studies have focussed on the sector's challenges as well as opportunities. To our knowledge, this is a first empirical study which maps the technological capabilities of firms and the learning mechanisms used to build the capabilities.

Some of these insights have a number of implications to the particular industry. With regard to the level of capabilities, several illustrations are useful to explain this point. We have established for instance that packaging is matter of competitiveness among firms. Some firms have been denied access to some retail channels because of what was considered sub-standard packaging. We have also established that there is a considerable presence of imported products with better packaging than local processors targeting the premium market. It therefore means that the local processors must improve their packaging capabilities to match these emerging concerns. This is particularly critically for firms planning to internationalise and enter into the export market where the competition is tougher than the local market. Due to the cost implications, perhaps there is an opportunity to consider two alternatives. The first, and this applies especially to the large firms, is to go for second hand equipment which we have established is readily available in some European countries (FAO, 2014). The second option, and this applies especially to the small firms, is for firms to pool resources or engage in subcontracting arrangements. This is an area where industry associations have a scope to intervene as a support to the firms.

The second related issue concerns the ability of firms to effectively work with various retail options particularly supermarkets. For the large firms, the challenge is to respond to the growing mass market. For the small processors, the challenge is to improve their products'

quality enabling them secure access to the large diversified retail chains. Otherwise they may also wish to consider other lesser competitive retail options available to them.

8.4 Limitations of the study

In the methodology section this study noted it would not attempt to make generalisations because it is not the purpose of case study research to generalise to other cases or to populations beyond the case. Rather, case studies endeavour to bring out the distinctiveness and variations that exist among cases. This study therefore limited itself to food processing firms. It further limited itself to those firms doing potato processing. This was done so as to focus the discussion to a particular sub sector in the food processing industry in the Nairobi and Kiambu areas of Kenya. The findings therefore largely speak to these particular segments.

8.5 Areas of further research

Future studies could build on this work and extend it in various ways. Methodologically, such a study could combine survey and case study approach so as to reach a larger number of firms. Similarly, the sectors could be expanded to cover more sub sectors in the manufacturing industry in Kenya. Comparisons could then be made to establish the similarities as well as differences among the various sub sectors studied.

In the same way, so as to be able to track the capability building over a period of time, future studies could benefit from a longitudinal research design. Identified firms would be studied over a prolonged period of time so as to observe likely development of the capabilities along the continuum of production, investment and innovation. It has been said that it can even take as many as ten years or more to develop a single capability such as production. It takes even more to develop others such as innovation (Dahlman et al., 1987).

Future studies could also widen the scope of respondents to involve key industry actors such as engineers and technologists well versed in the sector. These could help in determining the parameters to measure across firms so as to establish aspects such as the levels of capabilities identified. This study did not benefit from such an inclusion due to the difficulty of identifying and assembling such actors beforehand. So it resorted to the use of secondary data by benchmarking the capabilities against Frito-Lay, a well-established and global leader in the sector.

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APPENDICES

Appendix 1. Instrument for the first interviews

UNIVERSITY OF NAIROBI
Institute for Development Studies (IDS)

RESOURCES AND FIRM SUCCESS: EXAMINING HOW POTATO PROCESSING FIRMS IN KENYA BUILD THEIR TECHNOLOGICAL CAPABILITIES – INTERVIEW INSTRUMENT.

Questionnaire No.....

Date.....

Start Time

End time:.....

INTRODUCTION

- My name is Wamalwa Nyukuri Herberts, a PhD student at the Institute for Development Studies, University of Nairobi. I am carrying out a study on ***“Resources and Firm Success: Examining How Irish Potato Processing Firms in Kenya Build Their Technological Capabilities”***.
- The study collects information about firms’ product and process innovation as well as organizational and marketing innovation during the 2007 to 2012 financial years or the nearest financial years.
- I kindly request you to participate in the survey by answering the questions as potato processing firm. Participation is voluntary and I assure you of confidentiality. The information collected will **ONLY** be used for academic purposes.
- I expect that the interview will take up to an hour
- I will send you the overall findings of the survey and invite you to a workshop where the results from the project will be presented to firms.

PART 1: General information about the enterprise, business, company or firm

1.0.1	Name of the enterprise		
1.0.2	Physical address		
1.0.3	Telephone		
1.0.4	Email		
1.0.5	Main economic activity		
1.0.6	Year of establishment		
1.0.7	Number of employees		
1.1	Short description of your main activity:		
1.2	Is your enterprise part of a larger group? <i>A group consists of two or more legally defined enterprises under common ownership. Each enterprise in the group may serve different markets, as with national or regional subsidiaries, or serve different product markets. The head office is part of an enterprise group</i>	Yes	No
1.3	In which country is the head office of your group located?		
<i>If your enterprise is part of an enterprise group, please answer all further questions with respect to your enterprise in Kenya only. Do not include results for subsidiaries or parent enterprises outside Kenya</i>			
1.4	What was your enterprise's total number of employees in 2008, 2010 and 2012? <i>Give the total number of employees (casual and permanent) at the end of each year.</i>		
1.4.1	2008		
1.4.2	2010		
1.4.3	2012		
1.4.4	What was the number of employees in 2012 with a university degree? _____		
1.5	What was your enterprise approximate total turnover for 2010 and 2012?		
1.5.1	2010.	Kshs.....	
1.5.2	2012.	Kshs.....	

Information about the owner(s) of the company.

1.6.1	Over the last five years who has been the person who is most responsible for the direction and performance	
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	of the company – MD/CEO, main shareholder (not MD), other (give title)	
1.6.2	Gender of the most responsible person?	
1.6.3	Age of the most responsible person?	
1.6.4	Please state the education background of this person, whether primary, secondary or tertiary:	
1.6.5	If tertiary, kindly state which (certificates, diplomas and or degree program(s)?	
1.6.6	How many years has the person been working in the sector?	
1.6.7	How long has the person owned or worked for the company?	
1.6.8	What are the main functions of the person in the company?	
1.6.9	Are there family members of the person involved in the business (YES, NO)? if no, then go to question 2.1:	
1.6.10	If YES, kindly state whom (one or more generations)?	
1.6.11	In which positions?	
1.6.12	With which skills/qualifications?	

1.7	Kindly state how the company has been performing financially (as an average over the last 2-3 years) compared to the industry? Use a scale from 1-5 where '1' is 'well above industry average' and '5' is 'well below industry average'.	
	Level of performance	Circle
	Well above industry average	1
	Somewhat above industry average	2
	At industry average	3
	Somewhat below	4
	Well below	5

PART 2: Product innovation

For this study, a product innovation is the introduction to the market of a new or significantly improved good with respect to its capabilities, such as improved user-friendliness, components, software or sub –systems. The innovation (new or improved) must be new to your enterprise, but it does not need to be new to your industry sector or market. It does not matter if the innovation was originally developed by your enterprise or by other enterprises.

2.1	During the period under review (2007 to 2012), did your enterprise introduce: New or significantly improved goods. <i>Exclude the simple resale of new goods purchased from other enterprises</i>	Circle 1. Yes
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	<i>and minor changes that only alter the appearance of the product.</i>	2. No		
			If NO, please go to question 3.1.	

2.2	By whom were these product innovations developed?			
		Yes	No	Select all that apply.
2.2.1	Mainly your enterprise itself			
2.2.2	Your enterprise together with other enterprises (<i>independent enterprises plus other part of your enterprise group (such as subsidiaries, sister enterprises, head office , etc) or institutions (universities, research institutes, non-profit, etc)</i>)			
2.2.3	Your enterprise by adapting or modifying goods or services originally developed by other enterprises or institutions			
2.2.4	Mainly other enterprises or institutions			
2.3	Who within your enterprise drives product innovation?			

2.4.	Did these innovations originate in Kenya or abroad?			
		Yes	No	Don't know
2.4.1	Kenya			
2.4.2	East Africa			
2.4.3	Rest of Africa			
2.4.4	Europe			
2.4.5	United states			
2.4.6	Asia			
2.4.7	Other countries			

2.3	Were any of your goods innovations during the period under review (2007 to 2012) new to your market or new to your firm?	Yes	No
2.3.1	New to your market? <i>Your enterprise introduced a new or significantly improved good onto your market before your competitors</i>		

	<i>(it may have already been available in other markets).</i>		
2.3.2	Only new to your firm? <i>Your enterprise introduced a new or significantly improved good that was already available from your competitors in your market.</i>		

2.4	Please estimate the total turnover in 2012 of goods innovations introduced during 2007 to 2012 that were:	2012 Turnover distribution (Kshs)
2.4.1	New to your market	
2.4.2	New to your firm	
2.4.3	Unchanged or only marginally modified <i>Include the resale of new goods purchased from other enterprises</i>	
2.4.4	Total turnover in 2012	

PART 3: Process innovation

Process innovation is the use or implementation of new or significantly improved process or method for the production or distribution of goods or supporting activity. The innovation (new or improved) must be new to your enterprise, but it does not need to be new to your industry sector or market. It does not matter if the innovation was originally developed by other enterprises.

Exclude purely organizational innovations such as changes in firm structure or management practice impacting on the final product-these are covered in question 10.

3.1	During the period under review (2007 to 2012), did your enterprise introduce any:	Yes	No	
3.1.1	New or significantly improved methods of manufacturing or producing goods?			
3.1.2	New or significantly improved logistics, delivery or distribution methods for your inputs, goods?			
3.1.3	New or significantly improved supporting activities for your process, such as maintenance and operating system for purchasing, accounting or computing?			
	If No to all questions, please go to section 4.			

3.2	Who developed these process innovations?	Yes	No	(Select all that apply)
3.2.1	Mainly your enterprise by itself			
3.2.2	Your enterprise together with other enterprises (independent enterprises plus other part of your enterprise group such as subsidiaries, sister enterprises, head office etc) or institutions(universities, research institutes, non –profit, etc)			
3.2.3	Your enterprise together with other enterprises or institutions			
3.3	Were any of your process innovations introduced during the period under review (2007 to 2012) new to your market?			
		Yes	No	
3.3.1	New to your market? <i>Your enterprise introduced a new or significantly improved process innovations onto your market before your competitors (it may have already been available in other markets).</i>			
3.3.2	Only new to your firm? <i>Your enterprise introduced new or significantly improved process innovations that were already available from your competitors in your market.</i>			
3.3.4	Who within your enterprise drives process innovation?			

PART 4: Organizational and marketing innovation

An **organizational innovation** refers to the implementation of new organizational method in the firm’s business practice, workplace organization or external relations in firm structure or management methods that are intended to improve your firm’s use of knowledge, the quality of your goods and services, or the efficiency of workflows.

A **marketing innovation** is the “Implementation of new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing “or sales methods to increase the appeal of your goods and services or to enter new markets.

4.1	During the period under review (2007 to 2012), did your enterprise introduce:		
	Organizational innovations	Yes	No
4.1.1	Business practices: <i>New business practices for organizing procedures (i.e. supply chain management, lean production, quality management, etc.) Exclude routine upgrades</i>		
4.1.2	Work responsibilities and decision-making: <i>New methods of organizing work responsibilities and decision-making (i.e. first use of a new system of employee responsibilities and teamwork ,</i>		

	<i>decentralization, integrating /disintegrating different departments or activities, education/training systems)</i>						
4.1.3	External relations: <i>New methods of organizing external relations with other firms or public institutions (i.e. first use of alliances, partnerships, outsourcing or sub – contracting, etc)</i>						
4.2	Marketing innovations						
4.2.1	Significant changes to the design or packaging of goods. <i>Exclude routine /seasonal changes such as clothing fashions.</i>						
4.2.2	New or significantly changed sales or distribution methods, such as internet sales, franchising, direct sales or distribution licenses.						
4.3	If your enterprise introduced an organizational innovation during the period under review (2007 to 2012), how important were each of the following results or effect?						
	Results	Degree of importance					
		High 4	Medium 3	Low 2	No results 1		
4.3.1	Increased or maintained market share						
4.3.2	Reduced time to respond to customer or supplier needs						
4.3.3	Improved quality of your goods						
4.3.4	Reduced cost per unit output						
4.3.5	Improved employee satisfaction and /or reduced rates of employee turnover						
4.4	Kindly tick the geographic markets that your enterprise sold goods for 2008, 2010, and 2012.						
	Regions	2008		2010		2012	
		Yes	No	Yes	No	Yes	No
4.4.1	Nairobi						
4.4.2	Central						
4.4.3	Coast						
4.4.4	Eastern						
4.4.5	North Eastern						
4.4.6	Nyanza						

4.4.7	Rift Valley						
4.4.8	Western						
4.4.9	East Africa						
4.4.10	Rest of Africa						
4.4.11	Europe						
4.4.12	United states						
4.4.13	Asia						
4.4.14	Other countries						

PART 5: Ongoing or abandoned innovation activities

Innovation activities include the acquisition of machinery, equipment, software and licenses; engineering and development work, training, marketing and research and experimental development (R&D) [Basic R&D not specifically related to product and /or process innovation should be included]

When they are specifically undertaken to develop and /or implement a product or process innovation.

5.1	During the period under review (2007 to 2012) did your enterprises have any innovation activities to develop product or process innovations that were:	Yes	No	
5.1.1	Abandoned during the period under review (2007 to 2012) before completion			
5.1.2	Still on-going at the end of 2012			
5.1.3	If the answer to 5.1.2 is YES, why were the innovation activities abandoned?			
	If your enterprise had no product or process innovations or innovation activity during 2007 to 2012 (No to all options in questions 2.1, 3.1, and 4.1) please go to question 9.2. Otherwise, please proceed to question 6.1.			

Part 6: Innovation activities and expenditures for process and product innovations

6.1	During the period under review (2007 to 2012), did your enterprise engage in the following innovation activities:	Yes	No
6.1.1	<p>Intramural or in-house Research and Experimental Development (R&D) <i>Creative work undertaken on a systematic basis within your enterprise to increase the stock of knowledge and its use to devise new and improved products and processes (including software development in-house that meets this requirement).</i></p>		
	If yes, did your firm perform R&D during 2007 to 2012		
6.1.1.1	Continuously?		
6.1.1.2	Occasionally?		
6.1.2	<p>Extramural or outsourced R&D <i>Same activities as above, but purchased by your enterprise and performed by other companies (including other enterprises within your group) or by public or private research organizations.</i></p>		
6.1.3.1	<p>Acquisition of machinery, equipment and hardware <i>Acquisition of advanced machinery, equipment and computer hardware to produce new or significantly improved product and processes.</i></p>		
6.1.3.2	<p><i>Acquisition of software</i> <i>Acquisition of software to produce new or significantly improved products and processes</i></p>		
6.1.4	<p>Acquisition of other external knowledge <i>Purchase or licensing of patent and non-patented inventions, expertise and other types of knowledge from other enterprises or organizations.</i></p>		
6.1.5	<p>Training <i>Internal or external training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes</i></p>		
6.1.6	<p>Market introduction of innovations <i>Activities for the market introduction of your new or significantly improved goods and services, including market research and launch advertising.</i></p>		
6.1.7	<p>Design <i>Activities to design ,improve or change the shape or appearance of new or significantly improved goods or services</i></p>		
6.1.8	<p>Other activities <i>Implementation of new or significantly improved products and process such as feasibility studies, testing, routine software development, tooling up, industrial engineering, etc</i></p>		

6.2	Please estimate the amount of expenditure in 2012 for the innovation activities mentioned in 6.1. Include personnel and related costs.	
6.2.1	Intramural (in-house) R&D in 2012 <i>Include labour costs, capital expenditures on building and equipment specifically for R&D.</i>	
6.2.3	Acquisition of R&D. <i>Extramural or outsourced R&D</i>	
6.2.4	Acquisition of machinery, equipment and software. <i>Exclude expenditures on equipment for R&D.</i>	
6.2.5	Acquisition of other external knowledge. <i>Purchase or licensing of patent and non-patented inventions, expertise and other types of knowledge from other enterprises or organizations.</i>	
6.2.6	Training <i>Internal or external training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes</i>	
6.2.7	Market introduction of innovations <i>Activities for the market introduction of your new or significantly improved goods and services, including market research and launch advertising.</i>	
6.2.8	Design <i>Activities to design, improve or change the shape or appearance of new or significantly improved goods or services</i>	
6.2.9	<i>Other activities</i> <i>Implementation of new or significantly improved products and process such as feasibility studies, testing, routine software development, tooling up, industrial engineering, etc</i>	
6.2.10	Total of these eight innovation expenditure categories	

6.3	State the firm's investment in technological and managerial training		
		Technological training	Managerial training
6.3.1	Expenditure (per year)		
State the number of trained employees according to level of qualification.			
		Total staff per level	Technological training
			Managerial training
6.3.2	Completed primary		
6.3.3	Completed secondary		
6.3.4	Youth Polytechnic		
6.3.5	College certificate		
6.3.6	College diploma		
6.3.7	University bachelors		

6.3.8	University masters			
6.3.9	Other			

6.4	During the period under review (2007 to 2012), did your enterprise receive any public financial support for innovation activities from the following sources? <i>Include financial support via tax credits or deductions, grants, subsidized loans guarantees. Exclude research and other innovation activities conducted for the public sector under contract.</i>	Yes	No
6.4.1	County government (County Councils, Municipalities,[Constituency Development Fund, Local Authority Trust Fund] etc)		
6.4.2	Central/National government (Budgetary allocations)		
6.4.3	National funding agencies e.g. NCST		
6.4.4	Foreign governments and /or other foreign public sources (e.g. European Commission, USAID, SIDA, IFC loans etc)		

PART 7: Sources of information and co-operation for innovation activities

7.1	During the period under review (2007 to 2012), how important to your enterprise's innovation activities were each of the following information sources. <i>Please identify information sources that provided information for innovation activities/projects or contributed to the completion of existing innovation activities/projects</i>					
	Information sources		Degree of importance <i>Tick None if no information was obtained from a source.</i>			
			High 4	Medium 3	Low 2	None 1
7.1.1 Internal sources	7.1.1. 1	Sources within your enterprise				
	7.1.1. 2	Sources within enterprise group				
7.1.2 Market resources	7.1.2. 1	Suppliers of equipment, materials, components or software				
	7.1.2. 2	Clients or customers				
	7.1.2. 3	Competitors or other enterprises in your sector				
	7.1.2. 4	Consultants, commercial labs or private R&D				

		institutes				
7.1.3 Institutional sources	7.1.3.1	Universities or other higher education institutions				
	7.1.3.2	Government or public research institutes				
7.1.4 Other sources	7.1.4.1	Conferences, trade fairs, exhibitions				
	7.1.4.2	Scientific journals and trade/technical publications				
	7.1.4.3	Professional and industry associations				
	7.1.4.4	Internet				
7.2	<p>During the period under review (2007 to 2012), did your enterprise co-operate on any of the innovation activities with other enterprises or institutions.</p> <p><i>Innovation co-operation is active participation with other enterprises or non-commercial institutions on innovation activities. Both partners do not need to benefit commercially.</i></p> <p><i>Exclude pure contracting out of work with no active co-operation.</i></p>		Yes	No		
					If NO, please go to question 8.1	

7.3	Please indicate the type of co-operation partner and location.							
	Type of co-operation partner	Location						
		<i>Tick all that apply.</i>						
		Kenya	East Africa	Rest of Africa	Europe	United States	Asia	Other countries
7.3.1	Other enterprises within your enterprise group							
7.3.2	Suppliers of equipment, materials, components or software							
7.3.3	Clients or customers							
7.3.4	Competitors or other							

	enterprises in your sector							
7.3.5	Consultants, commercial labs or private R&D institutes							
7.3.6	Universities or other higher education institutions							
7.3.7	Government or public research institutes (e.g. Research councils)							
7.4	Which type of co-operation partner was the most valuable enterprise's innovation activity? Give corresponding number from 7.3. For example, clients or customers= " 7.3.3 "							

PART 8: Effects /Objectives of innovations during 2007-2012

8.1	How important or successful were each of the following types of outcomes for your products and process innovations introduced during the period under review (2007 to 2012)?						
	Outcomes /Effects		Level of success of outcomes Tick "No effect" if there were no innovations outcomes.				
			High 4	Medium 3	Low 2	No effect 1	
8.1.1 Product oriented effects	8.1.1.1	Increased range of goods					
	8.1.1.2	Entered new markets					
	8.1.1.3	Increased market share					
	8.1.1.4	Improved quality of goods					
8.1.2 Process oriented effects	8.1.2.1	Improved flexibility of production service provision					
	8.1.2.2	Increased capacity of production provision					
	8.1.2.3	Reduced production cost per unit of labour, materials, energy					
8.1.3 Other effects	8.1.3.1	Reduced environmental impacts					
	8.1.3.2	Improved working conditions on health and safety					

	8.1.3.3	Met governmental regulatory requirements				
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8.2	How important were each of the following objectives for your products (goods and services) and process innovations introduced during the period under review (2007 to 2012)?					
	Objectives		Importance of objectives Tick No effect if there were no innovation outcomes.			
			High 4	Medium 3	Low 2	No effect 1
8.2.1	Increase range of goods and services					
8.2.2	Replace outdated products or processes					
8.2.3	Enter new market					
8.2.4	Increase market share					
8.2.5	Improve quality of goods or services					
8.2.6	Improved flexibility for producing goods and services					
8.2.7	Increased capacity for producing goods and services					
8.2.8	Reduce production (labour, materials, energy) costs per unit output					
8.2.9	Improved working conditions on health and safety					

PART 9: Factors hampering innovation activities

9.1	During the period under review (2007 to 2012), were any of your innovation activities or projects :	Yes	No	N/A
9.1.1	Abandoned in the concept stage			
9.1.2	Abandoned after the activity or project was begun			
9.1.3	Seriously delayed			

QUESTIONS 9.2, 10 and 11 TO BE ANSWERED BY ALL ENTERPRISES:						
9.2	During the period under review (2007 to 2012) how important, were the following factors in hampering your innovation activities or projects or influencing a decision not to innovate?					
	Hampering factors		Degree of importance <i>Please also indicate particular factors that were not experienced</i>			
			High 4	Medium 3	Low 2	Factor not experienced 1
9.2.1	9.2.1.1	Lack of funds within				

Cost factors		your enterprise or group				
	9.2.1.2	Lack of finance from sources outside your enterprise				
	9.2.1.3	Innovation cost too high				
	9.2.1.4	Excessive perceived economic risk				
9.2.2 Knowledge factors	9.2.2.1	Lack of qualified personnel				
	9.2.2.2	Lack of information on technology				
	9.2.2.3	Lack of information on market				
	9.2.2.4	Difficulty in finding cooperation partners for innovation				
9.2.3 Market factors	9.2.3.1	Market dominated by established enterprises				
	9.2.3.1	Uncertain demand for innovative goods or services				
	9.2.3.1	Innovation is easy to imitate				
9.2.3 Other factors	9.2.3.1	Organizational rigidities within enterprises				
	9.2.3.2	Insufficient flexibility of regulations or standards				
	9.2.3.3	Limitations of science and technology public policies				
9.2.4 No need to innovate	9.2.4.1	No need due to prior innovations				
	9.2.4.2	No need because of no demand for innovations				

PART 10: Intellectual property rights

10.1	During the period under review (2007 to 2012), did your enterprise:		
		Yes	No
10.1.1	Secure a patent in Kenya?		
10.1.2	Apply for patent in Kenya?		
10.1.3	Register an industrial design?		
10.1.4	Register a trademark?		
10.1.5	Claim copyright?		
10.1.6	Grant a license on any intellectual property resulting from		

	innovation?		
10.1.7	Defend Intellectual Property Rights?		

PART 11: Specific innovations by your enterprise

11.1	During the period under review (2007 to 2012), were any of your innovations :			
		Yes	No	Don't know
11.1.1	A first in Kenya?			
11.1.2	A world first?			
11.2	If your answers to either question 11.1.1 or 11.1.2 was "YES " then please give a short descriptions of these innovations (or attach separate pages or promotional brochures)			
11.3	Please list other significant innovations in your enterprise in the last three years (or attach separate page or promotional brochures etc)			

PART 12: Creativity and skills

12.1 During the five years (2007-2012), did your enterprise employ individuals in-house with the following skills, or obtained these skills from external sources?				
<i>(Tick both 'Employed in-house 'and 'Obtained from external sources' if relevant.)</i>				
		Employed in-house	Obtained from external sources	Skills not used /not relevant
		1	2	0
12.1.1	Graphic arts/layout /advertising			
12.1.2	Design of objects or services			
12.1.3	Multimedia (combining audio, graphics, text, still pictures. animation, video etc.)			
12.1.4	Web design			
12.1.5	Software development			
12.1.6	Market research			
12.1.7	Food technology and related skills			
12.1.8	Engineering/applied sciences			
12.1.9	Mathematics/statistics database management			

12.2	During the five years (2007-2012), did your enterprise use any of the following methods to stimulate new ideas or creativity among your staff? If YES, was the method successful in producing new ideas or increasing creativity?	Method used:			
		Successful 1	Not successful 2	Don't know if successful 3	Method not used 0
12.2.1	Brainstorming sessions				
12.2.2	Multidisciplinary or cross-functional work teams				
12.2.3	Job rotation of staff to different departments or other parts of your enterprise group				
12.2.4	Financial incentives for employees to develop new ideas				
12.2.5	Non-financial incentives for employees to develop new ideas, such as free time, public recognition, more interesting work, etc.				
12.2.6	Training employees on how to develop new ideas or creativity				
12.2.7	Others				

Thank you for your participation. It is sincerely appreciated

Name of the respondent: _____

Position: _____

Telephone: _____

Email and/or web address

Email address: _____

Name of interviewer: _____ Signature: _____

Appendix 2. Six Interview Guides used during the first round of qualitative interviews 2014

Firm A .

1. What is the number of employees with a university degree and in which skill areas?
2. What is the number of food technologists against the overall employee base?
3. Apart from food technologists, what other skills are present and are critical for the successful operation of the firm?
4. Is the firm lacking in particular skills relevant for its successful operation?
5. Why is the firm losing 20% of its staff to multinationals?
6. What does external training entail?
7. What is the nature of the production line?
8. What is the estimated total value of the capital equipment?
9. Apart from the four departments i.e. engineering; quality and assurance; sales and marketing; and finance, are there other departments existing and if so, why don't they receive interns in 2011 and 2012?
10. What is the estimated expenditure on capital equipment in 2012?
11. What was the estimated expenditure on services in 2012?
12. Why was building the cold storage in Kisumu necessary?
13. What has been the value of merchandisers in improving sales?
14. Your firm is partnering with many institutions. Why do you engage with them and of what value has it been to the success of your firm?
15. Is there a particular relationship that has paid more dividends than the rest?
16. Why did the firm choose to join the USA based Snack Food Association and of what strategic value has it been for the firm?
17. Explain the nature of engagement with the IESC program and what value has this brought to the firm?
18. What is the current range of brands?
19. What is the range of innovations between 2007 and 2012?
20. What is the range of product, process, organizational and marketing innovations the company is engaged in?
21. What makes your firm be an industry leader in the snacks industry in Kenya?
22. Between 2007 and 2012, the turnover figures show a steady improvement. EBIT figures do not match this trend. Why is this so?

Firm B

1. Aside of the production department, do you have any other staff who have university qualifications?
2. Why don't you see value in engaging university graduates?
3. Do you have any of food technologists among your employee base?
4. What does employee training entail?
5. What is the name of the firm that your firm sells a number of raw materials to?
6. Which are these raw materials?
7. What is the value of these sales compared to the overall sales?
8. What was the estimated expenditure on capital equipment in 2012?
9. What was the estimated expenditure on services in 2012?
10. What is the range of skills of your employee base?
11. Is the firm lacking in particular skills relevant for its successful operation?
12. Are there any plans of fully automating your production line?
13. What is the estimated total value of the capital equipment?
14. What is the estimated total expenditure on services?
15. On top of merchandisers, other firms in the industry have engaged marketing firms to extend their market reach. Does the firm have any such plans in the future?
16. Of what value to the firm has been the engagement with KEBS, KNBS, Potato Council and Ectoville
17. What is the current range of brands?
18. What is the range of new innovations between 2007 and 2012?
19. What is the range of in production, process, organisational and marketing innovations the company is engaged in?
20. How does your firm cope with the intense competition in the snacks industry in Kenya and the larger East African Community?
21. What is the turnover for 2007?
22. What is the EBIT for 2007, 2010 and 2012 and what explains the trend if any?

Firm C.

1. Please explain to us in detail about your experience before 2003 and what key lessons did you learn from that experience
2. Why did you choose to start your own enterprise when you were doing very well as an employee?
3. Why don't you see value in engaging university graduates?
4. Do you have any of food technologists among your employee base?
5. Why don't you hire already trained staff with the necessary skill base for your firm?
6. Need to do a factory visit
7. What is the range of skills of your employee base?
8. Is the firm lacking in particular skills relevant for its successful operation?
9. What is the nature of your production line?
10. What key capital have you acquired in the recent past and which ones are planning to acquire in the near future?

11. Apart from Tumaini Supermarket, and given that you have faced difficulties penetrating other supermarkets, what other strategies do you have to increase your market reach?
12. Of what value to the firm has been the engagement with KEBS, and GS1?
13. What is the current range of brands?
14. What is the range of new innovations between 2007 and 2012?
15. What is the range of in production, process, organisational and marketing innovations the company is engaged in?
16. How does your firm cope with the intense competition in the snacks industry in Kenya and the larger East African Community?
17. What is the turnover for 2007?
18. What is the EBIT for 2007, 2010 and 2012 and what explains the trend if any?

Firm D

1. Please tell us about the life history of your firm.
2. What have been the main turning points in the life of your firm?
3. How do you make decisions within the firm?
4. How many employees do you have and how are they distributed within the two branches?
5. In January this year, you had plans to introduce new products: omena and mandazi by May 2014. Has this been accomplished?
6. You also had plans to change the labelling by sticking labels for upmarket customers by October 2014. Has this been accomplished? If not, what are the reasons?
7. You supply to most parts of the country. I.e. Nairobi, Eastern, Nyanza, Western and Rift Valley. How are you able to accomplish this?
8. Who are your main customers?
9. Is the firm lacking in particular skills relevant for its successful operation?
10. What is the nature of employee training in your firm?
11. What is the nature of the production line?
12. What is the estimated total value of the capital equipment?
13. How does the firm recruit its employees
14. What was the estimated expenditure on capital equipment in 2012?
15. What was the estimated expenditure on services in 2012?
16. What is the nature of your production line?
17. Are there any plans to move beyond your current range of brands?
18. What is the range of in production, process, organisational and marketing innovations the company is engaged in?
19. During the interview, you stated that the big players in the industry do not have any effects on the firm's competitiveness. Why is this so?
20. What strategy do you have for growing your firm to the next level and move beyond the current production level?
21. What was the 2010, 2012, 2013 turnover?
22. What is the EBIT for 2010, 2012 and 2013?

Firm E

1. Please tell us about the life history of your firm.
2. What have been the main turning points in the life of your firm?
3. How do you make decisions within the firm?
4. How does the presence of family members within the business affect the running of your firm?
5. Is the firm lacking in particular skills relevant for its successful operation?
6. What is the nature of employee training in your firm?
7. What is the nature of the production line?
8. What is the estimated total value of the capital equipment?
9. How does the firm recruit its employees
10. What was the estimated expenditure on capital equipment in 2012?
11. What was the estimated expenditure on services in 2012?
12. Tell us about your markets for your product
13. Are there any plans to move beyond your current range of brands?
14. What is the range of in production, process, organisational and marketing innovations the company is engaged in?
15. What strategy do you have for growing your firm to the next level and move beyond the current production level?
16. What was the 2010, 2012, 2013 turnover?
17. What is the EBIT for 2010, 2012 and 2013?

Firm F

1. Is the firm lacking in particular skills relevant for its successful operation?
2. What is the nature of employee training in your firm?
3. Apart from cost implications, why did you choose Kibera as your operational base?
4. It appears like accessing markets in not a major challenge for you. If this is so, what area do you consider as needing priority for improvement?
5. What plans do you have for upgrading your production line?
6. What plans do you have of moving to better premises out the informal settlement?
7. Are there any plans to move beyond your current range of brands?
8. What is the range of in production, process, organisational and marketing innovations the company is engaged in?
9. Why do you feel you are performing at the industry average?
10. Who do you consider to be your competitors?
11. What strategy do you have for growing your firm to the next level and move beyond the current informality?
12. What was the 2013 turnover?
13. What is the EBIT for 2012 and 2013?

Appendix 3. Interview Guide used during the second round of qualitative interviews 2016

- General business status
 1. Have you had any major changes in the company since we met you?
 - a. Turning points
 - b. Vision
 - c. Size of turnover
 - d. Size of employment
 - e. Significant investments
 - f. Change in ownership structure

- Product related
 2. Ability to process in sufficient quantities a range of crisps products meeting customer requirements as well as local food processing standards
 - a. Let us review once more your production processes. Include from the time you receive an order to the time you deliver it? Looking at quality checks and time taken.
 - b. What is your current production capacity per day, per week, and per month?
 - c. How do you structure your production? Is it based on orders received or? Are there any instances where you have been able to deliver on particular orders? Please explain
 - d. Apart from crisps, what other products? Other crisps apart from potatoes?
 - e. Number of crisps flavours. Which is popular? Why? Where do you buy the flavours? What are the cost implications
 - f. Food standards – which standards do you adhere to? How do you maintain quality in the processing? What licenses do you have in place?

- Marketing
 3. Ability to pack using appealing packaging material (aluminium foil or transparent polythene packaging)
 - a. Please describe to me once more your packaging process. Have you thought of outsourcing of packaging?
 - b. Have you thought of upgrading your packaging? If yes, why?
 - c. What determines the packaging choices you make
 - d. Which packaging material is used and why?
 - e. Weight – which weight options do you use, which are popular and why?
 4. Ability to brand processed products
 - a. Product positioning - how do you position your products – mass or premium? Or do you have some products for the mass and others for premium market?
 - b. Labelling - what plans do you have to improve the way you label your products?

- c. How do you promote your products? Merchandisers, website, Facebook, email, others? Do you have any promotional offers?
- 5. Ability to access markets for products including finding new markets
 - a. Who are your primary customers? Supermarkets? Wholesalers? Others?
 - b. Please comment about your experience with your customers. Payment
 - c. What is the current market reach and how do you secure new market outlets? Any new ones in the recent past?
 - d. What is your competition and what is your strategy to beat the competition?
- Introduction of new products
 - 6. Ability to introduce new products on the market
 - a. Please comment on whether you have introduced any (a) new crisps products (b) new other products

- Learning

Please let us review once more your learning processes and in particular how you have learned from the following sources:

Internal mechanisms

1. Onjob training
2. Expatriates and technical personnel
3. Research and development activities
4. Searching the internet

External private

5. Buyers
6. Suppliers
7. Inter-firm linkages - other firms
8. Consultants, commercial labs, private research and development institutes

External collective

9. Government or public research institutes
10. NGOs
11. Business associations, conferences, exhibitions

Appendix 4. Sample Pictures taken during fieldwork



Firm D – some of the raw materials used in the production process



Firm D- some of the products packed ready for the market



Firm D – production equipment



Firm E- final product packed



Firm F – some of the final products on display at the workshop



Firm F- production area



Firm C – production area



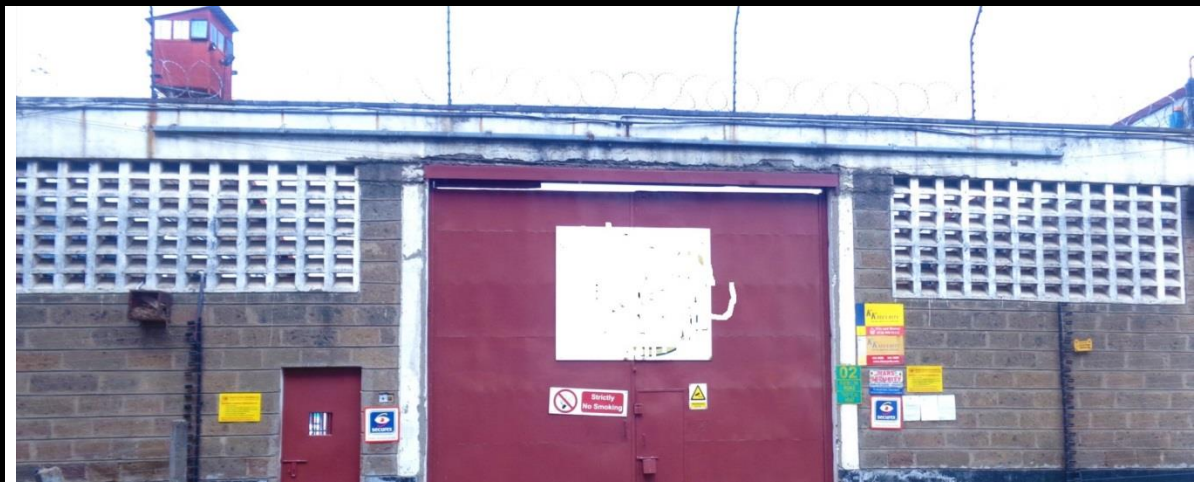
Firm C – production area



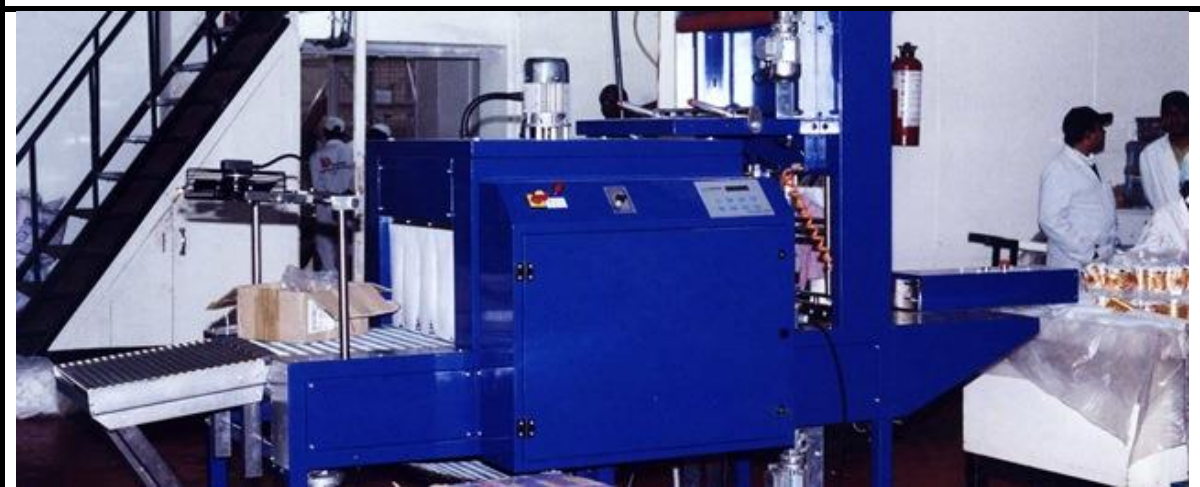
Firm B- newly acquired sealing equipment



Firm B – production staff demonstrating how to seal final product



Firm A- Industrial godown



Firm A – production equipment

Appendix 5. Retail Outlets Visited in 2013 to Check Crisps Brands Stocked

Date	Area	Retail Outlets visited
16 August 2013	Outering Ring road	1. Naivas – Outering Road
		2. Royal Supermarket – Baba Dogo
		3. Chammari Supermarket – Baba dogo
		4. Mum’s supermarket – Baba Dogo
		5. Lucky Summer – Baba Dogo
		6. North Line Supermarket – Mathare North
17 August 2013		7. Stewell Supermarket – Umoja
		8. Ahadi Supermarket – Umoja
		9. Umoja Two Supermarket – Umoja Two
		10. Patmartt Supermarket – Umoja II
18 August 2013	Kangundo road	11. Karia Supermarket – Dandora
		12. Royal Supermarket – Kariobangi North
19 August 2013	Jogoo road	13. Mesora Supermarket – Buru Buru phase II
	Jogoo road	14. Tuskys Buru Buru
		15. Uchumi Buru Buru
20 August 2013	CBD	16. Nakumatt Ronald Ngala, 17. Nakumatt Monrovia,
		18. Tuskys Daima – Tom Mboya, 19. Tuskys OTC, 20. Tuskys Magic, 21. Tuskys Hakati,
		22. East Mart – Bus Station
		23. Ukwala – Tom Mboya, 24. Ukwala Haile Selassie,
		25. Ibrahim and Co Supermarket – Moi Avenue
		26. Uchumi Monrovia
21 August 2013	Thika	27. Thika Tex Supermarket
		28. Central Supermarket1 29. Central Supermarket2

		30. Leen's Supermarket
		31. Mathai Supermarket
		32. Tuskys Supermarket
	Githurai	33. Kassmart Supermarket
		34. Stan Mart Supermarket
		35. Maguna Mini Supermarket
	Juja	36. Siwan Supermarket
		37. Price Worth Mini Supermarket
30 August 2013	Kawangware	38. Set-Light Supermarket
	Karen	39. Nakumatt 40. Karen Provisions Store
	Ngong'	41. Sweet World Supermarket 42. Naivas 43. Sidai Supermarket 44. Jopany Supermarket 45. Kings Supermarket 46. Ngong' Provisions Store1 47. Ngong' Provisions Store2 48. Ngong Hills Supermarket 49. Eden Matt Supermarket
31 August 2013	Ongata Rongai	50. Kwarematt Supermarket 51. Fair-Matt Supermarket 52. Clean Shelf Supermarket 53. Tuskys1 54. Tuskys2 55. Tumaini Supermarket 56. Uchumi
	Langata road	57. Nakumatt Galleria 58. Uchumi Langata Hyper 59. Tuskys Tmall 60. Nakumatt Mega

Source: Field notes, 2013.

Appendix 6. Number of Interviews Done for Each Case Study Firm

Firm	Number of interviews done
Firm A	<ol style="list-style-type: none"> 1. Five interviews in total 2. First interview was with the firm Chairman in December 2013. The interview was done in a restaurant away from the firm. The chairman prefers such interviews to be done in the afternoons and away from the office for convenience purposes. 3. The second interview was with the assistant production manager at the firm in October 2014. After the interview I was taken on a factory tour. The firm is located in the Nairobi Industrial Area. This interview was recorded. 4. The third interview was in July 2015 with the firm Chairman again away from the firm. This interview was not recorded. 5. The fourth interview was in October 2016 with two managers: the research and development manager and the quality manager. This was done at the firm and after the interview I was also taken on a factory tour. This interview was recorded. 6. The fifth and last interview was also in November 2016 with the firm Chairman once more in a restaurant away from the firm. This interview was recorded.
Firm B	<ol style="list-style-type: none"> 1. Four interviews in total 2. The first two interviews were done in January 2013. The production manager was the main person who was interviewed. But during the first interview, I was also able to also talk to one of the directors and the firm's accountant. On both occasions, I was also taken on a factory tour. The firm is located in the Nairobi Industrial Area. 3. The third interview was done in June 2015. I interviewed the production manager at the firm's premises. This interview was recorded. 4. The fourth interview was done in August 2016, again with the production manager at the firm's premises. This interview was recorded.
Firm C	<ol style="list-style-type: none"> 1. Three interviews in total 2. The first interview was done in December 2013 at the firm's offices in Kiambu town. I interviewed the firm's owner. 3. The second interview was done in October 2014. It was done at the company's offices with the owner of the firm. This interview was recorded. 4. The third and last interview was done in August 2016. This time, the owner took us to the firm's factory which is located on the outskirts of Kiambu town. The factory is build adjacent to his residential house. I saw the production process in action. This interview was recorded.

Firm D	<ol style="list-style-type: none"> 1. Three interviews in total 2. The first interview was done in January 2014. Interviewed the firm's owner at a restaurant in downtown Nairobi. He had come to the city centre to buy materials for his production process. These included packaging paper and labels. 3. The second interview was done in November 2014. Interviewed the owner at the firm's premises in Kariobangi Light Industries. At that time, the firm was just recovering from a major downturn because its premises had burnt down in August of the same year. He lost equipment worth KES 230,000. The fire that gutted his premises started in an adjacent business unit. This interview was recorded. 4. The third interview was done in August 2016. The firm had moved from its previous location in Kariobangi Light Industries. The new premises were still in the Kariobangi but they were smaller. This interview was recorded.
Firm E	<ol style="list-style-type: none"> 1. Three interviews in total 2. The first interview was done in January 2014. Interviewed the firm's owner at a local bank's lobby in downtown Nairobi. The owner had come to follow up on her loan payments at the bank. 3. The second interview was done in October 2014. This was done at the owner's house which was adjacent to the firm's production premises. The premises were in rented house in the same residential area in Githurai 44. Her son who was a university student at a local private university at that time listened in on the conversation during the interview. This interview was recorded. 4. The third interview was done in August 2016 at firm's production premises. The owner had moved from previous production premises to new ones but still in the same estate, Githurai 44. This interview was recorded.
Firm F	<ol style="list-style-type: none"> 1. Four interviews in total 2. The first interview was done in September 2013 at the firm's rented premises in Kibera Nairobi. Interviewed the firm's three directors. 3. The second interview was done in December 2013. It was also done in Kibera at the company's premises. 4. The third interview was done in October 2014 at the company's premises in Kibera. However, I noted that the firm had moved to slightly more

	<p>spacious premises. At all these three interviews, the three directors who are also the founders of the firm were present. This interview was recorded.</p> <p>5. The fourth and last interview was done in August 2016 at the company's premises in Kibera. This time the interview was with the staff in charge of production. During this time, I observed that the firm had done some facelift of the premises. The firm had also acquired a computer and printer. This interview was recorded.</p>
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Source: Author's Compilation