FACTORS INFLUENCING THE SUCCESSFUL ADOPTION OF TECHNOPRENEURSHIP IN THE FOOD PROCESSING SECTOR IN ZIMBABWE

by

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DECLARATION

I Nicholas Zivengwa Kakava declare that:

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This thesis is dedicated to Him Who does not die, my family: Eunah, Abide, Obey and Ordain; the Church of Christ.

GLOSSARY OF ACRONYMS

AEO	–	African Economic Outlook
AfDBG	–	Africa Development Bank Group
CZI	–	Confederation of Zimbabwe Industries
FTLRP	–	Fast Track Land Reform Program
GNU	–	Government of National Unity
GPA	–	Global Political Agreement
IDP	–	Industrial Development Policy
IEEA	–	Indigenisation and Economic Empowerment Act [*Chapter 14:33*]
IPR	–	Intellectual property rights
MIC	–	Ministry of Industry and Commerce
NERP	–	National, Economic Revival
R&D	–	Research and Development
SIRDC	–	Scientific and Industrial Research and Development Centre
STERP	–	Term Emergency Recovery Programme
SADC	–	South African Development Community
Zanu-PF	–	Zimbabwe African National Union – Patriotic Front
ZESA	–	Zimbabwe Electricity Supply Authority
Zim	–	Zimbabwe
ZIMASSET	–	Zimbabwe Agenda for Sustainable Socio-Economic Transformation
ZIMPREST	–	Zimbabwe Program for Economic and Social Transformation
ZIMSTAT	–	Zimbabwe National Statistics Agency

ABSTRACT

Technopreneurship has been found to be one of the modern approaches to lead economic development in such success stories like the Asian upcoming economies. From such a background, the study endeavoured to determine the factors which influence technopreneurship in such a developing nation as Zimbabwe. From theory and practice, technopreneurship is found to be the key to knowledge-based economies that can assist most developing countries that may struggle to industrialise. Zimbabwe as an economy is well positioned to produce food products for the domestic and other regional and international economies. The objectives of the study were: to examine factors that influence the adoption of technopreneurship in the food processing sector in Zimbabwe; to assess the importance given to technopreneurship by the food processing sector in Zimbabwe; to examine the feasibility of technopreneurship, and to test the relationship between factors that influence technopreneurship in the food processing sector in Zimbabwe.

Current literature on technopreneurship addresses issues in developed countries and success stories of other upcoming economies like India and China. The study contributed to the context of technopreneurship in developing countries and especially in sub-Saharan Africa. The issues of a lack of development in such nations like Zimbabwe which may have natural endowments and what could be seen as good economic policies were addressed. A model of a technopreneurship system was proposed to contextualise the Zimbabwean technopreneurship situation and this could apply to most regional and global situations.

The research onion was adopted to guide the research methodology and methods. The positivist research philosophy and a quantitative research approach were adopted to gather data through a questionnaire from the major industrial food processing technopreneurs in Harare. Nine companies were contacted to get a final sample of 147 respondents who included management, administrative and technical staff. SPSS was used for data management and quantitative data analysis techniques which included descriptive and inferential statistics adopted.

Findings suggest that technopreneurship plays an important developmental role in the food processing sector and while several factors influenced technopreneurship such as internal processes; human factors; global factors; venture capital; partnerships, and government support was found to be the most important factor influencing all other factors. The major and determining factor influencing technopreneurship in the industrial food processing factor in Zimbabwe was Government support. A contribution to new knowledge and respective stakeholders in technopreneurship was made.

Key Terms: Technopreneurship, Innovation, Food processing, Entrepreneurship, Technology

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CHAPTER 1: NATURE AND SCOPE OF THE STUDY

1.1 Introduction

Economic development happens in an ever evolving economic order characterised by nations engaging in a technological race with regions and countries competing on such fronts as technological innovation, industrialisation, income per capita and living standards (Szirmai, 2013). The essence of technopreneurship is a driving force steering economic growth and development. Most policy failure in Africa (including in Zimbabwe) could be attributed to institutional weakness and implementation failure leading to African nations relegating to the league of least developed countries and focusing on the trade of primary commodities and vulnerability to volatile terms of trade (Soludo et al., 2004).

Food security in Africa has been considered an urgent global challenge to meet the required quantities and nutritional quality that free trade is encouraged since food is a basic human right despite situations and circumstances (Sasson, 2012). The United Nations (2015; 2014) Millennium Development Goals progress report shows that there was insufficient progress in Sub-Saharan Africa to reach the target if prevailing trends persisted. Thus extreme poverty and hunger remained critical in the region. Farming methods to include horticulture have been researched to enhance food security in KwaZulu-Natal, South Africa (Modi, 2015). Urban farming was upheld as a source of food security in the copper belt of Zambia (Smart et al., 2015). In either case, modern farming skills and knowledge are adopted to improve productivity. Agricultural produce is seasonal in most cases unless backed by irrigation. In order to ensure a continuous food supply, there would be a need for food preservation for future and out of season supplies.

Zimbabwe experienced food insecurity since the adoption of the Fast Track Land Reform Programme (FTLRP) which is classified as one of the policy failures (Murphy, 2013; Munangagwa, 2009). The FTLRP marked the beginning of the worst economic policy ever and buttressed by the controversial Indigenisation Act of 2008 which is still effective in Zimbabwe's Agenda for Sustainable Socio-Economic Transformation (ZIMASSET) and which condemns economic development through Foreign Direct Investments (FDIs) thus heading for failure (Murphy, 2013). That is so, especially in the current globalised economy. According to Murphy (2013), economic policy failure is characterised by social suffering, economic crisis and political instability. Hungwe (2015) reported that President Robert Mugabe on his 91st birthday admitted that the controversial land reform programme was a failure when he was quoted saying, "I think the farms we gave to people are too large. They cannot manage them." This was a reflective statement by some aged man who has had some long experience with several economic programmes hat had also failed. In any case, food security is critical in Zimbabwe to such an extent that it was captured on the current economic programme, ZIMASSET as one of the key result areas.

Food preserving through processing also ensures food security. All agricultural food produce require value addition for it to be made available on the market and preservation. The Zimbabwean economic crisis has seen massive deindustrialisation taking place for the past 15 years. Musonza (2015) looks at industrialisation, de-industrialisation, and re-industrialisation as referring to some changes happening in the contribution of the manufacturing industry to Gross Domestic Product (GDP) or employment. In particular, Musonza (2015) refers to deindustrialisation as the reduction of the contribution of the manufacturing industry to GDP or employment. This is characterised by operating below capacity, retrenchment, downsizing and company closures in the Zimbabwean manufacturing industry. According to Kariati (2015) within a period of six weeks after a Supreme Court ruling, 30000 people lost their employment in July and August 2015. Mataranyika (2015) indicated that about 150 companies closed in 2014. That covers the manufacturing sector and the food processing sector in particular.

Modern economic development and growth theory have a strong bearing on entrepreneurship (Stull, 2014; Ferreira et al., 2015) or technopreneurship (Rostamnezhad et al., 2014; Brem and Borchardt, 2014) and this is owing to the merits and facets of the subject. The current trend is a shift from managerial economies to entrepreneurial economies (Drucker, 2014). However entrepreneurship may be viewed as not an effective economic development concept without a technological emphasis (Drucker, 2014). This is largely true when examining developing economies that are to some extent unable to exploit their natural endowments for industrialisation. While acknowledging that high-performing entrepreneurial sectors include Science, Engineering and Technology (SET), McAdam (2012), explores how a high-technology entrepreneur fits into the prevailing culture of the business incubator where her business is located.

Industrial food processing is important as a value addition activity for all agricultural produce. Its value is found in improving the health and taste of food (Lee et al., 2015); enhancing food safety (Goddard, 2015); and nutritional and dietary purposes (Green, 2015). Therefore, industrial food processing is key to geographical distribution of food stuff, nourishment, and storage and food safety. This chapter introduces the topic of the study background of the study; the research problem; research objectives; questions; type of study; justification; and the outline of the whole thesis documentation.

1.2 Definition of terms

In this study, the following terms are regularly used and need to be put in perspective. It has to be appreciated that the terms may have different meanings in other usage and meanings are determined by the context. However, current context has references to other usages.

Technopreneurship is viewed as consisting of innovation, technical science and knowledge applied to the creation and management of a business at some financial risk so as to achieve own goals and perspectives (Dolatabadi and Meigounpoory, 2013). In most cases, technopreneurship is viewed as business venturing through the compounding of entrepreneurial skills and technological prowess (Pujanis et al., 2015; Dutse et al., 2013; Harlanu and Nugroho, 2015).

Technology – "is a set of tools designed to manipulate the natural world and to extend human intentions" (Wagner et al., 2015:4). Or, technology is a set of tools and procedures designed to make human life convenient through the application of acquired knowledge to the day-to-day individual, domestic and industrial activities.

Science –"is a way of knowing things – it is a widely accepted, adaptable, and transferable set of assumptions about how to understand the world in which we find ourselves." (Wagner et al., 2015:3-4)

Entrepreneurship – Shane and Venkatraman (2000) hold that entrepreneurship is the exploration and exploitation of profitable business opportunities. Entrepreneurship can be seen as a process of perceiving market opportunities as well as organisational resources to exploit the opportunities so as to attain results in the long term (Nacu and Avasilcăi, 2014). It can also be viewed as the business approach that perceives business opportunities and adopts an innovative way to create a new venture or revive an existing one.

Innovation –is viewed as the utilisation of new technology in an organisation (Jonsson, 2015). "Innovation consists of the generation of a new idea and its implementation into a new product, process or service, leading to the dynamic growth of the national economy and the increase in employment as well as to a creation of pure profit for the innovative business enterprise." (Urabe et al., 1988:3).

Industrial food processing– refers to the practices used by food and beverage industries to transform raw plant and animal materials, such as grains, produce, meat and dairy, into products for consumers (John Hopkins Bloomberg School of Public Health, 2015).

Economic Development –"Economic development is concerned with quality improvements, the introduction of new goods and services, risk mitigation and the dynamics of innovation and entrepreneurship. Economic development is about positioning the economy on a higher growth trajectory. It is within the purview of government." (Feldman et al., 2014:1).

Economic growth – "is simply an increase in aggregate output" (Feldman et al., 2014:1).

Developed countries – OEED (2015) view developed countries as those that qualify to be members of OECD. Nielsen (2011) looks at developed countries as countries that are affluent enough to participate in assisting other poor countries.

Developing countries / Least Developed Countries (LDC) – OECD (2015) adopted the United Nations' definition of LDC which are countries that are poor and weak in the international community based on their GNP per capita, "weak institutional and human capacities, low and unequally distributed income and scarcity of domestic financial resources, often suffer from governance crisis, political instability and, in

some cases, internal and external conflicts". Nielsen (2011) examines developing countries as countries that are still so poor that they cannot assist other countries who need help to develop.

Technopreneur – "A technopreneur means an entrepreneur who involves and deals with technology in their business. A technopreneur believes that technology would increase efficiency, productivity, product quality, broaden the market and helps to market the developed product widely" (Harlanu and Nugroho, 2015:148). The term 'technopreneur' emanates from the notion of an entrepreneur, who makes use of technology to come up with a new invention and innovation and thereby being competitive on the market (Mohannak and Matthews, 2015). A technopreneur "is an individual who successfully uses talent and ventures capital, innovative ideas, and managerial skills for either commercial production of effective and viable technological innovations or effective leverage of innovations using technology" (Memon et al., 2015:5).

1.3 Clarification of the title of the study

The title of this thesis is "*Factors Influencing the Successful Adoption of Technopreneurship in the food processing sector in Zimbabwe*". Two concepts to be noted in the title are Technopreneurship and the food processing sector in Zimbabwe. In this study, Technopreneurship refers to Technological Entrepreneurship (Satria et al., 2014; Velikova et al., 2014; Venkataraman, 2004), that is, the use of technology to exploit new business opportunities for wealth creation.

Kwa et al. (2014:66) give a Nigerian perspective that equally applies to the Zimbabwean situation as they view technopreneurship as "the process of organisational creativity is a process of mainstreaming innovation or continually finding important corporate problems, solving those problems, and, implementing the solutions to satisfy the global market." As it were, industrial food processing technopreneurs and other manufacturing organisations in Zimbabwe have corporate problems that require creativity and innovation to solve those problems. Such a process is the one being referred to as technopreneurship. Dolatabadi and Meigounpoory (2013:140) define technopreneurship as, "innovative application of technical science and knowledge individually or by a group of persons, who create and manage a business and take its financial risk to achieve their goals and perspectives". The definition has initially defined technology and then added the entrepreneurship part to come up with a complete definition of the compounded concept. As can be appreciated, the term is a compounded term that is relatively new in academia (Pujanis et al., 2015; Dutse et al., 2013; Harlanu and Nugroho, 2015).

The other term used in the topic is, 'sector', which in this study refers to an area or portion of the manufacturing industry that is distinguished from others through its concentration on food processing. While the manufacturing industry in Zimbabwe covers a wide range of processing and value addition of primary products some of which are non-food stuff, this thesis focuses on the food processing sector. The

logic behind it is that since the economy of Zimbabwe is agriculturally based, an industrial food processing technologies study can be utilised to produce food products in the nation. The noted situation is that most basic food products such as snacks, biscuits, cereals and beverages are imported from other economies such as Singapore and South Africa (Chinamasa, 2015). Primary resource endowments require technological backing to create wealth for the natives (Kwa et al., 2014).

The chapter introduces the thesis regarding the subject matter and its scope. The section introduces the research by the clarification of the topic as well as the background of the study. It also covers the research problem, research objectives, questions and research hypotheses.

1.4 Background of the study

According to Petti (2009) development agencies such as the United Nations Development Programme (UNDP) and World Bank (WB), as well as politicians of late, called for economic policies that are entrepreneurial, especially in poor societies to reduce the gap between developed and developing or underdeveloped economies. As of June 2013, available statistics indicate that the majority of people in Sub-Saharan Africa are still living in extreme poverty with less than $1 per day per capita, meaning there is still high levels of poverty and hunger as well as a large deficit in decent work in Sub-Saharan Africa (United Nations, 2014). Thus, from this perspective, progress is insufficient to reach the United Nations 2015 Millennium Development Goals (MDGs) target, unless prevailing trends improve significantly.

Heng et al. (2012) confirm that in most countries, to achieve productivity and growth, economies are now not relying much on the endowment of natural resources but the intellectual capacity and quality of human capital. Developing economies in sub-Saharan Africa can achieve greater results if a paradigm shift takes place from relying on trading primary resources to rather processing the resources before trading. This is so, especially with insights from Bihar (India) according to Minten et al. (2013) who asserted that local brands in developing countries are rapidly gaining agricultural market share. The blend of technology and innovation that lead to technopreneurship in entrepreneurial activities is, according to Dutse et al. (2013), known to be the key drivers of enterprise growth in modern economies. Technopreneurship is seen as the best to foster competitive advantage in Small and Medium Enterprises (SMEs) (Pakrad et al., 2012).

Therefore, with the economic and industrial challenges in developing countries like Zimbabwe, the aspect of technopreneurship makes sense since it fosters value addition to the natural endowments and agricultural produce thereby creating and wealth enhancing sustainability. Also, the macro-economic level success of a country depends on the success of the industrial level activities which in turn depends on the micro level, that is, the organisational level activities. About the organisational level, Harlanu and Nugroho (2015) assert that technopreneurship enhances the competitiveness of organisations in the

international market, and thus a competitive advantage in modern error is not based on only the abundance of natural endowments. No economy can make itself immune to external forces such as globalisation and the rising competition therein.

In Zimbabwe, the manufacturing industry capacity utilisation reduced in 2013 by 5.3% to 39.6% (CZI, 2013). In the Zimbabwean scenario, statistics shows that the nation went through a deindustrialisation process that was characterised by a constant and massive economic meltdown of about 40% (CZI, 2011). Most manufacturing organisations closed, and the remaining few are operating below capacity (CZI, 2011). The 2011 statistics have recorded average capacity utilisation at the end of the first half of 2010 standing at 43.7% (CZI, 2011), and 2015 capacity utilisation dropped from 36.5% in 2014 to 34.3% in 2015 (CZI, 2015).

The Zimbabwean industrial food processing technopreneurs have since been stating importation of cheap food products from neighbouring countries as one of the factors influencing business operations in the nation (CZI, 2014). In 2015, as shown in **Table 1.1**, low local demand and capital constraints are the major constraints while aged equipment and competition from imports follow up. That could point to the notion that economic development happens in an ever evolving economic order that is characterised by nations engaging in a technological race with regions and countries competing on such fronts as technological innovation, industrialisation, income per capita and living standards (Szirmai, 2013).

Table 1.1: Capacity constraints 2015

Major Capacity Constraints	**Percentage**
Low local demand	28.4
Capital constraints	18.6
Antiquated machinery and machine breakdowns	12.3
Competition from imports	10.3
High cost of doing business	8.3
Cost/Shortage of raw materials	6.9
Power and water shortages	6.4
Drawbacks from current economic environment	2.0
Other	6.9

Source: CZI (2015:13)

The above could point to the fact that industrial food processing technopreneurs are failing to be competitive globally. Protective measures by authorities may not work in this case since the nation needs to have trade relations with other economies. Adopting modern business models and operations like

technopreneurship could have a lasting solution to such developing economies that is relying on natural endowments to have economic leverage that is no longer a prudent approach to developing nations. As argued by Kim et al. (2015) who asserted that scientific knowledge (publications) is not developmental but technological knowledge (patents). The current situation in Zimbabwe is that there is a high literacy rate of 98% (ZIMSTAT, 2015) but there is no application of the education. Thus, there is a need for application of acquired knowledge in the developing nations for development purposes. That is the essence of technology as equipment, techniques and procedures designed to exploit the natural world so as to satisfy day-to-day working and living requirements (Wagner et al., 2015).

A Knowledge-Based Economy (KBE) rely on the application of knowledge and information for economic development (Mortazavi and Bahrami, 2012; Popescu and Crenicean, 2012; Martini et al., 2012). Heng et al. (2012) also confirm that, in most countries, to achieve productivity and growth, economies are now not relying much on the endowment of natural resources but the intellectual capacity and quality of human capital. Developing economies in sub-Saharan Africa can achieve greater results if a paradigm shift takes place from relying on trading primary resources to rather processing the resources before trading (Kwa et al., 2014). That is so, especially with insights from Bihar (India) according to Minten et al. (2013) who asserted that local brands in developing countries are rapidly gaining agricultural market share. There is ethnocentrism in the Zimbabwean local food market. Hence local food products could be preferred by the local people (Makanyeza, 2014).

As of June 2013, available statistics indicate that the majority of people in Sub-Saharan Africa are still living in extreme poverty with less than $1 per day per head, There are still high levels of poverty and hunger, as well as a large deficit in decent work in Sub-Saharan Africa (United Nations, 2014). Thus, from this perspective, progress is insufficient to reach the United Nations 2015 Millennium Development Goals (MDGs) target unless prevailing trends improve significantly. The prevailing trends are that sub-Saharan African countries are either stagnant or deteriorating economically.

Entrepreneurs are venturing into trading or other service provision ventures and not manufacturing. Most of the manufacturing organisations are still closed or are still operating below capacity, and there are very few or no new upcoming manufacturing entities, despite entrepreneurial opportunities in the form of industrial operations (CZI, 2014). According to CZI (2011), capacity constraints are being cited by most organisations, and these include low product demand, machine breakdowns, lack of working capital and lack of raw materials while CZI (2012) identified these as factors having the greatest negative impact on capacity utilisation and doing business in Zimbabwe. According to CZI (2014) economic challenges that influence business operations in Zimbabwe were: tight liquidity conditions; company closures; rising formal unemployment; low production levels; non-performing loans; and a disproportionate trade balance while CZI (2011-2014) annual surveys focus on the general manufacturing industry, and industrial food

processing technopreneurs make up almost 50% of the participating companies in Zimbabwe. A summary of the findings of the CZI (2011-2012) annual surveys is shown in **Table 1.2.**

Table 1.2: Manufacturing industry challenges

Year	Challenges
2011	Low product demand, machine breakdowns, lack of working capital and lack of raw materials
2012	Availability and cost of funding; infrastructure, in particular, power shortages and cost; economic policy instability; and high labour cost and rigid labour laws;
2013	Working capital constraints; infrastructure, in particular, power shortages; water shortages and power costs; ageing equipment and machine breakdowns; low domestic demand
2014	Tight liquidity conditions; company closures; rising formal unemployment; low production levels; non-performing loans; disproportionate trade balance.

Source: Own compilation extracted from CZI (2011-2014) annual surveys

The challenges faced by the manufacturing industry in Zimbabwe in **Table 1.2** above are equally applicable to the industrial food processing sector. There is demand for domestically produced food products in Zimbabwe given the ethnocentrism of the Zimbabwean food consumers (Makanyeza, 2014). More than 60% of the consumer goods in the Zimbabwean retail outlets is imported from other countries like South Africa and Zambia (Nyakazeya, 2013). Mabuwa (2014) acknowledges that the exportation of raw agricultural commodities added to the negative effect on the economy of the nation; since employment is exported and potential income is lost to economies that adopted innovation and value addition policy priorities in manufacturing models.

Modern socio-economic problems require modern economic policies to alleviate the impact of such problems on the society. Newfarmer and Pierola (2015) highlight that even nations with an abundance of natural resources face policy competitiveness with Zimbabwe as an example. Devendra et al. (2015:146) also indicated the effects of climate change especially on developing countries regarding droughts and food shortages. That leads to the need for advanced solutions to such challenges and technopreneurial strategies to deal with such problems. Success stories of Asian Tiger economies (for example, Singapore, Indonesia, Hong Kong, Malaysia, South Korea, Taiwan) can be found to be anchored on technology and wealth creation (Wong, 2011; Goh and Wong, 2012). Other world records of technology and entrepreneurship lead economic developments and include the Silicon Valley (Adams, 2011) and Taiwan Hsin Chu Industrial Science Park (Sun, 2011). Given these successes in different countries, it is important to ask what factors are influencing technopreneurship in the Zimbabwean food processing sector. The study aims to understand if manufacturing technology with an entrepreneurial thrust can assist the Zimbabwean food processing sector to capitalise on the local brand preference and agricultural food production opportunities.

1.5 Research problem

According to Creswell (2009:18), a research problem "is an issue or concern that needs to be addressed". The manufacturing sector of Zimbabwe is among the economic sectors that contribute to wealth creation, such as the agricultural sector and mining sector. Sectors that are into services are said to be active in the role of distributing the wealth (CZI, 2010). Mining and Agricultural sectors are said to contribute less to economic development since they have less returns to labour and more returns to capital; that is, they create less employment than the manufacturing sector (Newfarmer and Pierola, 2015). Without a viable manufacturing sector, the Zimbabwean nation is caught in a developmental trap or vicious cycle of poverty, as illustrated by Mabuwa (2014). From **Figure 1.1**, it can be appreciated that if a nation concentrates on trading raw material, it loses in several ways that include: income from value addition, employment creation, disposable income, government income tax and protection from unstable raw material prices. Economies that rely on exporting raw material remain poor while those who engage in value addition become more affluent and thus escape the concept of the poverty trap.

The latter is where an economy has a developmental dilemma and has no hope of growth and development. Focusing on low-income commodity-dependent sub-Saharan African countries like Zimbabwe, Sindzingre (2012) argues that the impact of the 2008-2009 crisis, and more generally, these countries' growth trajectories, can be explained by the concept of the poverty trap. What may be lacking is the application of scientific knowledge to transform the natural resources to finished products (technological knowledge) thereby benefiting the nations (Kim and Yun, 2015).

Phase 1: Agricultural product

Leaf Tobacco, sold at$3.00/Kg

Phase 2: Semi-processed tobacco product

Crushed tobacco, sold at US$6.00/Kg

Phase 3: Fully processed tobacco product

Cigarette, sold at US$30.00 to US$60.00

Figure 1.1: A three-stage tobacco processing

Source (Own compilation extracted from Mabuwa (2014))

Focussing on the food processing sector, in particular, the question is how much help could the adoption of industrial food processing technology aid to address the situation. That is taking the comparative advantage as a competitive advantage; industrial food processing technopreneurs could utilise the upcoming technologies to produce food products. Jermann et al. (2015) analysed the adoption of emerging industrial food processing technologies which included: High pressure processing (HPP); Pulsed electric field (PEF); Ultraviolet light (UV); Radiation; Ozone (O3); Pressure and CO2; Power ultrasound; Cold atmospheric plasma; and Electrolysed water. Their conclusion was that some of the technologies had not

been adopted as large-scale industrial technologies and those adopted were not uniformly distributed across the developing world (Jermann et al., 2015). From the regions mentioned such as in the US and Europe, no African country such as Zimbabwe was indicated to have adopted these emerging technologies. That has an implication on the innovativeness of such economies and as a result, the economies are found to be not competitive in the international market. Other novel technologies in industrial food processing are based on nanotechnology (Momin and Joshi, 2015; Neves et al., 2015; Var and SağLam, 2015; Keshwani et al., 2015). According to Var and SağLam (2015:101), "Nanotechnology is a field of applied sciences and technologies involving the control of matter on the atomic and molecular scale, below 100 nanometers". Nanotechnology is said to have the potential to impact the food processing industry by: "improved taste, flavour, colour, texture and consistency of foodstuffs, better absorption, the bioavailability of nutraceuticals and health supplements, food antimicrobials development, innovative food packaging materials" (Momin and Joshi, 2015:3). It can also enhance innovation in the food sector by aiding the introduction of new food products and packaging (Siegrist et al., 2008; Var and SağLam, 2015). Combined with the entrepreneurial aptitude, how could industrial food processing technopreneurs in Zimbabwe explore and exploit opportunities vested in these emerging industrial food processing technologies. Any organisation that may pursue the possibilities becomes an international competitor and may seize to cry foul. This could be calling for policies and behavioural models to create wealth, employment and reduce hunger considerably. Technopreneurship as a potential policy guide and behavioural model has received some advocacy from academia and developmental policies (Pereira, 2007; Bulsara et al., 2009; Pei et al., 2010; Dolatabadi and Meigounpoory, 2013) in both developed and developing countries. But the question could be, "What factors affect technopreneurship in the nation?"

The deindustrialisation challenge, subsequent lack of capacity utilisation and low investment in manufacturing that the nation face implies that there is a need for a developmental model to guide potential manufacturing participants in the economy of Zimbabwe. From this perspective, the study seeks to break the vicious cycle by promoting the development of food manufacturing ventures, by both corporate and upcoming entrepreneurs if they could embrace the upcoming industrial food processing technologies.
The arguments cited by current manufacturers in the nation that there is a low product demand, machine breakdowns, lack of working capital and lack of raw materials (CZI, 2011), are subject to testing given the aspect of technopreneurship. In June 2012, one of the leading retailers in Zimbabwe indicated that it imported between 60 and 65 percent of all its retail products from South Africa due to depressed capacity utilisation in the domestic manufacturing sector (CZI, 2013). According to CZI (2013), failure to utilise capacity by Zimbabwean manufacturers is owing to mainly liquidity challenges and costs of producing goods locally which are above costs of importing finished goods. While these may be found to be true to some extent, this study proposes that all these are symptoms of causes which can be revealed by analysing factors which influence Technopreneurship in the food processing sector, especially the manufacturing production technologies (MPT) (Szirmai, 2012).

The culture of innovation can change the face of the Zimbabwean manufacturing sector. This argument is in agreement with the literature on knowledge-based economies (Mortazavi and Bahrami, 2012; Popescu and Crenicean, 2012; Martini et al., 2012), but these have been seen to be successful mostly in the Western and Eastern economies. There is a knowledge gap in this area in Sub-Saharan Africa and in particular in Zimbabwe where development in the manufacturing sector is still lagging behind. The situation is somewhat unusual in Zimbabwe, where there is high knowledge base but no commensurate industrial development. Employing the inductive approach (Neuman, 2012) the research question here is, "Which factors influence the successful adoption of technopreneurship in the food processing sector in Zimbabwe?"

1.6 Problem statement

The study has two issues to deal with: the examination of factors influencing the successful adoption of technopreneurship in the food processing sector in Zimbabwe and the theoretical gap in technopreneurship as an area of study and as it applies to developing nations. The food processing sector in Zimbabwe suffered massive shrinkage since the year 2000. The advent of technopreneurship in the global environment seems to be working in other economies than others. There could be some determining factors influencing the success of technopreneurship in a nation. The study endeavours to establish the factors influencing the adoption of technopreneurship in the Zimbabwean scenario. The impact of such factors could vary from nation to nation depending on the levels of democracy. Theoretically, the study contributes to the literature in technopreneurship which is a relatively new area of study, especially in a developing economy like Zimbabwe. The theoretical contribution could be made in the form of a model of factors influencing the adoption of technopreneurship in a developing nation.

1.7 Industrialisation

The food processing sector in Zimbabwe is a subsector of the manufacturing industry. The literature on industrialisation equates it to the expansion of the manufacturing sector (Szirmai, 2012; Xin and Weiguo, 2011). Guo (2012) holds that industry can be defined as the material production sector that engages in the extraction of natural resources and the processing and reprocessing of natural resources and agricultural products. In this study, while industry can be subdivided into primary, secondary and tertiary industries, industry refers to the secondary industry, that which processes raw materials to consumer products. That is, the sector that will be used to study the factors influencing technopreneurship.

In addition, Szirmai (2012), argues for manufacturing by asserting that: there is an empirical correlation between the degree of industrialisation and per capita income in developing countries; productivity is higher in the manufacturing sector than in the agricultural sector; the transfer of resources from agriculture to manufacturing provides a structural change bonus, a dynamic version of the structural change bonus

argument is that manufacturing has higher rates of productivity growth than other sectors. The argument for manufacturing ventures is based on the Prebisch and Singer Hypothesis, which states that real commodity prices decline in the long run and this cannot be rejected for most commodities other than oil, according to Arezki et al. (2012). Therefore, a nation may not rely outrightly on trading primary commodities like minerals.

A case in point was the situation in Zimbabwe in 1998 where the sharp depreciation in the Zimbabwean dollar was mainly attributed to the reduction of Zimbabwe's major minerals on the international market and low tobacco international prices which led to a reduction in foreign exchange earnings (Bonga, 2014). Thus, economies cannot rely on the trade of raw commodities for sustainable economic development.

Another latest case in point is the September 2015 case of the Zambian currency (Kwacha) which fell by 17% against the dollar, which according to Mfula and Strohecker (2015), represents its greatest recorded one-day fall. According to Backman (2015), the Kwacha had gone down by 45% against the US$ from August to October 2015, because of the nation's heavy dependence on the copper trade that, in turn, is dependent on China, which at the time devalued its currency and dropping the prices of copper. These are the hazards of relying on the primary industrial activities and overlooking the secondary activities and supporting the Prebisch and Singer Hypothesis.

Focusing on the manufacturing production technologies impacts on developing economies, Szirmai (2012), indicates that manufacturing has been important for growth in developing countries. Szirmai (2012), further indicates that not all expectations of the 'engine of growth hypothesis' are borne out by the data; the more general historical evidence provides more support for the industrialisation hypothesis.

Modern theories of industrialisation have put across two basic theories of industrialisation, that is, the export promotion (EP) and import substitution (IS) (Ottaviano et al., 2015). Prebisch and Singer (1950), quoted in Hadass and Williamson (2001) advocated (moderate) import substitution (IS) and recommended having it interwoven with export promotion (EP) (Sai-Wing Ho, 2012). The researcher agrees with this recommendation but does not segregate manufacturing technologies. All technologies, whether foreign or domestic, which promote productivity could be adopted. Thus, an entrepreneur capitalises on any technology to create a viable venture or revitalise an existing one.

1.8 Research Questions

Research questions are inquisitive statements that express what the researcher wants to explore (Bryman and Bell, 2015). These questions point to gaps of knowledge in literature, as well as in practice that a research study seeks to answer. In this study, there are four research questions which are listed as follows:

1. How much importance is given to technopreneurship in the food processing sector in Zimbabwe?
2. What are the most important factors influencing the successful adoption of technopreneurship in the food processing sector in Zimbabwe?
3. To what extent is the feasibility of the adoption of technopreneurship viable in the food processing sector of Zimbabwe?
4. What is the relationship between factors influencing the successful adoption of technopreneurship and the employee characteristics?

1.9 Research objectives

Research objectives assist the study to be focussed and avoid the gathering of unnecessary data. Well formulated research objectives help to structure the research process into clearly defined categories or phases. Research objectives lay the foundation on which the research methodology, data collection, analysis, interpretation and utilisation are developed. In this study, all the objectives are actioned in the industrial food processing sector in Zimbabwe. The industrial food processing sector of Zimbabwe is a portion of the general manufacturing industry of the nation. Thus, the objectives aim to gather data that will be valuable to the industrial food processing sector in particular and the manufacturing industry of Zimbabwe in general. The objectives sought to specify what the study would do, where and for what purpose. The research objectives of this study were:

1. To assess the importance given to technopreneurship by the food processing sector of Zimbabwe.

The knowledge and application of technopreneurship is an important issue since it helps the research to note how far the food processing sector is aware and adopted technopreneurship. It is assumed that if the food processors value technopreneurship they are likely to adopt it to capitalise on its merits in the modern environment.

2. To examine the most important factors which influence the successful adoption of technopreneurship in the food processing sector in Zimbabwe.

This is one of the objectives of the research which contributes towards the examination of the factors influencing the successful adoption of technopreneurship. The examination of such factors assists stakeholders such as industrialists and policy makers to anticipate such factors and contribute to new knowledge in technopreneurship. If technopreneurship is adopted, the adoption can be limited by some elements whose negative impact need to be minimised and positive impact maximised.

Technopreneurship could be widely applied in the industrial food processing sector, but the feasibility of such an application is important. Such issues as demand in the domestic market, organisational capacity

and organisational competence, food processing technology, technopreneurial knowledge and skills could determine.

3. *To examine the feasibility of technopreneurship in the food processing sector in Zimbabwe.*

Industrial food processors in Zimbabwe can be limited in their adoption of technopreneurship if other elements like demand and competition are not considered. Apart from other determinants of the adoption of technopreneurship, such elements need to be examined so as to achieve the goal of the research.

4. *To test the relationship between factors that influence the adoption of technopreneurship and employee demographic characteristics in the industrial food processing sector in Zimbabwe.*

One of the key elements to technopreneurship is innovation. Innovativeness of an individual may be aligned to the area of specialisation. Most employees may be specialised in either: business, engineering or both and as such this may have an implication on the innovativeness of the individual.

Further to the feasibility of technopreneurship in the industrial food processing sector, there is a need to determine the critical success factors. A technopreneurial organisation should have such attributes as innovativeness and flexibility to make it an enabling environment. The noting off such critical success factors would also assist stakeholders to be informed and respond accordingly.

1.10 Type of Study

The study adopted the positivism research philosophy, which believes that the truth exists and can be discovered (Hepper et al., 2015). In fact, the research was guided by a postpositivism philosophy which shares the same beliefs as the positivism but goes on to say that, the truth cannot be fully discovered, but we can only make probabilistic statements about the truth (Creswell, 2009; Hepper et al., 2015). That is, the research endeavours to examine determinants of the successful adoption of technopreneurship but will not make absolute statements of these factors but probabilistic statements of the determinants. According to Sekaran and Bougie (2009:126) investigations can either be causal or correlational; where causal research is suitable "when it is necessary to establish a definitive cause-and-effect relationship"; while "correlational study is when there is need for "a mere identification of the important factors associated with the problem" at hand (adoption of technopreneurship). In this study, it was realised that it was difficult to establish the absolute cause and effect relationship. This was so given the fact that there are numerous variables (independent variables) that influence the dependent variable (adoption of technopreneurship) other than the ones explored from literature. As such, the study focused on identifying the crucial factors associated with the adoption of technopreneurship and did not establish a cause-and-effect relationship (Sekaran and Bougie, 2009). Therefore, a descriptive research design was adopted in

the study. That is, the researcher described what was observed (Maxfield, 2015). Thus, the researcher deduced, from the responses, factors influencing technopreneurship and described these factors. The design is compatible with the phenomenological philosophy, quantitative research strategy and survey method. Regarding the research strategy, the study adopted the quantitative research. In quantitative research, the emphasis is made on quantifying when gathering and analysing data (Bryman and Bell, 2015). The strategy provides straightforward quantified data that can answer questions through deduction. Quantified data can be gathered through a standardised questionnaire. To achieve the goal of the study, the researcher collect data using the survey research method. According to Denscombe (2010), a survey is a research strategy that aims at measuring some aspect of a social phenomenon through gathering facts by asking questions. The subject of technopreneurship combines two areas of study, that is, entrepreneurship and technology to gather the desired information, questions about entrepreneurship, technology and technopreneurship specifically.

A survey gathers data by asking questions to the target respondents. Mustafa (2010) indicates merits and demerits of survey research as:

Merits:

- Widely use the method and has universal application
- It is based on actual observation
- Useful in leading to hypothesis formulation
- Gives the researcher an opportunity to personally experience realities of life
- Can be used to test the validity of many theories
- Avoids the possibility of personal biases
- Time effective
- Makes a calculation of the sampling error possible

De-Merits:

- It demands resources, both financially and human
- Lacks uniformity during data collection
- Time-consuming
- Many challenges during field work
- Lacks flexibility
- Cannot be done on historical retrospect studies

The researcher obtained a sample of 147 respondents from the population of employees of nine industrial food processing technopreneurs in Zimbabwe after administering a standardised questionnaire to the

selected companies. A mainly purposive sampling approach was employed to come up with the desired sample. Purposive sampling was used to select the employees who met the criteria of being an administrator, manager, technician, scientist, technologist or engineer. Such employees were taken to have the desired information sought in the study. It then follows that the research is mainly quantitative. Quantitative research is a means for testing objective theories by examining the relationship among variables (Ingham-Broomfield, 2014).

It has to be noted that the initial intention was a sample of at least 200 workers from ten companies, but the researcher could only get 147 respondents from nine companies which were not equally represented. Circumstances and situation in the country made the attainment of the sample size not feasible. During at least three months of field data collection through hand deliveries in Harare industries, it was discovered that:

1. Other gatekeepers who had previously signed consent letters reversed their previous decisions and refused access to their employees. They stated reasons of the researcher being late and required a new arrangement that proved difficult as they could continuously postpone to the frustration of the researcher. Some could indicate that they only allow access to researchers that they sponsor. In fact, there is hostility between Universities and industry in Zimbabwe. This points to the lack of knowledge and management principles crucial for innovation in an economic system.
2. In companies in which access was allowed, the response rate was overwhelming in other companies while very low in others. Where there was a low response, the reason was mainly staff's low morale. 2015 was marked with massive retrenchment owing to the companies facing viability challenges (CZI, 2015) as well as some Supreme Court rulings which saw an estimated number of 30000 people being retrenched in August 2015 (Kariati, 2015). Therefore, workers felt insecure and feared that their employment was at stake. As such they had no motivation to respond to issues which seemed not to address their immediate problems.
3. The mentioned main causes of a smaller sample size were strengthened by the required ethical standards of University of KwaZulu-Natal ethical requirements. According to the ethical standards, gatekeepers and respondents are at liberty to cooperate or not. As such the researcher maintained high ethical standards to meet the University requirements and used strategies such as snowballing to secure cooperation from respondents in companies whose gatekeepers had allowed access.

The research is guided by the postpositivism philosophy that refers to the belief that causes probably leads to the effects (Creswell, 2009). The study concentrates on industrial food processing technopreneurs in Harare which are representative of all industrial food processing technopreneurs in Zimbabwe. Most of the industrial food processing activity takes place in Harare. Hence the sample would be representative of

the population. The research covers the period from 2009 to 2015 since in 2009 the economic trend turned from a recession to a revival. That is, 2009 has all the qualities of being the base year.

1.11 Delimitation of the study

Geographically, the study took place in Harare which houses all the industrial food processors of Zimbabwe. The targeted organisations are the industrial food processors which are organisations and part of the manufacturing industry in Zimbabwe. Within the industrial food processing companies, respondents who were deemed to be rich in organisational information would be targeted as respondents such as managers, technicians, administrators and scientists. Technopreneurship would be taken as the area of study but included aspects of entrepreneurship as the broader area of study and innovation as an important aspect of technopreneurship.

1.12 Significance of the study

The original contribution of this study is considered to be the analysis and examination of the factors influencing technopreneurship in the industrial food processing sector. Technopreneurship is considered in the form of corporate entrepreneurship or intrapreneurship; that is, entrepreneurship in an existing business operation. This is an important branch of entrepreneurship since it ensures sustainability, survival, development and growth of existing organisations. The study contributes to both theory and practice of technopreneurship in the industrial food processing sector in Zimbabwe and other developing economies. It has an input to mainly existing industrial food processing operations. However, existing business operations can be diversified and expanded by introducing new operations. Much input is at the micro-economic level and to some extent also at the macro-economic level as an upcoming concept and area of study. At the macro level, technopreneurship is one of the policy guides to modern economic policy makers.

Technopreneurship is viewed as a process through which technopreneurs go through to achieve their objectives. The view is discussed in **Section 3.7** of **Chapter 3** and materialise in the conclusions and recommendations, mainly in **Figure 8.1**, the new knowledge accumulated in the study. The process is taken to involve perceiving a technopreneurial opportunity, pursuing the opportunity and exploiting the opportunity. The technopreneurial process is however taken to be taking place in an environment which impact on it. The technopreneurial process is impacted by environmental forces and this enhances the process perspective to a systematic perspective. Thus, technopreneurship is a process influenced by internal and external factors. The broader picture of technopreneurship is also clarified in theory and practice as different concepts are analysed and related to the subject area. These include such concepts in theory and practice as knowledge spillover theories, innovation theories, value addition, academic entrepreneurship, technology parks, technology transfer and technology sourcing. The understanding of

these concepts in perspective broadens the understanding of technopreneurship as a subject area. A model is proposed to simplify the understanding of factors influencing technopreneurship especially in a developing country like Zimbabwe in sub-Saharan Africa. Mostly factors influencing technopreneurship were researched before, but in developed countries and, therefore, this study initiates the closing of a critical gap in theory and practice. The conclusions and recommendations of the study also contributed to practice in other manufacturing sectors. Thus, the research has an influence on organisational policies, sectoral or industrial policies, national policies, regional policies as well as global policies. It assists organisations and economies to be competitive in the current globalised market.

1.13 The conceptual framework

To guide the study, **Figure 1.3** represents a conceptual framework or theoretical framework. Sekaran and Bougie (2009) define a theoretical framework as consisting of the researcher's beliefs about the relationship between certain phenomena and the explanation of the belief. There are two variables: Factors influencing technopreneurship is the independent variable and the technopreneurial performance in industrial food processing is the dependent variable.

Bhattacherjee (2012) defined different forms of variables in a conceptual framework as follows:

- *Independent variable* – the variable that determine other variables
- *Dependent variable* – the variable that is determined by another variable
- *Mediating variables* – the variable determined by the independent variable but also determines the dependent variable
- *Moderating variables* – variables are influencing the relationship between the independent and dependent variable

The variables can be presented as follows (**Table 1.3**):

Table 1.3: Independent, dependent and intervening variables of the study

Independent Variable	Moderating and Mediating Variables	Dependent Variable
Factors influencing technopreneurship • Internal processes • Human factors • Venture capital • Partnerships • Government support • Global factors	*Macro environmental factors* • Political environment • Economic environment • Social environment • Technological environment	*The degree of adoption of technopreneurship in the Industrial food processing sector* • Entrepreneurship • Innovation • Foreign direct investment • Technology transfer • Technology sourcing • Technoparks • Industrial clusters

Source: Own compilation

From Pakrad et al. (2012) the framework will take internal processes as it is and will consider individual factors under the theme Human factors; institutions will be considered under venture capital, and external networks will be dealt with under private and public partnerships. Lastly, the framework will concentrate on the theme that looks at factors that influence the growth and formation of a technological (food processing) firm (Bailetti, 2012). The study focuses on existing manufacturing projects, that is, those who are already operational (corporate entrepreneurship). However, it still touches new industrial food processing projects given that the corporate sector can start new industrial food processing projects. The framework investigates technopreneurship as a system that is influenced by other variables which in turn impacts on food processing. The variables include internal processes, human factors, venture capital, partnerships, government support and global factors.

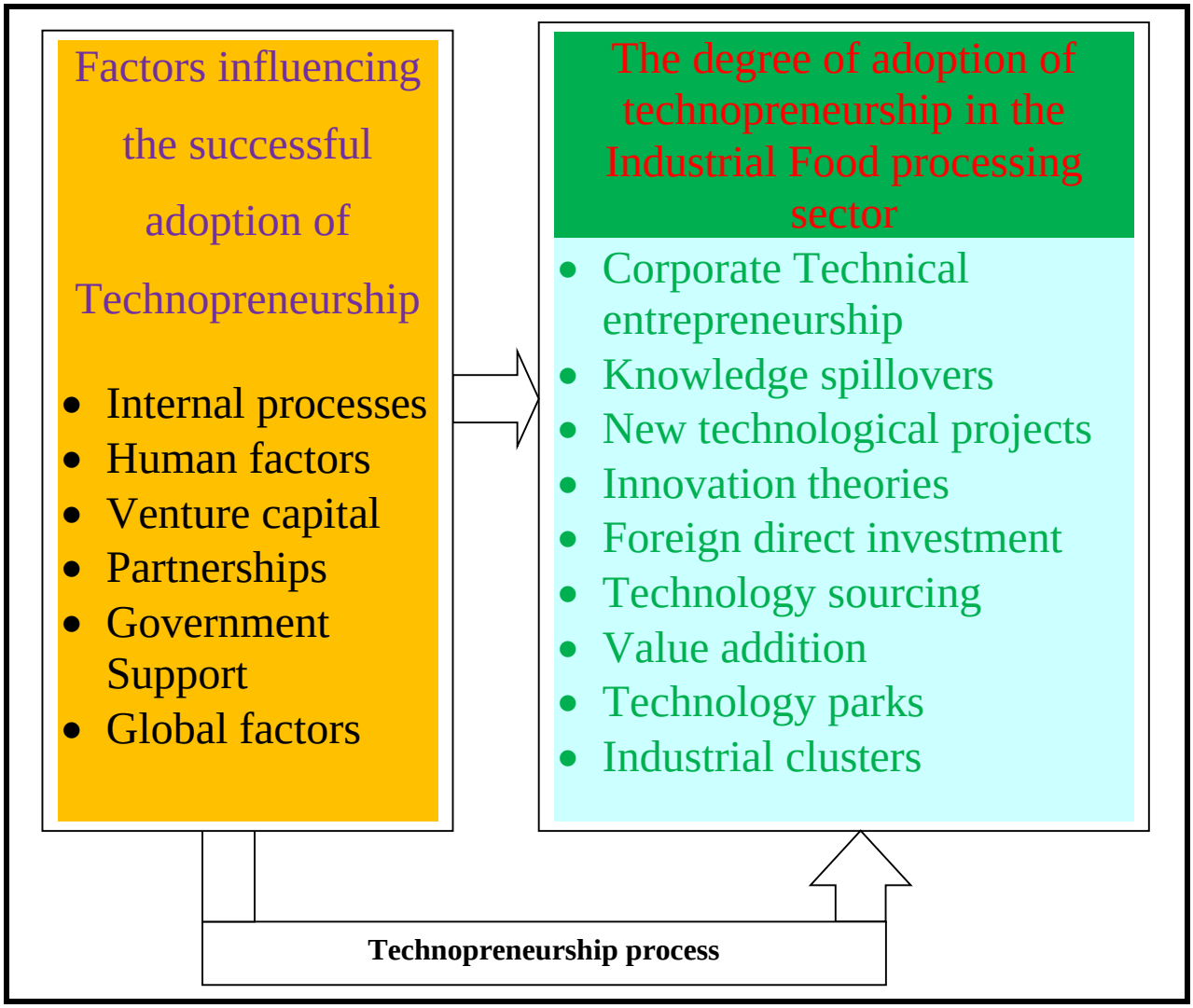


Figure 1.2: The conceptual framework

Source: Own compilation

1.14 Outline of study

This study is reported in eight chapters. This chapter is the first one and chapter two covers the economic situation and the industrial food processing sector in Zimbabwe. Chapter three deals with the content of technopreneurship as an area of study. Chapter four discusses the perspectives of technopreneurship and their application in Zimbabwe. Chapter five covers the research methodology and methods. Chapter six presents the research findings. Chapter seven discusses the research findings and Chapter eight covers the research conclusions and recommendations. The chapters can be outlined as follows:

Chapter 1: Nature and scope of the study

This part covered the clarification of the topic and background to the study. It further encompasses the research problem, objectives of the study and research questions.

Chapter 2: Zimbabwe and the food processing sector

The chapter investigates Zimbabwe as an economy, the manufacturing industry in general and the food processing sector in particular. A description of Zimbabwe, a map, the various sectors and elaboration of industrial food processing regarding importance, challenges, benefits and the role of technology. The international situation of industrial food processing business is also reviewed.

Chapter 3: Technopreneurship. The chapter deals with empirical and theoretical literature in technopreneurship. It identifies international trends; implementation and lessons learnt regarding technopreneurship; then move to Zimbabwe and the state of technopreneurship in general in the country – focus more specifically on the industrial food processing sector; identify variables/ factors with sources. Other related areas covered include entrepreneurship, technology, innovation, industrialisation and knowledge-based economies. The conceptual framework is further amplified.

Chapter 4: A Theoretical framework for the study

This chapter covers the theoretical framework of technopreneurship. Different perspectives and approaches of technopreneurship are discussed and its application in practice. The perspectives covered include knowledge spillovers, innovation theories; the technology transfer theory; University spin-off theory; the cluster approach; the technological parks perspective; the foreign direct investment theory and the value addition perspective. It explores how the perspectives are linked to the objectives and research instrument.

Chapter 5: Research methodology

Chapter five clarifies such methodological issue like research philosophies and designs in detail. These are dovetailed by issues like data collection approaches, research instruments, types of data to be gathered, contact methods, sampling procedures and data analysis techniques.

Chapter 6: Results

This section captures all the findings from the study, to include data presentation and analysis from the statistical packages. Tables, graphs and inferential statistics were also used to satisfy the research objectives.

Chapter7: Discussion

The data analysis in Chapter six is further discussed to derive the solid meaning of the findings. The ultimate aim is to develop a technopreneurial model to guide manufacturing companies, technologists and scientists in developing countries to venture in the manufacturing business.

Chapter 8: Conclusions and Recommendations

Lastly, the thesis summarises the discussion and makes relevant conclusions from the findings that lead to recommendations for further research and potential investors in developing economies.

1.15 Summary

The thesis aims to study the factors that influence technopreneurship in the food processing sector of Zimbabwe. The Zimbabwean food sector, like the whole manufacturing industry in Zimbabwe, has been characterised by massive de-industrialisation. Companies are operating below capacity and most of these were retrenching, downsizing and closing down. The world economic development programmes are technologically and entrepreneurially driven. Zimbabwe is not an exception and in the endeavour to develop has technological and entrepreneurial policies that seem not to address the economic and industrial dilemma. The research emphasised manufacturing given the weaknesses brought about by economic policies that relied on trading of raw commodities thereby losing out on employment creation, income per capita and government income through taxes that gain through manufacturing and trading of finished products.

The objectives of the study include, to: examine factors that influence the successful adoption of technopreneurship in the food processing sector in Zimbabwe; assess the importance given to technopreneurship in the food processing sector in Zimbabwe; examine the feasibility of technopreneurship in the food processing sector in Zimbabwe and test the relationship between factors that influence the adoption of technopreneurship and employee area of specialisation in the industrial food processing sector in Zimbabwe. The data collected has a bearing on the innovativeness of the industrial food processing technopreneurs about the adoption of upcoming industrial food processing technologies and exploiting the technopreneurial opportunities in the national and global environment.

The study assumes a positivist philosophy and descriptive research design to gather quantitative data on the factors that influence the successful adoption of technopreneurship in the food processing sector through a survey method. This was achieved through a survey questionnaire circulated in the food processing companies who cooperated. Some cooperated, but some declined to participate leading to a smaller sample of 147 respondents that the researcher adopted given the ethical standards of the study.

The chapter introduced the topic and area of study. Issues such as the background of the study, problem statement, research questions, objectives, type of the study, the significance of the study, the definition of terms as well as the outline of the study were covered. Some insight of the Zimbabwean economic and industrial situation may be required. The next chapter sheds some light on Zimbabwe and the food processing sector.

CHAPTER 2: ZIMBABWE AND THE FOOD PROCESSING SECTOR

2.1 Introduction

According to Monyau and Bandara (2015), the Zimbabwe 2014 economy had estimated indicators which were: real GDP growth of 3.1%; Real GDP per capita growth of 0%; CPI inflation of -0.1%; Budget balance % GDP of -2.4% and Current account balance % GDP of -23.1%. By August 2015, it was expressed that the government was moneyless and struggling to raise its monthly civil service wage bill (Mutenga, 2015). This is only one of the symptoms of an economic crisis in the nation. Other indicators are a high unemployment rate of 80% (Ndlela, 2015); year-to-year deflation rate of -2.77% (Financial Gazette, 2015); too old infrastructure leading to power shortages (Financial Gazette, 2015). These are symptoms of a declining economy which analysts indicate that a contracting economy leads to shrinking organisational operations; severe unemployment and reduction in income per capita (Ndlela, 2015). It is a vicious cycle of each indicator pointing to the other. The other economic indicators of interest in 2015 were government external debt and budget deficit. Trading Economics (2015) indicated that the Zimbabwean 2014 budget deficit was pegged at 2.40% of GDP. According to Chinamasa (2015) in his 2015 midterm fiscal policy review statement, the nation had a domestic debt amounting to US$1.7 Billion and an external debt to the tune of US$6.7 billion which was 47% of the gross domestic product. By June 2015, the country's public and publicly guaranteed debt was reported to be US$8.4 billion (Chinamasa, 2015). The chapter examines Zimbabwe as an economy, the manufacturing industry in general and the food processing sector in particular. A description of Zimbabwe, a map, the various sectors and elaboration of industrial food processing regarding importance, challenges, benefits, and the role of technology are discussed. The international situation of food processing business is also reviewed.

2.2 The Zimbabwean Economy

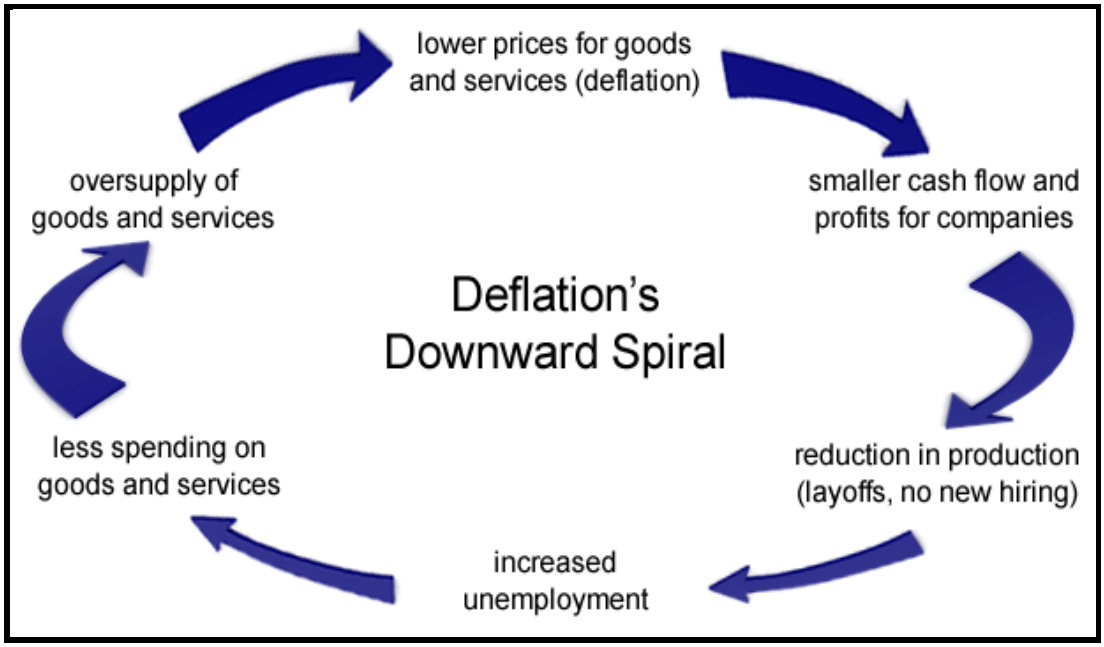
According to African Development Bank Group (ADBG, 2014) the Zimbabwean economy is fragile; marked by deindustrialisation, high external debt and formalisation. These have been mainly driven by liquidity challenges, ageing technologies, shortages, infrastructure deficits, corruption and a volatile global financial environment. Other factors adversely affecting the business environment include constrained fiscal policy; lack of some monetary policy because of a multicurrency system; "policy inconsistency, funding constraints, corruption, inefficient government bureaucracy and inadequate infrastructure" (ADBG, 2014). Monyau and Bandara (2015) summarise the economic situation by their statement:

"The economic recovery in recent years has been underpinned by the mining and agriculture sectors, which accounted for 93.5% of export revenues between 2009 and 2013. Mining, which made up 65.2% of

export earnings over the same period, is a typical enclave sector, with weak linkages to the rest of the economy. It is also capital intensive, with limited employment creation opportunities. The manufacturing sector saw a drop in activity between 2011 and 2014: at least 4 610 companies closed down, resulting in a loss of 55 443 jobs (2015 Budget Statement). On top of this, more than 80.0% of workers are employed in the informal sector".

Zimbabwe is experiencing deflation with prices decreasing by an average of -2,65% between April 2014 and April 2015; with "the year-on-year Food and Non-Alcoholic beverages standing at -2,93 percent" (Financial Gazette, 2015). One would wonder what effect that has on the economic activity. **Figure 2.1** models the scenario. It means lower product prices that lead to smaller cash flow and profits that lead to low production. Reduced production means reduced unemployment and reduced expenditure on commercial products and leading to oversupply and back to reduced prices.

Figure 2.1: Effects of deflation on the economy



Source: Financial Gazette (2015)

According to Techfin Research quoted in Financial Gazette (2015) analysis indicates that the deflation situation can be interpreted as:

- The nation is experiencing slow economic growth.
- There is a weakening of aggregate demand.
- There is the promotion of high unemployment.
- There is tight liquidity.
- There are increased loan defaults.

- There is reduced lending by banks to productive sectors.

The August 2015 year-on-year Zimbabwean inflation was reported to be -2.77% showing a further downward trend (Financial Gazette, 2015).

2.3 Level of Democracy and economic development

Zimbabwe attained its independence in 1980 and, to date, the leader of the nation has been President Robert Mugabe who is the leader of the ruling party Zanu-PF which has mainly a socialist ideology (Sichone, 2003). That is, political ideologies determine the economic policies advocated by the government and are mainly determined by the ideology of the ruling party. After the 2013 harmonised elections in which Zanu-PF worn through the use of state power, the elections for the 35th time, President Robert Mugabe has been described as a dictator (Southall, 2015). Discussions are on to analyse the effects of levels of democracy on economic activity (McChesney, 2015). Henrekson and Jakobsson (2001) indicated that experiences in Eastern Europe highlight the incompatibility of the full-fledged socialist system and a democratic system. On the other hand, Crouch (2015) comments that capitalism and democracy can be antagonistic systems as well as complementary systems, and extremes of either system are detrimental – however, the detriments of a democratic system are better than the detriments of a capitalistic system. That leaves democracy with superiority over other systems. McChesney (2015) asserts that democratic infrastructure is the foundation of effective economic activity and enables entrepreneurs to invest without much inference as well as empowering the citizens. Thus, the lack of democracy in Zimbabwe leads to ineffective economic activity. In this thesis, Zimbabwe is compared to different economies that some may have better levels of democracy while other may have the same levels of democracy relatively. In general, developed countries / 1st world countries are relatively more democratic than developing countries / 3rdworld countries. That means technopreneurship can be seen to be more successful in more democratic nations than those under a dictatorship like Zimbabwe.

2.4 Contribution of Zimbabwe in the SADC region

The South African Development Community (SADC) region is composed of 15 countries, in alphabetical order: Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. The major focus of SADC is to achieve political and economic integration but this has been hampered by different economic development levels in the nations (Moyo, 2014).

Zimbabwe contributes in the SADC region mainly through imports and exports. Nyoni (2014) indicated that Zimbabwe exports to SADC countries though dominated by commodities, increased from 2009 to 2013 by 113%. It has to be noted that, this period was a period of relatively political stability brought by

a Government of National Unity (GNU) through a Global Political Agreement between the Zimbabwean political parties. A different scenario can be noted after the 2013 elections where ZANU-PF used state machinery to win the elections. The Zimbabwean balance of trade in December 2014 was pegged at – USD$290.99 million, which shows a serious deficit because of decreased local industrial activity and increased imports (Trading Economics, 2016).

The exports to SADC were mainly Minerals (diamonds, nickel, iron and steel), tobacco, cotton, sugar, cement, raw hides and skins, and wood products while the nation's imports included fertilizers, petroleum oils, nickel matte, maize, animal feeds, motor vehicles and electrical energy. Of interest to this study are the food products which Zimbabwe is importing instead of producing. Moyo (2014) indicated that Zimbabwe and other SADC countries are mainly consumers of an industrialised South African economy. Despite the issues of global warming and climate change which has caused persistent drought and food shortages in the nation, as well as the dictatorship system in the political situation in Zimbabwe, industrial food processing technopreneurs can still capitalise on other opportunities brought by the global technological trends.

2.5 Distribution of economic activities

The major economic activities in Zimbabwe are:

- Mining – This is the leading income generating activity for the government with exports of minerals such as platinum, gold and diamonds.
- Agriculture – Is also one of the pillars of economic sustenance with the industrialised produce like tobacco, sugar cane and cotton generating income for the government and maize/corn sustaining families.
- Manufacturing – After recording the highest decrease of 73.3% between 2006 and 2008 (Ministry of Industry and Commerce, 2012), the manufacturing activity witnessed a further decrease between 2011 and 2014 with about 4 610 companies closing down and resulting in a loss of 55 443 jobs according to Monyau and Bandara (2015) quoting the Zimbabwe 2015 Budget Statement.
- Services – these cover banking and finance, tourism and communications.

All industries especially the mining and services sector employ more than 80.0% of workers in the informal sector (Monyau and Bandara, 2015) leading to an informalised economy. Zimbabwe covers an area of 390 757 square kilometres with a population of 13 061 239 according to the 2012 population census (ZIMSTAT, 2015). **Figure 2.2** presents the general map of Zimbabwe. Zimbabwe is an African nation that is in Sub-Saharan Africa; landlocked and surrounded by four countries – Mozambique, Zambia, South Africa and Botswana. The location of the study was Zimbabwe, particularly in Harare. Zimbabwe is in Southern Africa and within the South African Development Community (SADC).

The major economic activities, mining and agriculture, are found all over the nation, however with head offices housed mainly in Harare, which is the capital. This is the situation with other sectors like tourism and the financial sector. The situation is a bit different for the manufacturing industry, where production is concentrated in Harare with head offices in the capital Central Business District (CBD).

Figure 2.2: The general map of Zimbabwe

Source: World Atlas (2015)

Harare was chosen since it is the location of most industrial food processing technopreneurs; in fact, most of the manufacturing companies are headquartered in Harare with smaller branches in other smaller cities. Industrial food processing is concentrated in the Harare heavy and light industrial areas.

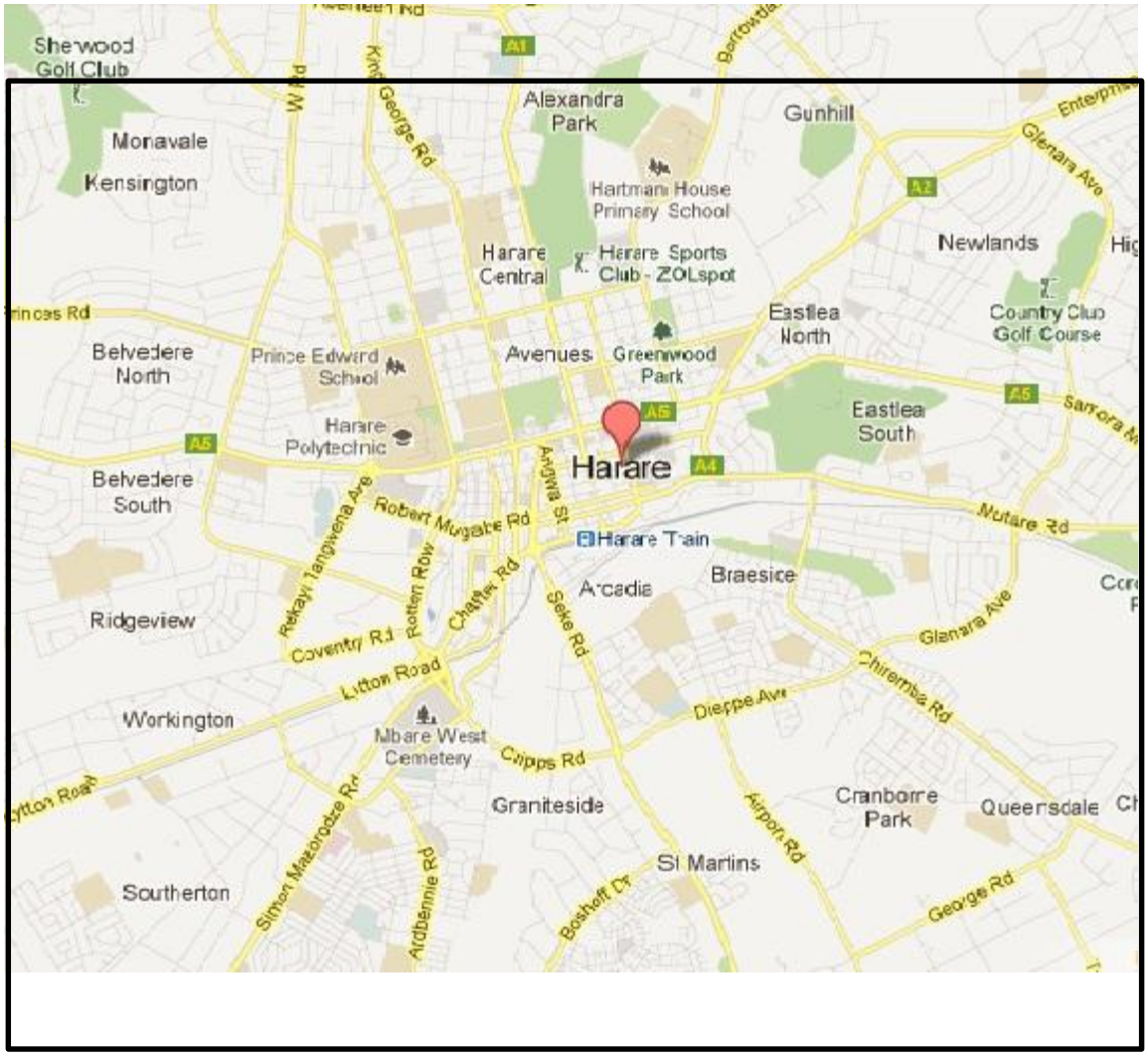


Figure 2.3: Harare Area Map

Source: Harare City Council (2015)

In Harare, industrial food processing technopreneurs are located in different industrial areas with offices in the city centre. The industrial areas include Ardbenie, Graniteside, Willowvale, Ruwa, Chitungwiza, Workington, Southerton and others. The industries cover approximately a 40km radius. The industries with other companies having sub-branches in other towns, produce for the whole nation and some for other neighbouring countries.

2.6 Zimbabwe economic system historically

The current Zimbabwe has its background traceable from 1980 when it attained its independence from Britain or Great Britain or United Kingdom. According to Soludo et al. (2004) Zimbabwe inherited by then one of the economies with one of the strongest industrial bases in Sub-Saharan African nations north of the Limpopo River. From 1980 to 1990 the government adopted a corporatist economic programme that was dropped and replaced by a liberal programme that ended in an economic crisis in around 1997 (Bonga, 2014; Brett, 2005). The corporatist economic system involved subsidies, price controls, licening, redistributive transfers and control of economic activity and the private sector with the government being the sole operator in a significant part of the economy (Brett, 2005). In 1990, the policy maker adopted a liberal economic programme known as Economic Structural Adjustment Programme (ESAP) which involved the removal of controls in trade, investments, credit, foreign exchange and labour (Brett, 2005; Davies, 2004; Davies and Rattsø, 2000). That is, it involved the government relinquishing some of its burdens to the private sector with other players coming in previously government monopolised activities.

ESAP could not last for a decade because of policy failure and was replaced by the Zimbabwe Programme for Economic and Social Transformation (ZIMPREST) in 1996 to 2000 (Bonga, 2014; Brett, 2005; Sichone, 2003). The major goal of ZIMPREST was to correct the shortfall of ESAP through creating a stable macro-economic system that promote higher investments and improved livelihood (Bonga, 2014; Sichone, 2003). ZIMPREST was succeeded by the Millennium Economic Recovery Programme (MERP) in 2001 to 2002. At the end of ZIMPREST in 2000, there was Fast Track Land Reform Program (FTLRP) which supported land acquisition by indigenous black people from white commercial farmers. Since the introduction of ESAP, the Zimbabwean economic performance was continuously retreating so the major objective of MERP was to enhance economic performance by protectionism and stabilisation of prices (Bonga, 2014). MERP lasted only for two years because of the political disaster of farm invasions and was replaced by the National Economic Revival (NERP) in February 2003 (Bonga, 2014). NERP mainly was put in place to save people from long-term drought and redistribution of land through a land reform programme (Bonga, 2014).

NERP lasted for some time with the government unable to launch a well-defined economic policy up to 2008 when the Government of National Unity (GNU) was put in place. NERP marked the end a sustainable economy that was described by Moyo and Basada (2008:7) as:

"Economic turmoil, caused by failed land reforms and inflation, combined with increased malnutrition, and evaporating access to education, health care, and employment have only exacerbated unrest, particularly for constituencies who receive few benefits from President Robert Mugabe's regime."

The birth of the GNU through the Global Political Agreement (GPA) saw the launch of the Short Term Emergency Recovery Programme (STERP) in 2009 to 2012. STERP was part of the implementation of GPA. Bonga (2014:9-10) states that: *"The key priority areas of STERP were Political and Governance Issues constitution and the constitution-making processes, media and media reforms, legislations reforms) intended at strengthening governance and accountability, promoting governance and the rule of law and promoting equality and fairness, including gender equality."*

From 2013 to 2018 there is the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET) whose goal can be summarized by a quotation of Bonga (2014:10) from the speech of the president on the launching ceremony as:
"In pursuit of a new trajectory of accelerated economic growth and wealth creation, my Government has formulated a new plan known as the Zimbabwe Agenda for Socio-Economic Transformation (ZIMASSET): October 2013 to December 2018. ZIMASSET was crafted to achieve sustainable development and social equity anchored on indigenisation, empowerment and employment creation that will be largely propelled by the judicious exploitation of the country's abundant natural and human resources."

Thus, this study took place during the era of ZIMASSET, where the controversial indigenisation programme is being implemented. Bonga (2014) warns that without the collaboration of economic agents and all sectors and stakeholders, the programme will once again be a failure and proposed that the business community and the government work together to eliminate sabotage. That is without proper governance, coordinated effort and management of internal and external relationships the programme will be a failure.

The Fast Track Land Reform Programme (FTLRP) is classified as one of the policy failures (Murphy, 2013; Munangagwa, 2009). The FTLRP marked the beginning of the worst economic policy ever and buttressed by the controversial the Indigenisation Act of 2008 which is still effective in ZIMASSET and which condemns economic development through Foreign Direct Investments (FDIs) thus heading for failure (Murphy, 2013), especially in the current globalised economy.

According to Murphy (2013), economic policy failure is characterised by social suffering, economic crisis and political instability. Hungwe (2015) reported that President Robert Mugabe on his 91st birthday admitted that the controversial land reform programme was a failure when he was quoted saying, "I think the farms we gave to people are too large. They can't manage them." This was a reflective statement by some aged man who has had some long experience with several economic programmes that all failed.

2.7 General overview of the industrial background

Zimbabwe went through a deindustrialisation process since 2000. The manufacturing industry contributes about 15% of the country's Gross Domestic Product (GDP) (Ministry of Industry and Commerce, 2012). The major events were driven by the political situation in the nation which saw commercial farms being invaded and most white farmers displaced in 2002. Since then the supply of agricultural produce declined affecting most industrial food processing technopreneurs in the nation. The manufacturing sector obtains 63% of its inputs from the agricultural sector (CZI, 2010). With low economic activity especially in the agricultural sector, industrial food processing technopreneurs turned to imports. This had an effect of increasing production costs and, as a result, rendering local production not viable. The trend continued downwards up to the major economic deterioration in Zimbabwe in 2007-2008, which was marked by an annual hyperinflation rate that was more than over 231 million percent in mid-2008 (CZI, 2010), hence rendering the currency unusable. By then all industrial activities came to a halt.

There was an economic meltdown of about 40% (CZI, 2010). The economic crisis led to the formation of a Government of National Unity (GNU) in 2009. This led to an introduction of a multicurrency system. The introduction of a multicurrency and political stability led to some improvement of the economic situation. Capacity utilisation rose up to 43.7% in mid-year 2010 and thus there was some form of reindustrialization in the manufacturing sector. Capacity utilisation could be viewed as an important measure and determinant of industrial activity. **Figure 2.4** below can assist to have an insight of the major trends in the Zimbabwean manufacturing sector from 2008 to 2013. 2014 capacity utilisation was pegged at 36.3% (CZI, 2014), which represented a further downward trend. In other words, economic activity is still falling in the Zimbabwean economy given the importance of the manufacturing sector to the economy.

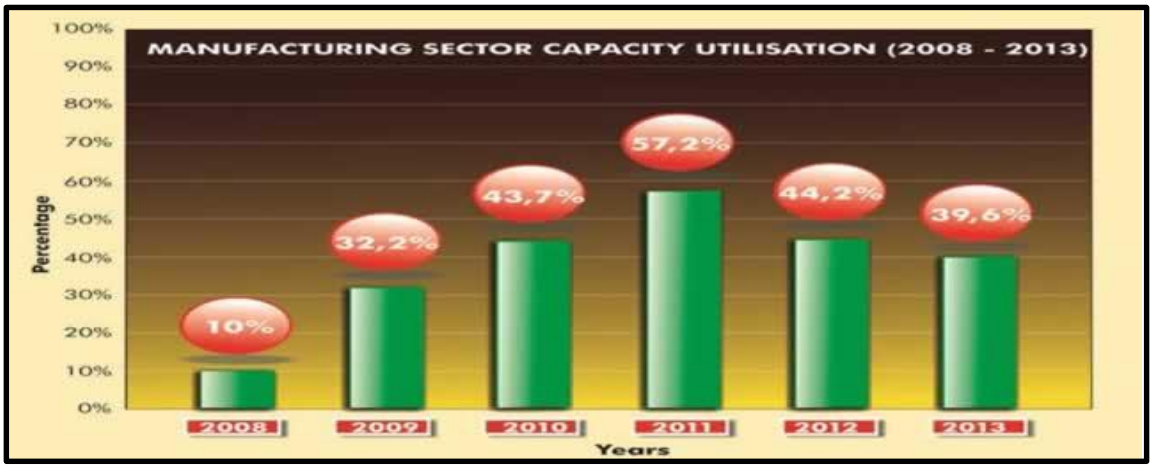


Figure 2.4: Zimbabwe Manufacturing Sector Capacity Utilisation (2008 – 2013).

Source: The Herald (3 October 2013)

2.8 Industrial Development Policy (IDP)

Industrialisation is taken to be critical to economic development in Zimbabwe. Aiming to show the importance of industrialisation, the government developed an IDP. The previous IDP addressed 2004-2010. According to The Ministry of Industry and Commerce (MIC, 2012), the major drawback to the success of the IDP 2004-2010 was viewed as the absence of a mechanism for institutional funding with enough resources that was specifically targeted to help the manufacturing sector. The IDP 2012-2016 has a particular emphasis on promises to design a plan to harness resources for the manufacturing sector. Furthermore, it also includes other policy strategies like plant, equipment and skills audit; import substitution; value addition; tariff regime; technology transfer, and research and development. Cluster initiative is also taken as an industrialisation strategy that succeeded in other economies like the Republic of Korea, Malaysia and Pakistan. The IDP 2012-2016 is in full support of the Indigenisation and Economic Empowerment Act [*Chapter 14:33*] (IEEA) which holds that at least 51% of ownership of all public companies or all other businesses should be owned by indigenous Zimbabweans (IEEA, Chapter 14:2004).

2.9 Food processing sector

The food processing sector is a sub-sector of the manufacturing sector in Zimbabwe. Like the general manufacturing sector, the food processing sector was equally affected by the political and economic challenges in the nation. Perhaps owing to the political and economic challenges, there is not enough formal information, readily available for use by researchers and other users. The study obtained information of the food processing sector from records of CZI, annual reports and the stock exchange. In addition to the different sources of data, availability of food products on the retail market could also point to the existence of the food processing company. Generally, 64 companies were registered on the Zimbabwe Stock Exchange (ZSE) on 1 September 2015, and only three companies were classified as in the food sector and two in the beverage sector. Other sectors included the agricultural sector, mining sector, technology sector, banking and finance, and tourism. Therefore, it can be concluded that 5 out of 64 companies listed on the ZSE are the food and beverage sector, which is about 8%. The implication of such an issue is the low performance of the industry. The industry was not spared by the global economic meltdown, which was characterised by companies' downsizing, retrenching and others closing in great numbers. The CZI has a membership of companies in the general manufacturing sector. While at least 50 companies are members of CZI, seven are from the food processing sector. Companies that are members of CZI are mostly from the private sector. Multinationals and parastatals are not members of the organisation. The food and beverage sector used to have their own sub-association to cater for their unique needs but it dissolved owing to the rampant political and economic sectors. In general, the food processing sector in Zimbabwe specialises in different food stuff. The specialisations cover meat processing, dairy products, beverages, cereals and snacks, mealie meal production, rice processing and packaging, cooking oil and others. About 15 companies, some of which are subsidiaries of others are still operational in the

industrial food processing sector in Zimbabwe. In Harare, industrial food processing technopreneurs are located in different industrial areas with offices in the city centre. The industrial areas include Ardbenie, Graniteside, Willowvale, Ruwa, Chitungwiza, Workington, Southerton and others. The industries cover approximately a 40km radius. The industries with other companies that have sub-branches in other towns produce for the whole nation and some for other neighbouring countries.

2.10 Challenges of the food processing sector

The challenges faced by the food processing sector are not unique but those are affecting the whole manufacturing industry and the economy at large. According to the CZI (2014), such challenges include unchanged economic policy, low local demand, liquidity crunch and lack of capital inflow. **Table 2.1** summarises challenges gathered from six food processing companies' reports. The challenges highlighted in **Table 2.1** have led to continuous shrinkage of the food processing sector with some of the companies closing and the remaining retrenching as survival strategies. The industry is marked by a floodgate of litigations.

Table 2.1: Challenges faced by some industrial food processing technopreneurs in Zimbabwe

Company	Highlighted challenges
1	Shortage of locally produced raw materials; Lack of supplies; Competition from finished imports; Power supply; Overhead costs; Reduced disposable incomes; Regional competitor activity
2	The environment turbulent, challenging and unpredictable; regional competition
3	Shortage of supply of raw materials; lower disposable income, declining consumer purchasing power; competition from imported finished food products; cheaper South African imports
4	Compromised control and governance environment, ceuipment failures – operating an ageing facility
5	Shortage of inputs; power and water outages; labour disputes; high cost of Utilities; high price competition; deflation – retail price index of -2.81% and -3.32% for food and beverages
6	Inadequate capital financing; declining capacity utilisation; high cost and unreliable supply of utilities such as energy and water; increasing costs of key raw materials; competition from cheaper imports; limited lines of credit and the high cost of capital.

Source: Own compilation from annual reports of food processing companies in Zimbabwe

Looking at the local supply side of the industrial food processing sector, Mutenga (2015) indicated major factors affecting the agricultural sector as:

- the successive droughts,
- poor investment in production,
- lack of cheaper lines of credit,
- lack of equipment, and
- the high cost of inputs.

Mutenga (2015) went on to assert that the factors had "taken a toll on Zimbabwe's agricultural sector, which has failed to ensure food security and also feed the country's agriculture-based industries." This is supported by the fact that shortage of inputs is a pertinent factor affecting the industrial food processing sector and shortage of inputs leads to increased cost of inputs and production. The latest development was the 17th July 2015 Supreme Court ruling that led to about 30 000 workers being retrenched within 30 days on no package (Martel, 2015). This was replaced by the Labour Amendment Act 5, 2015 which was launched in retrospect in August 2015. The scenario has brought workers to work under fear and uncertainty. The workers feel they have no job security; as a result, they are hostile.

Other factors include the infrastructural challenges. According to Financial Gazette (2015), the 3rd point of the 25 August 2015 Ten Point Plan for sustained economic growth reads, "Focusing on Infrastructure development, particularly in the key Energy, Water, Transport and ICTs subsectors." The statement could be out of the realisation that infrastructure is a key element in industrial production. In June 2015, reports were that, "ZESA Holdings is already faced with a 400 megawatts (MW) plunge in generation capacity at Kariba Power Station occasioned by the fall in water supplies in Kariba Dam" (Mlanga, 2015). In September 2015, the Financial Gazette (2015) reported that **e**lectricity generation had fallen to below 1 000MW. In October 2015, Mhlanga (2015) indicated that the situation could worsen given insufficient rainfall forecasts for the region in the 2015-2016 rain season. The electricity shortage also leads to the shortage of water supply since water is pumped by electric motors.

2.11 Importance of the food processing sector

Access to food is not a privilege but a basic human right for all people and most advocated and enshrined in international laws as well as most advocated by most human rights activists and organisations; however, is the most infringed (Clover, 2003). Food is a basic requirement for human life sustenance that it is always a priority for most governments where the people may be vulnerable to food shortages because of political and economic crises due to natural disasters. Food security concerns three aspects, that is, food access, food adequacy and food availability (Mwaniki, 2006). Achieving outright food security is a challenge for

not only developing economies but also for developed economies (Mwaniki, 2006). Societies obtain their food to sustain themselves from subsistence production, the market or donations from the government or non-governmental organisations (Baiphethi and Jecobs, 2009). Subsistence works well in primitive unurbanised societies while the market is the major source of urbanised societies. Donations are most pertinent in the case of natural disasters or political and economic crisis and in most cases these have no assurance for continuous sustenance. Given the urbanised situation of the Zimbabwean communities (Potts, 2015), it can be concluded that the major source of food for individuals, households and societies is the market. When the market fails to supply enough food for the communities, it means disaster. Thus, food production and processing are of paramount importance to Zimbabwe and all other economies.

According to ZIMSTAT (2015), the poverty datum line measured regarding food requirements per capita in July 2015 was US$31.41. Given the population of 13 061 239, it means food production to sustain the population should be valued at US$410 353 517. This could be compared with total food production from agriculture and industrial food processing technopreneurs. Given the agricultural, industrial and industrial food processing situation, the result is that regarding food requirements to satisfy the population there is a need to supplement the deficit by importing food products.

The Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET 2013 to 2018) is the current economic policy for the nation. The policy and its supporting documents like the IDP 2012-2016 place the agricultural sector and value addition (food processing) as some of the prioritised economic activities. ZIMASSET 2013-2018 places food security and nutrition as the first cluster of monitoring implementation of the economic policy (Zimbabwe Government, 2013). Thus, the agricultural sector is on the supply side of the food processing sector. In turn agricultural input manufacturing sector is on the supply side of the agricultural sector. The viability of the food processing sector is derived from the agricultural sector, which in turn is derived from the agricultural input manufacturing sector.

2.12 Summary

Zimbabwe is a landlocked country in southern Africa between Zambia, Mozambique, South Africa and Botswana. The nation relies mainly on mining and agriculture and to some extent manufacturing. The Zimbabwean economy is currently dominated by a massive economic meltdown, characterised by company closures, massive retrenchment and downsizing. The nation has its economic policy, ZIMASSET, which has other economic policy documents like the Industrial Development Policy (IDP) which have a direct bearing on the food processing sector. The economic policy seems not to yield much regarding boosting the food processing sector. Major challenges facing the food processing sector are not unique to the sector but common to the Zimbabwean manufacturing sector. The challenges include competition from imported foodstuff; load shedding; policy instability; electricity costs and corruption

(CZI, 2015). The latest challenges emanate from the economic situation; characterised by year-on-year September 2015 inflation rate of -3.11% (Mangudhla, 2015). This research addresses these challenges by analysing the factors influencing technopreneurship in the sector and recommending strategic and policy guidelines for the sector. The chapter has covered the overview of the Zimbabwean economic situation with emphasis on the food processing sector. The next chapter covers technopreneurship as an area of study and its application globally, locally and in the Zimbabwean food processing sector.

CHAPTER 3: TECHNOPRENEURSHIP

3.1 Introduction

Technopreneurship determines the national and organisational competitiveness that not only is based on the availability of cheap labour and abundance of natural endowments but scientific, technological and business innovations (Harlanu and Nugroho, 2015).This has been studied and advocated for such nations as Indonesia (Harlanu and Nugroho, 2015); India (Sahoo, 2015); Nigeria (Kwa et al., 2014); Namibia (Dana, 1993) Mozambique (Dana, 1996) and Lesotho (Dana, 1997). In this study, technopreneurship is applied to industrial food processing in Zimbabwe. Industrial food processing technologies, the innovativeness of Zimbabwean industrial food processing technopreneurs and entrepreneurial skills and knowledge of industrial food processing technopreneurs in the turbulent Zimbabwean business environment are the areas of concentration of this study. Reference is given to the global, international, national and industrial application of technopreneurship in food processing.

The main focus of this chapter is the discussion of the content of the subject matter of the study – technopreneurship. This chapter deals with empirical and theoretical literature in technopreneurship and factors that influence it. According to Boell and Cecez-Kecmanovic (2014), the process involved consist of, "literature searching, classifying and mapping, critical assessment, and argument development". The reviewed literature and discussion will assist in the development of the body of knowledge thatis needed in technopreneurship as an area of study and practically especially by developing economies in the Sub-Saharan Africa and worldwide. Other related areas to be covered include; entrepreneurship, technology, innovation, industrialisation. The area of technopreneurship is relatively new, with known peer reviewed literature dating as new as the new millennium. Known theories and models of technopreneurship are covered and in this study so as to establish factors that influence technopreneurship in the Zimbabwean food processing sector.

3.2 Entrepreneurship versus Technopreneurship

Malakh-Pines and Èzbilgin (2010) look at entrepreneurship as a broad discipline or field of study which has different versions one of which is technopreneurship. Thus technopreneurship is entrepreneurship which is technologically based. The perspective is shared by Venkataraman (2004); Antoncic and Prodan (2008); Urban (2010); Lakitan (2013); Van der Lingen and Van Niekerk (2015); Harlanua and Nugrohob (2015). Liu (2008) view technopreneurship as analogous to knowledge-based innovation which is seen as the 'super star' of entrepreneurship. This study adopts the view that entrepreneurship is the broader area of study and technopreneurship is narrower subject area. That is entrepreneurship is the discipline while technopreneurship is the subject area.

3.3 Entrepreneurship

Literature shows that citations between Entrepreneurship and Technology Studies as fields of discussion are scarce, as compared to citations within each of the fields (Bhupatiraju et al., 2012). It is at this intersection that this study is positioned. Greater integration between the fields of entrepreneurship and innovation studies is yet to be well documented (Landström et al., 2012). The three areas of entrepreneurship, innovation studies and science and technology have been taken as drivers of economic development in the knowledge-based economies (Wong et al., 2007). Nacu and Avasilcăi (2014) had to point out that:

"Entrepreneurship is seen as a process of searching for market opportunities and organisational resources necessary to exploit these opportunities to gain results on a long term. This is a process of planning, organising opportunities and risk taking. Thus, it is considered a business risk. It can be distinguished as independent risk-taking theability to achieve the biggest gains in the market. This is a creative and innovative ability and an adaptation response to the real business environment".

Entrepreneurship is one of the cornerstones of technopreneurship. Audretsch et al. (2015) define entrepreneurship as a term that has different meanings to different people such as scholars, industrialists and policy makers with several different implications to include: innovation, creativity, new venture development, and economic growth. This is an open view of the subject area as opposed to a narrower view that will reduce the scope. Given this, it has to be appreciated that entrepreneurship is a broad term that may be viewedin different angles, however, touches all main categories of stakeholders to include industrialists, society, academics and policy makers. Gries and Naudé (2011:216) define entrepreneurship as, "the resource, process and state of being through and in which individuals utilise positive opportunities in the market by creating and growing new business firms". The definition overlooks the issue of innovation: not all new businesses are innovative. From this perspective, it has to be appreciated that most African societies have a tendency of being traditional in their beliefs, attitudes and even business activities. Entrepreneurs do not create human needs but create and innovate new ways of satisfying those needs. Traditional ways of satisfying human needs or problems are equivalent to traditional non-innovative business efforts that in most cases fall short of the competitiveness required surviving in modern business environments. The dominant empirical definition of entrepreneurship in economic geography is the formation of a new firm by (an) individual(s); these individuals are called entrepreneurs or an entrepreneurial team when a collective starts a firm (Ünay and Zehir, 2012). The definition is taken to suit also the context of this study. However, the type of the new firm has to meet additional criteria for it to be classified as a product of technopreneurship. That is the essence of this study. Nasution et al. (2011:336) define entrepreneurship as "a process of enhancement of wealth through innovation and exploitation of opportunities, which requires the entrepreneurial characteristics of risk-taking, autonomy, and

proactiveness". The definition identifies important facets of entrepreneurship that include that it: is a process; involves wealth creation; is innovative; exploits business opportunities; involves risk-taking; self-governing and timeous. It is important to identify the major determinants of entrepreneurship since it is a field thatis mistaken in most cases.

This study adopts the process approach to determining the role of a technopreneur. According to Bygrave (2004), cited in Moroz and Hindle (2012:788), the entrepreneurial process involves "all the functions, activities, and actions associated with perceiving opportunities and creating organisations to pursue them". From this perspective, this study investigates functions, activities and actions required to exploit perceived opportunities in the food processing industry. It is believed that if entrepreneurship is understood from a process perspective, all the stages could have enough attention for the success of the whole process. Most developing economies fail to go through the whole process. They may succeed in realising the need to be entrepreneurs, identify the opportunities but may fail to pursue them or may pursue the opportunities but fail to create viable ventures. That may be owing to lack of skill or support.

Naude´ (2011), identifies three elements of a definition of entrepreneurship – resource coordination, new businesses creation, and innovation. The issue of new businesses, creativity and innovation, were discussed above. Zimbabwe like most African countries is endowed with some natural resources that are supposed to be coordinated through entrepreneurial skills to create new ventures to enhance economic development. This points to a shortfall among the skills required to develop such economies through entrepreneurial skills and aptitude. Furthermore, coordination of resources may not be enough without the application of knowledge to industrial operations. This brings in the notion of technology added to the entrepreneurial skills and thus the essence of technopreneurship in industrialisation.

Ünay and Zehir (2012) argue that the literature on entrepreneurship recognizes a variety of entrepreneurial roles in economic change, as the person who assumes the risk associated with uncertainty; an innovator; a decision maker; an industrial leader; an organiser and coordinator of economic resources; an arbitrageur; and an allocator of resources among alternative uses. The roles could be taken to fit a technopreneur but the question that remains unanswered is at which stage of the entrepreneurial process to assume which role. Li et al. (2012) concluded that entrepreneurship has a positive impact on economic growth and this finding is robust even after controlling for some demographic and institutional variables. Lastly De Beer et al. (2014:40), assert that one of the most referenced definitions of entrepreneurship in development literature is: "the manifest ability and willingness of individuals, on their own, in teams within and outside existing organizations, to perceive and create new economic opportunities (new products, new production methods, new organizational schemes and new product-market combinations) and to introduce their ideas in the market, in the face of uncertainty and other obstacles, by making decisions on location, form and the use of resources and institutions".

According to Bygrave and Zacharakis (2009:2), the entrepreneurial process involves "all the functions, activities, and actions associated with perceiving opportunities and creating organisations to pursue them". From this perspective, this study investigates functions, activities and actions required to exploit perceived opportunities in the region. The dominant empirical definition about entrepreneurship in economic geography has to with the formation of a new business venture by an individual or group who constitute an entrepreneurial team (Ünay and Zehir, 2012). This study is in agreement with this perspective. However, the type of the new firm has to meet additional criteria for it to be classified as a product of technopreneurship. This is the essence of this study.

In this study entrepreneurship is defined as *a behavioural process of perceiving and exploiting an innovative business opportunity and creating wealth against all odds.* In this perspective, the emphasis is that a definition which does not capture the issues of innovation, behavioural processes and wealth creation is not sufficient. However, it is also imperative that the subject areas emanating from entrepreneurship are also looked into. Entrepreneurship can be viewed from the perspective of whether it involves creating a new entity (Nascent entrepreneurship or entra-preneurship) or an existing organisation (corporate entrepreneurship or intra-preneurship). It can also be viewed from the perspective of the initial drive in the entrepreneur, that is, whether for commercial purpose or social purposes (social entrepreneurship).

3.4 Technology

Technology is also one of the key elements of technopreneurship and also one of the loosely used by many academics. The context of each use should be stated in each case. Wagner et al. (2015:4) define technology as "a set of tools designed to manipulate the natural world and to extend human intentions".This makes sense since it captures the notion of solving day to day problems but may require further clarification of two terms; science and mechanics. Wagner et al. (2015:3) distinguish technology from science as they define science as "a way of knowing things - it is a widely accepted, adaptable, and a transferable set of assumptions about how to understand the world in which we find ourselves."

The International Technology Education Association (2007:12) holds that "broadly speaking technology is how people modify the natural world to suit their purpose." The definition implies a diverse set of processes, procedures and knowledge that people utilise to improve continuously their ability to meet their needs and wants. It is broad enough but needs some explanation to point to these processes, knowledge and needs. Originally, according to Funk (1999), the word "*technology*" comes from two Greek words, transliterated "*techne*" and "*logos"*. "*Techne*" means art, skill, craft, or the way, manner, or means by which a thing is gained. "*Logos*" means word, the utterance by which inward thought is expressed, a

saying, or an expression. So, technology means words or discourse about the way things are gained. Funk (1999), went on to give five different definitions of technology to illustrate the different perspectives:

1. First, technology is the rational process of creating means to order and transform matter, energy, and information to realise certain valued ends.
2. Second, technology is the set of means (tools, devices, systems, methods, procedures) created by the technological process. Technological objects range from toothbrushes to transportation systems.
3. Third, technology is the knowledge that makes the technological process possible. It consists of the facts and procedures necessary to order and manipulate matter, energy, and information, as well as how to discover new means of such transformations.
4. Fourth, technology is a subset of related technological objects and knowledge. Computer technology and medical technology are examples of technologies.
5. Finally, technology is asystem consisting of atechnological process, technological objects, technological knowledge, developers of technological objects, users of technological objects, and the worldview (that is, the beliefs about things and the value of things that shape how one views the world) that has emerged from and drives the technological process.

Technology is so pervasive that it influences social life on a day-to-day basis (Kim and Lee, 2015). Most definitions of technology are myopic and lack a full understanding of the phenomenon. Another definition which can be seen as providing a full meaning of technology, apart from Funk's fifth definition (1999), is by Rebentisch and Ferretti (1995:2), who consider technology as, "any form, material or social, into which knowledge has been embodied; to include hardware, software, products, rules, procedures, organizational structure, and knowledgeor technical expertise." The list of issues that are covered by technology is endless, but the common thread is that they are all aimed at solving day-to-day industrial and domestic problems in a community through the application of knowledge to human activities. In practice, technology covers all disciplines and industries, that is, there is technology in all science and engineering disciplines, as there is also technology in business sciences, humanities and social sciences. There is also mining technology (Wang et al., 2015), farming technology (Holbreich et al., 2015), manufacturing or production technology (Milián and Kamen, 2015) and business technology (Strumickas and Valanciene, 2015), medical technology (Murray et al., 2015) and education technology (Schwendimann et al., 2015). Each field has its technology aimed at solving problems and making life convenient in each area. Other technologies cut across disciplines and industries such as information technology and nanotechnology. Sociopreneurs should appreciate that most social challenges are solved through the application of knowledge to human activities. Modern economies are knowledge based and, given that entrepreneurship is innovation based, there is a need to realise that sociopreneurship is made effective by fusing it with technological innovation (Technovation) and technopreneurship.

In this study, as such, by the same understanding, it can be concluded that *technology is the application of scientific knowledge (natural or social) to solve industrial or domestic day-to-day operational problems.* Thus, technology can be equated to applied science or scientific knowledge endowed with purpose and interactive tools such as technical expertise, rules, policies and procedures, strategies, hardware and software.It can also be viewed as an application of knowledge to human life. Day-to-day living standards here refer to the very idea that there is a need for continuous discovery of ways to make life more convenient. The purpose of technology is to enhance continuously the quality of human life. The definition is comprehensive and all are encompassing, assisting people understand the diversity of technology. The definition and the accompanying explanations are combined with the concept of entrepreneurship to propose industrial food processing start-ups.

Kim and Lee (2015:43) had wonderful results that can be quoted as:
" ... it is not scientific knowledge (academic articles) but technological knowledge (patents) that matters for economic growth, and that generating scientific knowledge does not automatically lead to the generation of technological knowledge. We find that technological knowledge is primarily determined by corporate research and development efforts, which used to be more lacking in Latin American countries, compared with East Asia. This finding sheds new light on the question of why Latin American and East Asian countries have shown such divergent economic performances."

Latin America is not the only one affected by this mistake, the problem is rampant and one ruining most African countries, especially sub-Saharan Africa. In particular Zimbabwe, which is viewed as having the highest level of literacy in the region, is lacking development because of concentrating on acquiring scientific knowledge without application (technology).

The Second Science, Technology and Innovation (STI) Policy of Zimbabwe has as its goals:

- To strengthen capacity development in STI.
- To learn and utilise emergent technologies to accelerate development.
- To accelerate thecommercialisation of research results.
- To search for scientific solutions to global environmental challenges.
- Mobilise resources and popularise science and technology.
- Foster international collaboration in STI.

If the STI goals could be pursued earnestly through the collaboration of all stakeholders with the government being the captain; it could take the nation somewhere. However, it could require the blending of the STI policy with the entrepreneurial facet to make it a technopreneurial policy. The argument being that science, technology and innovation may not function well without an entrepreneurial thrust.

Jakšić et al. (2014) identified six technologies which they took to be pivotal and behind the development and introduction of new products in future and impacting on the socio-economic systems to include:

- Advanced material technology.
- Nanotechnology
- Industrial biotechnology
- Photonics
- Micro and nanoelectronics
- Advanced manufacturing systems

The technologies are said to be cutting across industries. In Zimbabwe, these could have been known but not yet applied

Industrial food processing technologies vary greatly to include: High-pressure processing (HPP); Pulsed electric field (PEF); Ultraviolet light (UV); Radiation; Ozone (O3); Pressure and CO2; Power ultrasound; Cold atmospheric plasma; and Electrolysed water (Jermann et al., 2015). Several different factors determine Their rate of adoption. Energy requirements can be the major determining factor of whether to adopt or not to adopt anindustrial food processing technology (Rodriguez-Gonzalez et al., 2015). On the other hand, Ibarz et al. (2015) state factors such as emission power and stability, long life, adequate physical dimensions, ease of use and low cost as factors influencing the adoption of industrial food processing technology for industrial use. Jermann et al. (2015) indicate such factors as thecost of the equipment; lack of variety of equipment available; and lack of clear benefits of utilising the novel technology. Also, communication supports the adoption of novel technology (Dossick and Neff, 2011; Jermann et al., 2015).

3.5 Innovation

Jonsson (2015) view innovation as the utilisation of new technology in an organisation. In most cases scholars discuss innovation in conjunction with entrepreneurship as both are believed to influence technological development in designing, production and marketing of goods and services (Jonsson, 2015). Innovation can be categorised as either: business innovation (Kanter, 2015); industrial innovation (Mowery et al. 2015); financial innovation (Laeven et al., 2015); process innovation (Prajogo, 2015), product innovation (Prajogo, 2015) and technological innovation (Camisón and Villar-López, 2014).

Innovation is, also, an essential term to be understood in this study. Ünay and Zehir (2012:316) hold that "*innovation is also about new processes and new ways of doing things that may not be obvious to customers but add significant value in delivering the services and products that customers require*".

Urabe et al. (1988:4) holds that:

''Innovation consists of the generation of a new idea and its implementation into a new product, process or service, leading to the dynamic growth of the national economy and the increase of employment as well as to a creation of pure profit for the innovative business enterprise. Innovation is never a one-time phenomenon, but a long and cumulative process of a great number of the organisational decision-making process, ranging from the phase of generation of a new idea to its implementation phase. New idea refers to the perception of a new customer need or a new way to produce. It is generated in the cumulative process of information-gathering, coupled with an ever-challenging entrepreneurial vision. Through the implementation process, the new idea is developed and commercialised into a new marketable product or a new process with attendant cost reduction and increased productivity''.

The definition is comprehensive and is enhanced by the accompanying explanation. Afuah (1998) refers to innovation as, "new knowledge incorporated in products, processes, and services". The definition is short and to the point. Caggese (2012) holds that "entrepreneurial firms are an engine of innovation and technological progress, and they are likely to be responsible for a substantial portion of productivity and employment growth". Again, according to Caggese (2012), the entrepreneurial firm has access to a technology that produces output using capital and is subject to exogenous idiosyncratic shocks to its revenues. Innovation can be categorised into sub-areas that include technological innovation, product innovation, process innovation and business innovation. Innovation can be confused with creativity – creativity is the generation of new ideas while innovation is the application of new ideas.

The definition of innovation as proposed by Afuah (1998) and Garcia and Calantone (2002), cited in Pullen et al. (2012), is invention plus commercialization further aligned as "an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention".This is the essence of technopreneurship in this study. Caggese (2012), holds that entrepreneurial firms are an engine of innovation and technological progress, and they are likely to be responsible for a substantial portion of productivity and employment growth. Again according to Caggese (2012), the entrepreneurial firm has access to a technology that produces output using capital and is subject to exogenous idiosyncratic shocks to its revenues. Innovation is pivotal in technopreneurship. Lee and Narjoko (2015) look at innovation as a process or system of introducing products, businesses or processes in organisations. It can be classified into four categories namely, product innovation, process innovation, organisational innovation and marketing innovation (Lee and Narjoko, 2015). The relationship between innovation and economic development can be demonstrated by a systems perspective where research and development are input, the innovation output is patented and these enhance productivity and hence develop the economy (Lee and Narjoko, 2015).

In analysing the effects of firm size on Research and Development (R&D) productivity, for each different technological regime Damanpour (2010) discovered that the relation between firm size and innovation depends on the technological regime. Furthermore, where smaller firms are favoured by regimes characterised by the proximity to the science system, the use of intellectual property rights is a means of appropriation, or by low knowledge cumulativeness. Lastly, the innovation performance of larger firms is comparatively better in regimes with limited use of intellectual property rights and where the relationships with clients and suppliers are important sources of opportunities for innovation (Revilla and Ferna´ndez, 2012).

Although the focus is much on technopreneurship (Technological Entrepreneurship), it has to be noted that innovation is a key concept in both fields. Fusari and Reati (2013), extend the traditional macro and micro economic analysis by presenting a behavioural model in which innovation, entrepreneurship and radical uncertainty play an important role in determining the dynamics of technological revolutions. Clausen and Korneliussen (2012), indicated that entrepreneurship assists the development and commercialization of technology and products through venture incubation; and this was after realising that entrepreneurial orientation proved to have a positive effect on bringing technology and products quickly to the market.

3.6 Technopreneurship defined

The concept of technopreneurship is considered as a real source of economic power in modern knowledge-based as well as developing economies and furthermore a significant value driver of national competitive advantage (Dutse et al., 2013). Technopreneurship in most cases is viewed as business venturing through the compounding of entrepreneurial skills and technological prowess (Pujanis et al., 2015; Dutse et al., 2013; Harlanu and Nugroho, 2015). It is also mostly known as technological entrepreneurship (Satria et al., 2014; Velikova et al., 2015; Venkataraman, 2004). This gives the notion of a hybrid entrepreneurship management and engineering aptitude. That is organisational leadership that is not specialised but is based on both entrepreneurial competence and technological prowess. The technological thrust of technopreneurship is the element that distinguishes technopreneurship from entrepreneurship. However, entrepreneurship is the broader subject area of study and technopreneurship is the sub-sector of entrepreneurship. Dolatabadi and Meigounpoory (2013) view technopreneurship as consisting of innovation, technical science and knowledge applied to the creation and management of a business at some financial risk so as to achieve own goals and perspectives. From this perspective, the application of innovation, scientific knowledge can simply be interpreted as technology, while the creation of businesses and assuming risk to achieve own goals are entrepreneurship. Also, technology is not limited to technical science and knowledge but also covers products, policies, procedures, rules, organisational structure and strategies.

One of the leading proponents of technopreneurship Petti (2012) investigates technological entrepreneurship as encompassing all the activities concerning the identification of opportunities emanating from technological developments and the exploitation of the opportunities by successfully commercialising innovative products. It has to be appreciated that the innovative products include goods, services, ideas, places, people and anything of value that can be commercialised. Three basic issues can be observed in the definition that are: the identification of potential technological opportunities; the exploitation of such opportunities and the materialisation of the technological breakthroughs through products on the market. The principles of commercialisation of technology as a perspective of technopreneurship could be analysed regarding their application to different political leadership styles; that is, different levels of democracy.

Petti (2012) further explains that technological entrepreneurship is all about the transformation of technological developments, technological research, scientific breakthroughs and related investments into value. That createseconomic value in the form of return on investment for the investor, entrepreneurs as well as employment creation, contribution to gross domestic product and government taxes; societal value in the form of employability; enhancement of livelihood andincome per capita. Technopreneurship can be viewed differently on three dimensions according to Petti (2012) such as:

- Different names.
- Different perspectives: a system, a policy, a strategy, a process or individual attitude.
- Different souls: entrepreneurial soul, Technological soul and strategic management soul.

However, the aspect remains the same that of the endowment of technovation with value thereby creating wealth for the communities. As an emerging area of study and policy guide in knowledge-based economies, technopreneurship is attracting a lot of discussions. Websites have some coverage in the definition of technopreneurship. Cereijo (2002) views technopreneurship as a combination of technology ability and entrepreneurial aptitude and looks at it as not an event but a process to influence the future of an individual, organisation or nation, or the universe thus having connotations to economic development and the welfare of people. An important element added by this definition is the issue of determining the future of people in an economy. There is no technopreneurship if an activity does not contribute to sustainable economic development. The concept of sustainable economic development as aired by Kakava et al. (2013), as they evaluated corporate social responsibility activities in developing countries. Also, the process view to technopreneurship is also introduced. The principles of technopreneurship require analysis regarding their application to the Zimbabwean situation of deindustrialisation and political dictatorship.

Toral (2012) introduces some trait approach to viewing a technopreneur, viewing him to be: a technology savvy, creative, dares to be different, innovative, dynamic, takes the unexplored path, and passionate about

his work. The definitions give a focus on the issues analysed in this study as factors that influence technopreneurship. According to Beckman et al. (2012) cited in Judge (2013), technological entrepreneurship exists when developments in science or technology constitute a core element of the opportunity that enables the emergence of a venture, market, cluster, or industry. Bailetti (2012) defines technology entrepreneurship as dealing with individuals or groups and different sophisticated tools and specialised scientific and technological know-how to create and manage a business venture. Once more the definition has connotations to two specialised area of study, that is, technology and entrepreneurship harmonised to create or enhance value. Perhaps the only weakness is the issue of the use of the term 'specialised'. It can be appreciated that a technopreneur is not specialised but has compounded knowledge and skills. These definitions make some sense when focusing on industrial food processing projects that lead to food products on the market.

Beckman et al. (2012) and Petti and Zhang (2013) view technological entrepreneurship from a commercialisation perspective, holding that scientific and technological breakthroughs are the primary opportunity to create a venture, industry, cluster or market. That makes sense to some extent but limits the source of technopreneurial opportunities. While the definition represents most scholars' perspective, it is to some extent narrow in that the notion of technological breakthroughs is not the only source of a technopreneurial opportunity to create a business venture. An economic crisis or developmental need can be an opportunity for a technopreneurial venture and thus several phenomena are sources of technological venture creation to include social or industrial problems, scientific knowledge (social or natural science). The definitions confirm that technopreneurship and technology entrepreneurship or technological entrepreneurship are synonymous. Several nomenclatures have been used in literature to include: technological entrepreneurship, technology entrepreneurship, techno-entrepreneurship or techno-preneurship (Jakšić et al., 2014). In this study, the term technopreneurship is in main use. For the purpose of the study, *technopreneurship is defined as the process of perceiving and pursuing a sustainable opportunity in the form of a technological or scientific breakthrough, economic crisis, developmental need, domestic, social or industrial problem and establishing a sustainable and competitive business venture.* The definition agrees with other definitions in their context, however, combines the issues of contribution to the sustainable economic development and various sources of technopreneurial opportunities. Thus, for an activity to be technopreneurship it should contribute to sustainable economic development apart from combining entrepreneurship and technology.

3.7 Technopreneurship as a Behaviour

Pandey and De (2015:150) take entrepreneurial behaviour to consist in such traits as "innovativeness, firm decision-making, achievement motivation, knowledge of farming enterprises, risk taking ability, leadership ability and cosmopoliteness." The traits will determine how an individual responds to the environment. In practice, people tend to behave differently in response to the same situation in the same circumstances. According to Kuratko et al. (2015:24), "entrepreneurial behaviour is any newly fashioned set of actions through which companies seek to exploit entrepreneurial opportunities rivals have not noticed or exploited". The important element of the definition is the issue of a set of actions taken by an organisation to take advantage of opportunities. Alternatively, strategy (ies) adopted to exploit the opportunities points to the behavioural pattern of the organisation. How does an organisation respond to developments in the environment? Is the organisation proactive or reactive? As asserted by Sabouri and Safarpour (2015) idea application, opportunism and innovation are of the essence in entrepreneurship management. An opportunistic and innovative organisation view environmental threats positively, that is turn threats into opportunities. According to Lau et al. (2012), four dimensions of entrepreneurial behaviour inventory can be identified as consisting of innovativeness, risk taking, change orientation, and opportunism. It can be noted that the four dimensions can be viewed as both traits and behaviours. One of the most important dimension which can be all-encompassing when looking at technopreneurship as behaviour is innovativeness. As noted organisations in the food processing sector in Zimbabwe were facing such threats as cheap imports of food products flooding the local market especially from South Africa and Zambia. Organisational responses to this arena vary. Some feel there is no way out so it is wise to leave local production and start to import. Some find it as an opportunity to adopt new and efficient production technologies so as to be competitive, which is the essence of technovation in entrepreneurship. This perspective applies to entrepreneurial behaviour in corporate entrepreneurship.

Gartner (1989) discusses the behavioural approach to the study of entrepreneurship as a set of activities involved in organisational creation while the trait approach consists of a set of personality traits and characteristics. The definition pertains to nascent entrepreneurship. The main focal point here is the set of activities engaged by the individual to create a new venture. Thus, the person also should have internal processes that are cognitive and effective which act as motivators and drivers to lead to the desired activities of new venture creation. Thus, when motivators become strong enough to push someone to act, they become drivers. Apart from simple nascent entrepreneurship, the issue of entrepreneurship training also touches the issue of behaviour change. Marques (2012) concluded that entrepreneurial intentions of secondary students is determined by personal attitude, subjective norm and perceived behavioural control. The behaviour here is determined by attitudes, personal norms and perceived autonomy. Although this pertains to new practitioners, it is equally applicable to corporate entrepreneurs / technopreneurs, because the organisational entrepreneurial behaviour is a result of individual behavioural patterns. Personal attitude

is towards the behaviour or technopreneurial process; subjective norm pertains to the approval and support from others, and lastly perceived behavioural control consists of the belief that the technopreneur will succeed.

In this study, it is taken that the behavioural concept covers both the behavioural approach and the trait approach to understanding the technopreneurial behaviour. It is shared with the view that the traditional theories of human behaviour hold that psychological, sociological and economic factors (Kets de Vries, 1977) determine the actions taken by a person in response to the external stimuli. Behaviour in this study means *the set of actions adopted by a technopreneur in response to the developments in the economic environment*.

3.8 Technopreneurship as a Process

In this study, to have a simpler understanding of the subject area, technopreneurship is viewed as a process. It is also appreciated that processes take place within an environmental setup where other forces impact on the process, hence the essence of factors influencing technopreneurship.

The general new product development process requires some improvements to suit what can be called a technopreneurial process. Thus, the idea generation, idea screening and concept development and testing can be viewed as the opportunity perception where opportunity receptors are of the essence. The technopreneurs are distinguished from ordinary business managers by the ability to identify opportunities. Business analysis, prototyping and test marketing can be summarised as the persuasion of the opportunity. In this case, it means the technopreneur is making further investments into the project. Lastly the commercialisation, monitoring and evaluation constitute the development of a viable and sustainable business venture. Maglana (2007), proposed a technopreneur continuum. An analysis of the continuum shows a gap between products and the markets, which can be closed by technopreneurship. The continuum, as shown in **Figure 3.1**, implies that the technopreneurship process moves products from discovery through invention, innovation, entrepreneurship to the markets. The weakness of the model perhaps rests in the starting point which seems to be products. In practice, this could be applicable in other cases, but the issue of other opportunities as the starting point should be emphasised. It can be said that products are the result of a problem-solving process. Life problems could be the major source of technopreneurial opportunities.

Figure 3.1 is a fairly elementary figure without considerable contribution in the understanding of technopreneurship. Scientific and technological breakthroughs are not supposed to end up in there without reaching the market. It is the concept once advocated by The Ministry of Science and Technological development in Zimbabwe in 2010 which was entitled, "From lab to village" (Kakava, 2010). The idea of

linking products to the market was also pursued by Bulsara et al. (2009), as they moved the notion that there is a need to move further to techno-entrepreneurship from techno-innovation as an approach to Technology Business Incubation. Thus technological innovation alone is not as effective; neither is entrepreneurship alone but technopreneurship.

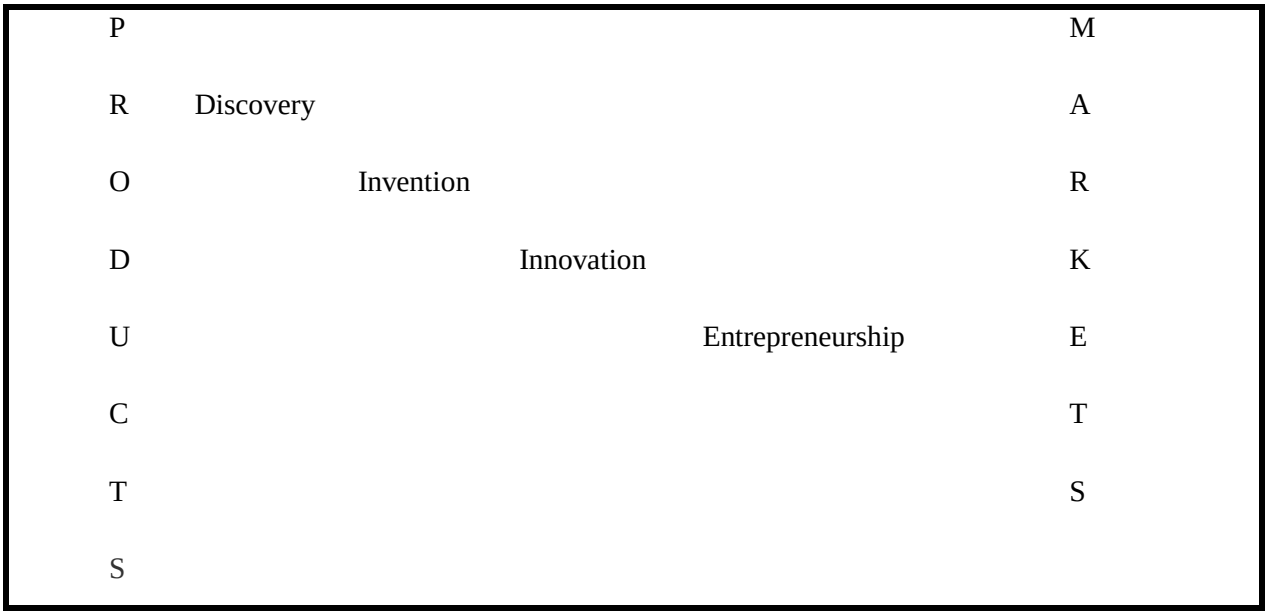


Figure 3.1: A Technological Entrepreneur Continuum
Source: Adapted from Maglana (2007)

However, the continuum also needs to include the issue of contribution to economic development by whatever moves through the continuum. Also, it has to be noted that the technopreneurial process can start from the entrepreneurial extreme or technological extreme or even from a challenge that may be within a different perspective such as an economic crisis as being faced by the nation under consideration. With the economic meltdown, the Zimbabwean economy needed to adopt the technopreneurship process to industrialise. In this research, Technopreneurship is viewed as the process of capitalising on a technological or scientific breakthrough to establish a business venture which contributes to sustainable economic development. However the thrust of this study is on corporate technopreneurship which is defined by Dolatabadi and Meigounpoory (2013) as "an intra- organizational process in which a technological entrepreneur or group of them create and manage an enterprise by research, development, innovation, and technology where this process is followed by venture (risk taking)."

3.9 Determinants of Technopreneurship

Technopreneurship as a subject of entrepreneurship may in most cases be influenced by factors that also influence entrepreneurship. As can be observed from Nacu and Avasilcăi (2014:1072) who indicated that:

"An entrepreneurial framework is defined by some factors such asentrepreneur, along with his personal and professional characteristics, who is the main actor of the so-called entrepreneurial process; business idea that entrepreneur wants to turn it into profitable business; market opportunity, which demonstrates that the business idea is valid, has novelty and can be fructified and developed; business plan, that needs to be well prepared in a very detailed manner and containing long run strategies; business start-up resources, including time resources allocated to implement the business plan, physical resources, information, financial and human resources; the environment where the business will be active; technology needed to develop the business activity".

The framework summarises what can be observed as different determinants of entrepreneurship and which can equally be determinants of technopreneurship. Literature that has dealt with the term technopreneurship is advocated by academics from economies that adopted technopreneurship as a lifestyle and economic policy (Caloghirou et al., 2015; Okorie et al., 2014; Wong et al., 2007). Such economies are success stories and the question is: "What are the success factors?" These factors are of interest to our perspective. Some considerable literature has covered factors that influence technopreneurship. Technopreneurship in this study is viewed as a process and behavioural pattern. The factors that have been indicated as influencing technopreneurship are then examined. Literature that has dealt with the term technopreneurship is still scarce. Pereira (2007), had reference to the term from the Singaporean economic policy of 2001 which was named, *Technopreneurship 21*. In Singapore, the government was viewed as a key agent in the process of creating an entrepreneurial culture in the nation (Pereira, 2007). The government's influence on technopreneurship in the Zimbabwean food processing sector is analysed in this study, its role and its policies. Pei et al. (2010) examined success factors that influence the Malaysian IT technopreneurship and these were classified into two categories, that is, internal and external factors. This is related to the views of Pakrad et al. (2012), who concluded that there are five factors influencing technological entrepreneurship, namely Internal processes, Individual factors, Institutions and External networks.

According to Dolatabadi and Meigounpoory (2013) determinants of corporate technopreneurship process consist of organisational, external, institutional and other new factors, that is, technological and individual factors as shown in **Figure 3.2.** The model is including a lot of detail which is not bad but is difficult to analyse. While all the factors included are pertinent, they require to be arranged in a way which shows how the factors also relate to each other. Something to be noted in this case is that while the subject matter is determined by the factors, the factors themselves also influence each other. Furthermore, other factors may be both internal and external such as technological factors that directly determine the organisational day-to-day operations internally and developments in other organisations that have implications to the competitiveness of the organisation. The model seems to be a technological model without entrepreneurship, but technology on its own does not create much value until it is endowed with the

entrepreneurial aspect (Petti and Zhang, 2011). Thus, the entrepreneurial factor was not given the weight it deserves in a technopreneurial entity. It could be considered in institutional factors, organisational factors as well as individual factors. Also, the model does not show corporate technopreneurship as a process that could assist in showing how and at what stage do the factors influence the process. Thus, **Figure 3.2** is a typical conceptual framework for factors influencing technopreneurship. The framework could also include the technopreneurial process so as to show off hand what is being displayed.

Petti and Zhang (2011) identified such factors as specific enterprise processes, external networks attributes and the effects of formal and informal institutions as affecting the technological entrepreneurship capabilities. They had a systematic view to technopreneurship, consisting of the entrepreneurial component, managerial component and the environmental component. Other additions to the system include such interactive actors involved in activities that are technological and entrepreneurial. The important contribution, in this case, pertains to the aspect of a systems view. This enhances the understanding of how factors relate to each other and the influence the dependent variable, in this case, technopreneurship. Their discussion though concerning the Chinese situation paid particular reference to the model by Petti (2009) in **Figure 3.3.** The model is relevant to the United States of America (USA) and the European Union (EU).

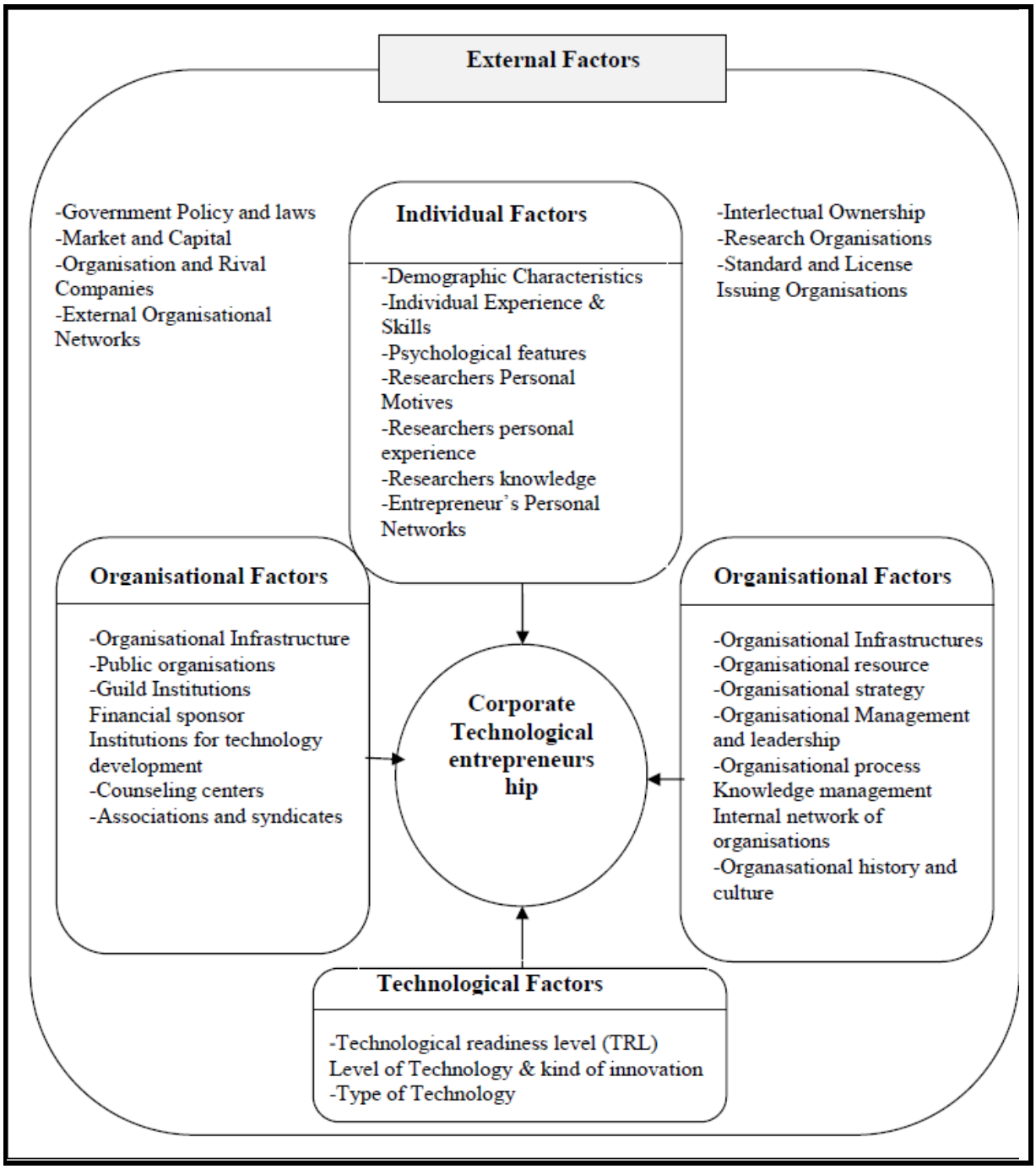


Figure 3.2: Conceptual framework of the effective key factors influencing in corporate technopreneurship in active knowledge base firms in nanotechnology industry.

Source: Adapted from Dolatabadi and Meigounpoory (2013)

Factors in **Figure 3.2** are considered in this study with further dimensions as applicable to the food processing sector in Zimbabwe. Petti (2009) adopted a systematic view of technological entrepreneurship as shown in **Figure 3.3**.

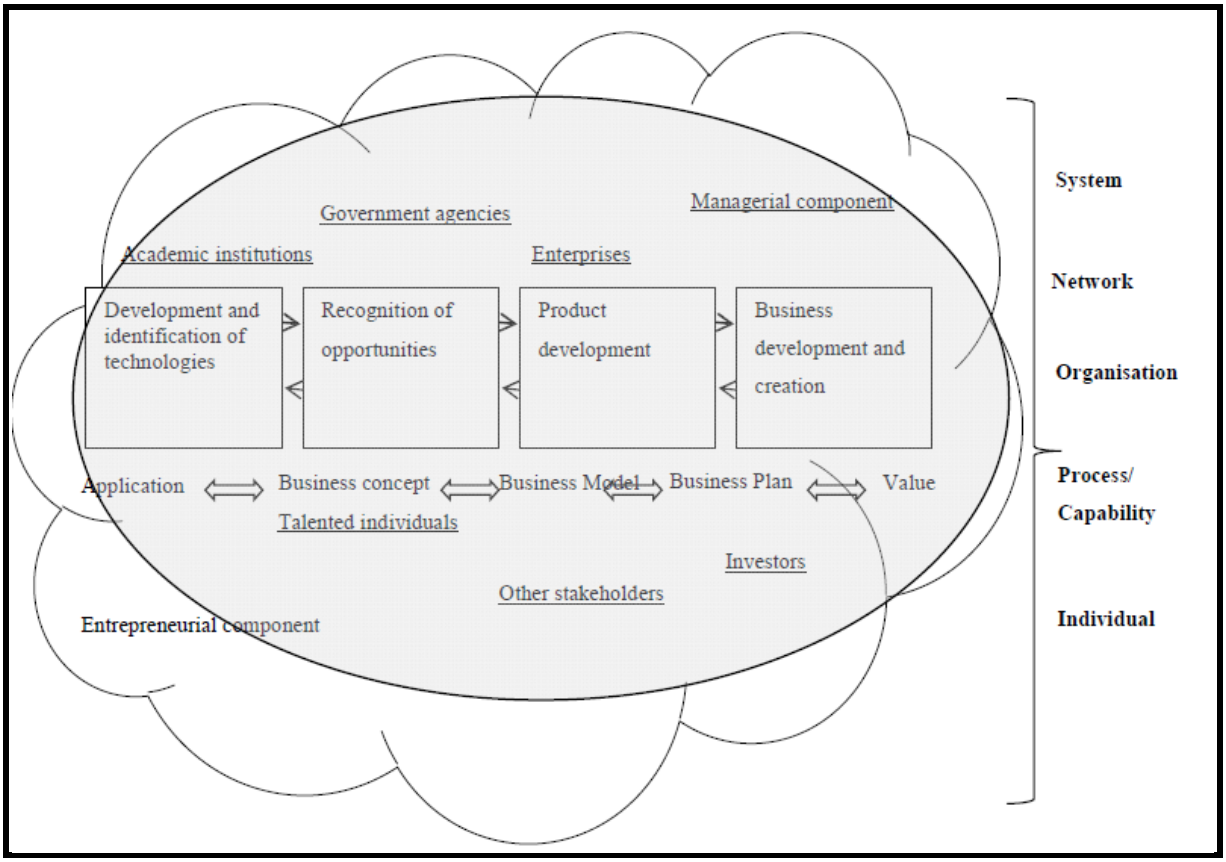


Figure 3.3: A systematic view of technopreneurship

Source: Adapted from Petti (2009)

The model in **Figure 3.3** is to some extent comprehensive, however, requires some improvements regarding how the three components namely entrepreneurial component, managerial component and environmental are related. Further, to that positioning, an entrepreneur or technopreneur in an organisation is also critical and this could be missing in the model. The technopreneurial process needs a conclusion, especially with the fact that there is not yet an agreed theoretical framework for technopreneurship. The represented technopreneurial process is represented as starting by developing and identifying technologies. This couldbe considered as just but one of the starting points since technopreneurship can start at any other points like social problems or economic challenge. Thus, the development of technologies can be the second or third phase.

Chittithawom et al. (2011:180), examined eight factors that influence the SMEs business success as: "SMEs characteristic; management and know-how; products and services; customer and market; the way of doing business and cooperation; resources and finance, strategy; and external environment. Aracid (2011), identified factors affecting open technology business incubation as influence from previous work; experience; the opportunity to develop a product or service; the presence of a skilled workforce to create the product or service and frustration or negative experience with the previous company and desire for

self-employment. From the factors, the most influential factors were: the opportunity to develop a product or service; experience; desire for self-employment; self-initiated but not influenced by my previous work; and the presence of a skilled workforce to create the product or service (Aracid, 2011). Although in the creative art industry, Kamarudin and Sajilan (2013), view marketing, technology, entrepreneurship and management as success factors in technopreneurs. This canbe viewed as a typical study of technopreneurship at the micro level. However, it overlooked other factors at the macro level. One of the modern organisational performance evaluation is absorptive capacity. Duchek (2013:312) look at absorptive capacity "as the ability of a firm to recognise the value of new external information, assimilate it, and apply it to commercial ends and it is regarded as an important factor in both corporate innovation and general competitive advantage". This is an important factor that also requires consideration in this study since business attitude is a fundamental determinant of a successful technopreneur. The factors can be summarised on as shown in **Table 3.1.**

Table 3.1: Factors influencing technopreneurship

	Factor	**Authors**
1	The Government	Pereira (2007)
2	Internal Factors, External factors	Pei et al.(2010)
3	Internal processes, individual factors, institutions and external Networks	Pakrad et al.(2012)
4	Human Resources Components, Environment Component, Laws and Policies Components and Financial Resources Components	Ilao (2013)
5	Organisational, external, institutional and other new factors, that is, technological and individual factors.	Dolatabadi and Meigounpoory (2013)
6	Specific enterprise's process, external networks attributes and the effects of formal and informal institutions	Petti and Zhang, Sh. (2011)
7	Enterprises' internal characteristics; enterprise's external network attributes; and environmental/institutional factors	Petti and Zhang (2011)
8	SMEs characteristic, management and know-how, products and services, Customer and Market, the way of doing business and cooperation, resources and finance, Strategy, and external environment	Chittithawom et al. (2011)
9	Opportunity to develop a product or service; experience; desire for self-employment; self-initiated but not influenced by my previous work; and the presence of a skilled workforce to create the product or service	Aracid (2011)
10	Absorptive capacity	Petti and Zhang (2013)
11	Marketing, Technology, Entrepreneurship and Management	Kamarudin and Sajilan (2013)
12	Support policies, IPR enforcement, personal relationships, internal characteristics, external networks, institutional environment, innovation practices and competitiveness	Petti and Zhang (2014)
13	Knowledge management, business model innovation, organisational culture, strong ties, personal relationship and IPR enforcement	Claudio and Shujun (2011)
14	Internal process capabilities, external networks characteristics, institutional, regulatory, normative and cultural factors	Mohammadi et al. (2014)
15	Environmental change, Networks, Strategy, systems, skills, style, staff	Brem and Borchardt (2014)

Source: Own compilation from literature

The factors summarised in **Table 3.1**, can be harmonised into clearer categories with the aim of combining such factors on the macro-level and micro-level. There is need to link the macro and the micro level since there are such gaps in entrepreneurship research. Deeds (2014) identify four questions not yet addressed by current researchers at the micro level:

- What action increase or reduce a venture's odds of success?
- What type of environment nurtures ventures?
- How do ventures emerge?
- How do we prepare entrepreneurs for their career?

The questions are pertinent and need some consideration by researchers in entrepreneurship and this study, a concentration on the micro level is done although the micro level is to a greater extent influenced by the macro forces.

3.10 The conceptual framework

In this study the factors dealt with by these scholars were regrouped and a proposal for a synchronised model of these factors was designed. The proposed regrouping focuses on corporate organisations. The rationale being that industrial food processing is technologically intensive and entrepreneurially oriented as well as at the centre of economic revival in the nation. Utilisation of the agricultural based economy, industrial food processing technology and the need for locally produced food products becomes an opportunity for technopreneurs.

Table 3.2: Factors influencing technopreneurship at the micro level perspective

Factor Influencing Technopreneurship	**Related Literature**
Internal processes	Petti and Zhang (2011); Pakrad et al. (2012) Petti and Zhang (2014); Mohammadi et al. (2014); Brem and Borchardt (2014); Claudio and Shujun (2011)
Human factors	Ilao (2013); Gilsing et al. (2010); Aracid (2011); Mohammadi et al. (2014); Brem and Borchardt (2014); Nacu and Avasilcăi (2014);
Venture capital	Ilao (2013); Chittithawom et al.(2011); Nacu and Avasilcăi (2014); Gilsing et al. (2010); Mustar and Wright (2010); Gompers and Lerner (2001)
Partnerships	Petti and Zhang (2014); Mohammadi et al. (2014); Brem and Borchardt (2014); Gilsing et al. (2010); Drucker (2014)
Government Support	Pereira (2007); Gilsing et al. (2010); Mohammadi et al. (2014); Brem and Borchardt (2014); Nacu and Avasilcăi (2014); Mustar and Wright (2010)
Global factors	Petti and Zhang (2014); Dolatabadi and Meigounpoory (2013); Brem and Borchardt (2014); Nacu and Avasilcăi (2014); Cabrita et al. (2015) Jakšić et al. (2014); Colovic and Lamotte (2015).

Source: Own compilation from literature

Having observed the discussions and arguments in the literature about factors that can influence technopreneurship, a conceptual framework was proposed to model the understanding of such factors so as to guide the research. The conceptual framework is represented in **Figure 3.4**.

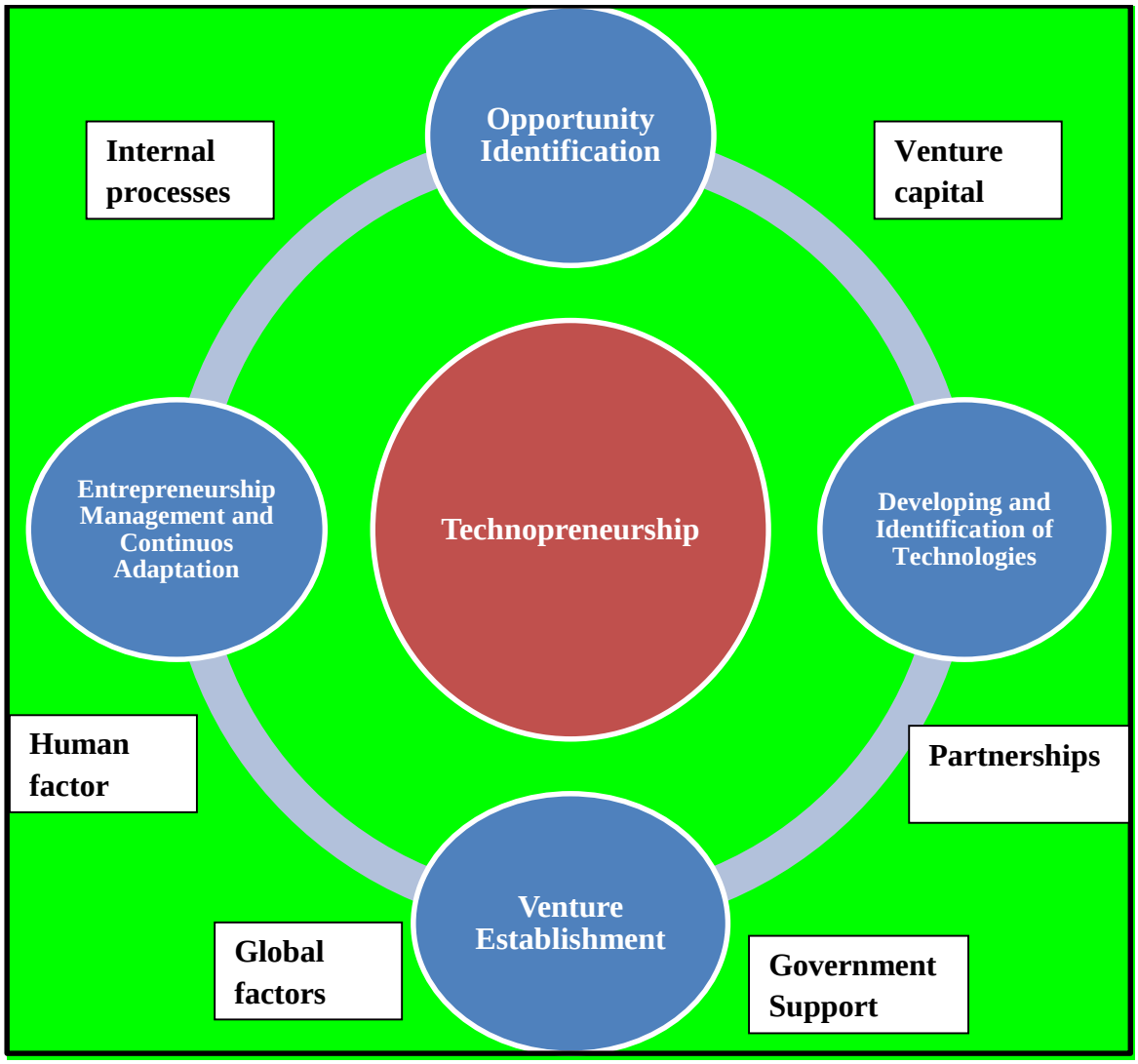


Figure 3.4: A theoretical framework for factors influencing adoption of technopreneurship

Source: Own compilation

3.11 Internal processes

Internal processes here refer to the managerial, administrative, logistical and operational processes that are formulated and executed within an organisation. From **Table 3.2**, although Petti and Zhang (2011) and Pakrad et al. (2012) have discussed internal processes as a factor influencing technopreneurship, it has to be noted that they were dealing with different industries in developed nations. This study concerns internal processes as they influence technopreneurship in the food processing industry in a third world country. Petti and Zhang (2014); Claudio and Shujun (2011) looked at factors influencing technopreneurship and included internal processes but in a Chinese setup while Mohammadi et al. (2014) included internal processes as a factor looking at assistive technologies of people with disabilities in Tehran, Iran. Brem and Borchardt (2014) itemised internal process factors and gave applications to developed countries such as United States of America (USA), Germany and Japan. There is a need for

research in developing countries at the organisational level regarding how they establish, manage and administer manufacturing organisations thatare rarely established in Zimbabwe and those which are established are continuously underperforming and eventually fold up. These further concerns need to look at strategic formulation and implementation, how entrepreneurial vision is shared with other organisational members.

3.12 Human factors

The International Association of Oil and Gas producers define human factors as "*the application of scientific information concerning humans to the design of objects, systems and environment for human use*". It encompasses people, workplaces and management. The human factor in this study consists of human skills, entrepreneurial skills, technical skills and business attitudes. Brem and Borchardt (2014) emphasised such factors such as skills, style and staff as factors influencing technopreneurship although in a developed country setup. It is essential to position properly an entrepreneur in the performance of the three basic organisational functions, that is, strategic, organisation and finance (Petti, 2009) as developing a technopreneurial culture in an organisation. Ilao (2013) looked at factors influencing technopreneurship including a human resources component analysed as covering: research-thinker, idea generator, innovator, developer-implementer and technical people, marketing people and financiers. The approach could streamline the component further so as to indicate how it relates to other components. Kenney et al. (2013), suggest that after a developing nation experiences a brain drain, the next phase may see these expatriates then returning home, and igniting a virtuous circle of technological entrepreneurship leading to rapid economic development. This was the case with Taiwan, China and India (Kenney et al., 2013) and could apply to Zimbabwe, nevertheless under specific conditions that have yet to be determined. Also, it was discovered that in Egypt, even after controlling for the endogeneity of the temporary migration decision, an overseas returnee is more likely to become an entrepreneur than a non-migrant (Wahba and Zenou, 2012). That is, although migrants may lose their social capital, they accumulate savings and experience overseas that increase their chances of becoming entrepreneurs (Wahba and Zenou, 2012). Such conclusions may need testing in the Zimbabwean scenario, where the economy faced some brain drain and currently some of it are returning from overseas. This contributes to the human capital.

It has to be also noted that the levels of democracy in a nation determine how much contribution can be made by individuals and groupsregarding involvement and participation. Musso et al. (2000) indicates that there is there is a coercive hierarchical relationship between government and individual in an autocratic system like the Zimbabwean situation and this has a bearing on the "entrepreneurial" and "participatory" models. Thus, an autocratic system limits citizens' entrepreneurial efforts, involvement and participation in the economic activities.

3.13 Venture capital

Ilao (2013) included financial resources as one of the major component influencing technopreneurship and itemised them as consisting of investor, business Sector, funding agencies and financial services although, in a lecture set-up, the further application could be requiredto gather empirical evidence. On the other hand Chittithawom et al. (2011) considered resources and finance as part of the factors influencing the business success of SMEs in Thailand. This is also related to Nacu and Avasilcăi (2014) argument that stipulated that financial resources are part of the resources that determine the difference between business ideas and successful businesses as they describe resources as an engine for business.

According to Gompers and Lerner (2001), *"Venture capital has developed as an important intermediary in financial markets, providing capital to firms that might otherwise have difficulty attracting financing. These firms are typically small and young, plagued by high levels of uncertainty and large differences between what entrepreneurs and investors know. Moreover, these firms typically possess few tangible assets and operate in markets that change very rapidly. Venture capital organisations finance these high-risk, potentially high-reward projects, purchasing equity or equity-linked stakes while the firms are still privately held".*

Along with venture capital, banks, individual investors (or "angels"), and corporations are among the other providers of capital for these firms. Petti and Zhang (2011) indicate investors as one of the factors influencing technopreneurship in the Chinese setup. Thus, if investors are not attracted to a nation and particular organisation, technopreneurial operations may not succeed. In this study, venture capital shall mean all funds are flowing into the organisation for the purpose of capitalising and recapitalising the organisational operations. Mustar and Wright (2010) talks of third stream financing of academic spin-offs as a policy designed in the United Kingdom (UK). That funding of technopreneurial projects can be taken as a policy issue by different governments.

3.14 Partnerships

Partnerships, in this case, cover all mutually beneficial relationships between the organisation and other organisations and institutions. It includes Public-Private partnerships (PPPs) which "is a contractual arrangement involving the private sector in the delivery of public services and is based on a partnership approach, where the responsibility for the delivery of services is shared between the public and private sectors, both of which bring their complimentary skills to the enterprise" (Hayllar, 2010). The literature discusses the triple helix model of government-university-industry relations in improving university research productivity and hence having a direct contribution to social and economic development (Chanthes, 2012). Consistent with this idea Kim et al. (2012), indicate that the 'triple helix' of the university–industry–government relationship and habitat are accepted as important determinants of

innovation and entrepreneurship. Román et al. (2012), assert that several European governments develop new start-up programmes during recessions and the appropriateness of these policies has become a hot policy issue. Ilao (2013) refers to partnerships when discussing incubation centres, science parks, research and development centres and academic institutions. The implication of these factors here means an industrial organisation should partner with the science and technology and entrepreneurial ventures so as to enhance their innovativeness. According to Fingaz (2015), the 7th point of the 25 August 2015 Ten Point Plan for sustained economic growth reads, "Promoting joint ventures and public-private partnerships to boost the role and performance of state-owned companies." The statement could have come from the realisation that there are benefits from public-private partnerships in the sustainable development of Zimbabwe. How these partnerships may be achieved could be the question.

3.15 Government Support

Government support covers government initiatives regarding economic policies, legal frameworks and exemplary behaviour (Nacu and Avasilcăi, 2014). O'Gorman (2003:177) highlights that "most national, regional and local governments have adopted measures to encourage entrepreneurship, with many city regions specifically seeking to encourage high-tech and knowledge intensive new venture creation". This is a matter of policy intervention and creating a favourable environment for technopreneurship (Zhang et al., 2008). Thus, the government is expected to play a leading role to promote technopreneurship (Pereirra, 2007). Recent literature in entrepreneurship suggests that market and legal institutions matter for entrepreneurial investment (Nacu and Avasilcăi, 2014). Zhou (2013), suggests that entrepreneurial firms with political connections (or higher level political connections) enjoy more security regarding property rights and, thus, have significantly higher reinvestment rates; and such political connections are more useful for smaller firms and among regions with the less developed market and legal institutions. Estrin et al. (2013), found that the relationship between growth aspiring entrepreneurs and institutions is complex; they benefit simultaneously from the strong government (in the sense of property rights enforcement), and smaller government. However the relationships are constrained by corruption, where social networks mediate some but not all institutional deficiencies (Estrin et al., 2013.). While the above case looks at institutions that encourage entrepreneurial growth aspirations, this study examines how the manufacturing or industrialisation policy may modify the role of technopreneurship in promoting industrialisation.

The role of government and its economic policy is a key factor in steering modern economies to higher levels of growth and development. According to Aharoni (2014) Israel started being poor after World War II and the government spearheaded developmental efforts which include among other things, agricultural focus, technological focus and reduction in government expenditure like military burden. Furthermore, McChesney (2015) asserts that a democratic infrastructure is essential for effective economic activity and

it is the role of the government to provide such an enabling environment. That is the government should provide a legal framework; uphold the rule of law; elaborate communication; power and energy, water, sanitation and transport systems.

3.16 Global factors

Ilao (2013) touches the global factors on the environment component when considering internet access, communication and other support services as well as geographic accessibility. Global factors are issues that arise from the fact that the world market has become a global village. All organisational decisions should consider global competition, technological breakthroughs and other trends. According to Fritsch (2011:27) "technology should be understood as a highly political and integral core component of the global system that shapes global affairs and itself is shaped by global economics, politics, and culture." Thus theories of International Relations (IR), and, in particular, those of International Political Economy (IPE) should consider technology as a core component of factors determining IR and IPE between nations and regions. Cabrita et al. (2015) assert that regions face evolving pressures from the global economy and have to engage withknowledge-based entrepreneurship to cope with the competition.

Nacu and Avasilcăi (2014) also argue that the political environment always affects the domestic and international success of business ideas, since it has implications on economic policy and economic and regional and international membership. This has a direct determination of the organisation to technological resources through FDIs, technological sourcing and otherwise. On another discussion, Nacu and Avasilcăi (2014) assert that globalisation is one of the influencing factors of technopreneurship. Dolatabadi and Meigounpoory (2013) indicated that networks with foreign organisations enhance the competitiveness of an organisation. This implies that no technopreneurial organisation can be competitive without networking with international organisations to benefit especially technologically.

3.17 Summary

Technopreneurship as an area of study has developed greatly since the early 20th century. Although the nomenclature varies to include technological entrepreneurship, techno-entrepreneurship and technology entrepreneurship; the study settled for the term technopreneurship. Numerous definitions have been proposed, however, the common thread joining them is that they acknowledge the fact that the term is a compound term derived from two words, technology and entrepreneurship. Elements of the subject include entrepreneurship, technology and innovation. Some view technopreneurship as a process, some as behaviour while others as a system. The systematic view includes factors influencing technopreneurship that is the subject matter of this study.

This study looks at technopreneurship as a three-stage process; that is, perceiving the opportunity, pursuing the opportunity and exploiting the opportunity. The technopreneurial process is taken to happen in an environment with some impacting forces. The forces are the factors influencing technopreneurship and include: internal processes, human factors, partnerships, global factors, government support and venture capital. The factors were used to determine data to be collected through the research questionnaire that was the research instrument.

The chapter discussed technopreneurship as an area of study and analysed its elements. A conceptual framework was proposed based on factors influencing technopreneurship in literature. A further understanding of the subject matter can be obtained by comparing theory and practice. The next chapter discusses the perspectives of technopreneurship from theories, approaches or paradigms.

CHAPTER 4: PERSPECTIVES OF TECHNOPRENEURSHIP

4.1 Introduction

Technopreneurship can be given several names: technological entrepreneurship (Carayannis et al., 2015); technology entrepreneurship (Ferreira et al., 2015); technoentrepreneurship (Abbasi et al., 2015); technopreneurship (Badaruddin et al., 2015); technology-based-entrepreneurship (García et al., 2015); knowledge intensive entrepreneurship (KIE) (Malerba et al., 2015) and many others. All these terms and others refer to the same concept. Technopreneurship can take different approaches, procedures, models and theories such as knowledge spillover theories; technology transfer; university spillovers; academic entrepreneurship; industrial clusters; technology parks; foreign direct investment; value addition; innovation theories; technology sourcing and others. All the perspectives foster some theory, model or approach to achieve the goals of technopreneurship. It also has to be appreciated that the perspectives are not free from overlaps. However, each perspective has its own thrust and emphasis, based on the proponents of the perspective. In fact, given that technology is so pervasive that it influences almost all businesses, technopreneurship can end up taking over from entrepreneurship that is currently the generic subject. However, the perspectives covered are viewed as paradigms that are different ways an organisation can adopt to foster technopreneurship and as such policy makers can adopt to cultivate a culture of technopreneurship in their economies. Therefore, technopreneurship can be taken as a policy, individual attitude, culture, lifestyle or behaviour (Petti, 2012). This chapter covers the perspectives of technopreneurship. Different perspectives and approaches of technopreneurship are discussed and its application in practice. It explores how the perspectives are linked to the objectives and research instrument.

4.2 Revisiting the definition of Technopreneurship

At this point, it could be appreciated that technopreneurship is viewed as consisting of innovation, technical science and knowledge applied to the creation and management of a business at some financial risk so as to achieve own goals and perspectives (Dolatabadi and Meigounpoory, 2013). In simpler terms it has been noted that technopreneurship involves the compounding of technological knowledge and skills with entrepreneurial acumen in a person, organisation, nation or region (Pujanis et al., 2015; Dutse et al., 2013; Harlanu and Nugroho, 2015). As the assumption is that all activities and concepts or perspectives by individuals, organisations or economies, may directly or indirectly require skills and aptitudes of both technological skills and entrepreneurial aptitudes are deemed to fall under technopreneurship. The argument is any endeavour that is targeted at wealth creation and improvement of the people's well-being is entrepreneurial as well as technological. Thus, the ultimate goal of the twins, technology and entrepreneurship is to enhance continuously the livelihood of people (Carayannis et al., 2015).

4.3The Theories / Models of technopreneurship

Theories and models of technopreneurship can now be discussed one by one. Links to the study are presented to appreciate the diversity of technopreneurship as an approach to enhance organisational performance; guide to economic policy makers and leaders, academics in entrepreneurial research and industrial development contribution.

4.3.1 Knowledge spillover theory

Perri and Peruffo (2015) look at knowledge spillovers as the informal flow of technological knowledge from one organisation to another. The definition does not generalise the knowledge under consideration but specifies the technological knowledge. Technological knowledge is the knowledge that is developmental since it is applied as contrasted to scientific knowledge that is theoretical (Kim et al., 2015). Knowledge spillover can occur at any level whether globally, internationally, nationally, inter-organisational or intra-organisational but, however, varies in magnitude, scope and speed (Perri and Peruffo, 2015). In most cases, knowledge spillovers happen in the case of multinational organisations. Thus, multinationals allow the flow of knowledge from nation to nation and branch to branch and from organisation to subsidiary. For the purpose of this study, knowledge includes skills and human capital which promote creativity, innovation and economic efficiency (Audretsch and Belitski, 2015). According to Ritala et al. (2015), some other scholars talk of knowledge sharing, knowledge leaking and innovation performance. Knowledge can be shared through people working together or co-workers (Kim and Yun, 2015). Thus, as people work together, knowledge is passed on from one person to the next. Knowledge can leak as organisations get into innovation activities given the multinational nature of organisations and the different organisational levels (Olander and Hermellina-Laukkananen, 2015). Both knowledge leaking and knowledge sharing have pros and cons to innovation performance of organisations (Ritala et al., 2015). These are both extended views of knowledge spillover and the idea is the same. Knowledge is shared and leaks through multinational corporations; foreign direct investment or technology-sharing.

According to Huggins and Thompson (2015), the knowledge spillover theory of entrepreneurship is based on the premise that uncommercialised knowledge created in an organisation can be utilised as a source of entrepreneurial opportunities for other organisations and as a result, contribute to innovation and development. **Figure 4.1** illustrates the knowledge spillover theory of entrepreneurship.

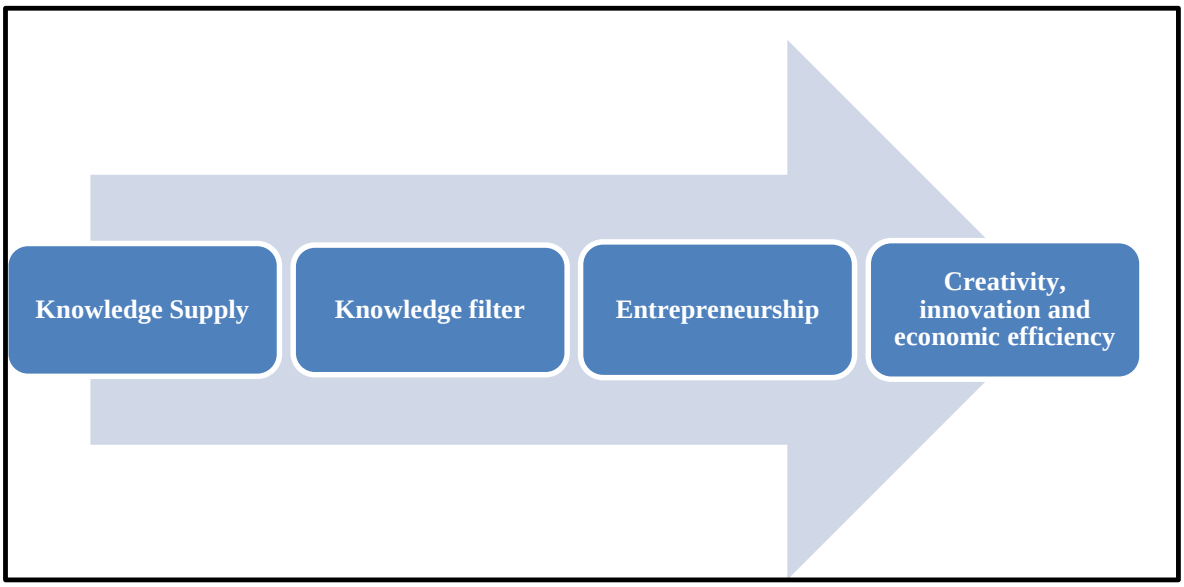


Figure 4.1: The knowledge spillover theory of entrepreneurship

Source: Adapted from Huggins and Thompson (2015)

It can be appreciated that the knowledge spillover theory builds on other theories like technology transfer, foreign direct investment and technology sourcing. The theory is universal in that it is applicable in practice to both developed and developing countries. It makes a lot of sense in both theory and practice.

For the Zimbabwean situation, food processing technopreneurs can benefit from knowledge spillovers within the organisation, across local organisations, regionally and globally. Some leading organisations in the food sector in Zimbabwe are multinationals with their head offices in foreign countries. That promotes knowledge spillovers and benefits local organisations and the economy. However, the challenge is that spillovers depend, to some extent, on networks (Huggins and Thompson, 2015). So if there are no good relations with other countries, the nation may not benefit fully, especially if foreign direct investment is not promoted.

Knowledge spillover theory was harnessed in the study and covered through the consideration of human factors, partnerships and global factors as factors influencing technopreneurship. The behavioural aspects of technopreneurship of individuals and organisations would determine their innovativeness and how the shared or leaked knowledge is applied to the benefit of the organisation. As can be appreciated knowledge spillover theory overlaps with other theories and models like innovation theories, foreign direct investment and technology transfers. In the Zimbabwe industrial food processing sector, knowledge and human capital could be available given the high literacy rate in Zimbabwe, but the application of the knowledge and utilisation of human capital could be lacking. In other words, there may not be knowledge spillovers without enough FDIs, partnerships and other platforms for the effective flow and application of technological knowledge.

4.4 Innovation theories

Lim and Suh (2015) discussed product and process innovation models and how these innovation theories relate to each other. These models include the Life Cycle Model (Utterback, 1994); Process-Enabling Industry (Pisano, 1997); Process Development Model (Lager, 2000); Quality by Design (Juran, 1992). It can be appreciated that, according to Lim and Suh (2015) these models can be classified into four types to include those which are:

- Mature – have a low rate of both product and process innovation
- Product driven – have a high rate of product innovation and low rate of process innovation
- Process driven – have a low rate of product innovation and high rate of process innovation
- Process enabling – have a high rate of both product and process innovation

Rodríguez-Pose and Peralta (2015) advocated for a movement from a linear approach to innovation to a systems approach when they linked innovation to economic growth in Mexico. This leads to the consideration of innovation policies and environmental factors as forces influencing innovation and economic growth. The systems view to innovation is supported by Gregor and Hevner (2015) who stresses that the territory covered by innovation is so wide since it involves human actors who include: entrepreneurs, technologists, managers, inventors, academics, employees and policy-makers. Furthermore, Salerno et al. (2015) explain that the innovation process from idea generation through to commercialisation is the traditional view. The modern view is that the innovation process may assume different phases and they proposed eight different innovation processes depending on the situation (Salerno et al., 2015). Thus to practice innovation may begin anyhow and anywhere. It may amount to innovation myopia to think of innovation as a mechanical, step-by-step process and this leads to reduced innovation performance. Innovation theories are also universal, applying to both developed and developing economies. This maybe found to be the case with evidence from nations that value research either at universities or research and development in an organisation. The innovation theories can guide technological development and entrepreneurial development which innovative organisations can utilise for their competitive advantage. However, most developing economies like Zimbabwe may not be as innovative; since they end at acquiring scientific knowledge that in most cases may not be applied or adopted by corporate organisations or nascent entrepreneurs (Kim et al., 2015). In this research study, innovation theories were a key to determining what data could be gathered. Most questions in the questionnaire were seeking for data that could lead to the researcher determining the innovativeness of individual employees and their organisations as a group. This was so since innovation is one of the important pillars of technopreneurship.

In this study innovation is considered as the utilisation of new technology in an organisation (Jonsson, 2015). As such, innovation theories are applicable to this study as they are discussed in both technology and entrepreneurship. The innovation information gathered determines the innovativeness of an organisation and, as a result, competency.

4.5 Technology transfer (TTs)

According to the Association of University Technology Managers (AUTM, 2013), technology transfer refers to the process of transferring scientific information from organisation to organisation for further development as well as commercialisation. This is related to Murphy et al. (2015) who look at technology transfer as the movement of knowledge, software, hardware and productive information between industry, research and development institutions, government and non-governmental institutions within and across nations. The idea behind the concept is that technological knowledge and skills are not equitably distributed within or across nations. As such, to maximise the utilisation of technology before it is replaced by a newer and better one, it has to flow to other potential users within and across nations.

Nastaseet et al. (2010) assert that innovation as a complex phenomenon is concerned by its globalism, the assets and business units defined systems: marketing, product adoption, technology and as such technology transfer as an element of the innovation becomes the key to realising the materiality of research and development results. AUTM (2013) further clarifies that technology transfer as a process typically includes:

- Identifying new technologies
- Protecting technologies through patents and copyrights
- Forming development and commercialisation strategies such as marketing and licensing to existing private sector companies or creating new start-up companies based on the technology

In well-developed systems like the United States of America, technology transfer is facilitated by technology transfer offices (TTOs). TTOs assist academics to identify, patent and create production and marketing companies or license the viable technologies. In most cases it is associated with breakthroughs from academic research, especially from universities, which are taken to industry and commerce for commercialisation (Mowery et al., 2015; O'kane et al., 2015; Allen and O'shea, 2014; Wright, 2014). Universities in the USA are assessed using the number of spin-offs they have achieved (AUTM, 2013). It may have several perspectives such as academic entrepreneurship, simply commercialisation of university research results, of simply university spin-offs. Academic entrepreneurship simply refers to the perspective that all research activities at universities should have a goal of ending up in industry and commerce. Commercialisation may mean that only successful research results should be taken to industry

and commerce. Allen and O'Shea, (2014) take technology transfer as an entrepreneurial approach, which is the perspective of this research study. Applied to Zimbabwean efforts, this could be linked to universities of technology, like Chinhoyi University of Technology (CUT). Such universities are meant to engage in technology transfer as motivated by Kakava (2013). Since the opening of the university in 2003, there is not yet a move towards technology transfer. Perhaps there may be not enough government initiative and policy support. This is the international scenario of technology transfer. It shows that there is a need for an enabling policy support and government initiatives and collaboration between universities and industry, as in the form of Private Public Partnerships (PPPs).

In this study, given the importance of technology transfer in technopreneurship, the researcher gathered data with regards to existing partnerships between research and development institutions and the food processing sector. Furthermore, the notion of government support also has a bearing on technology transfer given that the majority of universities are state universities that are mandated by the existing government regarding what their thrust comprises. Also, the government is responsible for cultivation good relations between industry and universities through their policies and the study also covered the issues in the process of questionnaire content design.

4.6 Academic entrepreneurship

Academic entrepreneurship is a concept related and handled in passing when technology transfer was discussed. It is found imperative to discuss it in more detail separately given its influence on government policy and relationships between industry and academic institutions. Academic entrepreneurship refers to efforts engaged by universities or research and development institutions to promote commercialisation of their activities on campus and in surrounding areas of the university (Siegel and Wright, 2015). Siegel and Wright (2015:583) argue that there is need for a more open and broader perspective of academic entrepreneurship that does not rely too much on "*the research-third mission nexus, with its narrow focus on university-industry links or a narrow emphasis of academic entrepreneurship on the transfer of scientists' inventions from the laboratory to licenses and start-ups, particularly in relation to formal intellectual property*".

There is need to harness opportunities for academic entrepreneurship which are arising from informal intellectual property and the creation of other forms of entrepreneurial ventures involving more stakeholders which include "students, a younger generation of faculty and post-doctoral fellows who are more comfortable working within dustry than the previous generation, federal" (Siegel and Wright, 2015:2). Meek and Wood (2015) acknowledge the changes in the perspective of academic entrepreneurship, especially given the need to generate income in modern universities, but considers the issue of role identity or work identity from the individual academic view. The modern approach is that

academic entrepreneurship is taken "as a strategy to overcome resource barriers to traditional academic duties (De Silva, 2015:1). In the Zimbabwean situation, because of current economic hardships, universities are required to generate their own income to run their affairs (Mhukahuru, 2015; Kakava, 2013; Mushava, 2014). The government began by failing to pay grants for students and requested students to meet their own study financial needs (Mushava, 2014). The trend was followed by the government failing to pay for infrastructural development, asked university management to find means to acquire and develop properties without government funding (Makoni, 2011). Furthermore, the government admitted that they could not pay regional rates of university staff salaries and other conditions of service, so they instructed university management to supplement the salaries from student fees or other income generating activities (Mhukahuru, 2015). The latest development is that the government is struggling to pay the salaries of university staff (Mhukahuru, 2015). Universities are being approached and requested to pay perhaps half of the salaries from student fees or other sources. It is believed that universities are supposed to be self-reliant (Mhukahuru, 2015). Given the situation, it is apparent that universities have no choice except to embrace the latest concept of academic entrepreneurship. Long established universities like the University of Zimbabwe (UZ) have well-established projects like farms that can supply their canteens with enough supplies to feed the university canteen. On the other hand, other universities like The Chinhoyi University of Technology may lack such established income generating projects. The dilemma is the compatibility of the new paradigm of academic entrepreneurship with the traditional academic duties. Thus, crises may be fertile grounds for creativity and innovation.

Gurau et al. (2012:165) concluded that academics choose to assume mainly three forms in academic entrepreneurship, that is:

(1) founder-manager of an entrepreneurial organisation;
(2) project manager in an existing organisation; or a
(3) science advisor to the board of directors of one or several organisations.

They noted that the role of the academic entrepreneur varies in each form of academic entrepreneurship. In this study, the second form, that is, project manager of an existing organisation is the most relevant form of academic entrepreneurship. The concept of academic entrepreneurship was included in the study through questions with regards to partnerships. The research sought to find out whether industry had partnerships with universities so that they benefit from university research activities. Academic entrepreneurship is a valid technopreneurship concept that encourages the application of scientific knowledge to industrial activities and perhaps partnerships between universities and industry.

4.7 Foreign direct investments (FDI)

Girma et al. (2015) talk of direct and indirect effects or spillovers of FDI on the host country. However it has to be noted that there is also spillover to the home country of investors of FDIs as noted in the American situation of multinational corporations (Tang and Altshuler, 2015) Studying the Chinese situation, Long et al. (2015) concluded that there are positive effects of FDIs on the institutional quality of the host country. China is one of the economies which has since benefited from advantages of FDIs. FDI spillovers include growth in both the capital flow and the economy; advanced technological or managerial expertise (Long et al., 2015). Long et al. (2015) point to the fact that the attraction of FDIs depends on the host countries' FDI policy. Thus, host countries should weigh the benefits of the FDIs against its disadvantages. Naturally, the benefits outweigh disadvantages, especially in developing countries like Zimbabwe. Rolfe et al. (2015) assert that intra-Africa FDI has grown faster than African FDIs from overseas. This could be attributed to the trust among African countries as compared to the trust of African countries to overseas investors. This can be attributed to the background of colonial history. Gui-Diby and Renard (2015) however indicate that FDI does not have an automatic impact on the industrialisation of African economies, because of the hosts' over-reliance on natural endowments and inadequate government interventions. Zimbabwe has managed to attract FDI from three major countries; China, South Africa and Australia. The policy has a direct effect on FDI and determines the attraction and benefits of FDI on host countries (Adams and Opoku, 2015; Bokpin et al., 2015). Therefore, measures have to be put in place to strengthen regulations in sub-Saharan Africa to realise the benefits of FDI especially on host countries of the region. According to the Wealth and Finance International (WFI) (2015), Zimbabwe's FDI dropped to $67m in 2014 from $165m during the same period in 2013. This was after the ruling party Zimbabwe African National Union – Patriotic Front (ZANU-PF) won the 2013 elections and hence their indigenisation policy was to continue being implemented. Thus, the Zimbabwe Indigenisation Policy is the major threat to foreign investors to commit their resources to the nation. This is in contrast to the nation's Chinese counterpart whose FDI year-on-year growth is 10.4%. The difference in such developments lies in the differences in FDI policies.

According to Ruwende (2015:1), senior reporter, in the Government controlled press, the Zimbabwe "government is coming up with a cocktail of measures to attract FDI in the country, among them amending the Companies Act and other relevant investment regulations to align them with the best business practices". It has to be noted that the government advocates for reforms regarding bureaucratic procedures, tariff barriers, non-tariff barriers and other regulatory issues contained in legal documents such as the Companies Act. The issue of corruption by government officials seeking to elicit for bribes to assist foreigners to register and operate their businesses was also mentioned in the report. From this view, it was noted that the reforms did not touch the Indigenisation and Economic Empowerment Act which could be one of the most threatening barriers for foreigners to do business in Zimbabwe. Other issues not pointed

to which could pose some risk include the issue of political hostility against white farmers (farm invasions that seem to continue). As such these can be viewed as political risks leading to fears of confiscation and domestication. Fingaz (2015) names the 10th point of the 25 August 2015 Ten Point Plan for sustained economic growth that reads "Implementation of Special Economic Zones to provide the impetus for foreign direct investment". The statements point to the realisation of the need for FDI in the nation.

Hu (2015:19) emphasised that FDIs benefit host countries through: *"The exposure of the local economy to the new technology through the training of local workers and engineers working in multinational corporations, the demonstration effect, and the linkages the multinational corporation builds with upstream and downstream firms in the local economy, thus, create opportunity for technology spillover, at least not all of which was intended by the multinational corporation."* In other words, economic policies that do not promote FDIs in the current globalised environment can be concluded to be leading to policy failure.

FDIs were covered when the researcher gathered data with regards to global factors, foreign partnerships and government policy support. FDIs are a relevant technopreneurship concept since technology is transferred through companies investing in other countries and taking with them technology and business concepts.

4.8 Technology sourcing

Another concept related to the FDI perspective is technology sourcing. Harhoff et al. (2014:5) define technology sourcing "as sourcing technological knowledge from local knowledge pools". That is, if an organisation intends to have knowledge of technology in a foreign nation, they would invest in that particular nation, or find other ways to collaborate with the foreign organisation so as to tap the foreign company's technological skills and knowledge. According to Yeoh (2014), technology can be sourced internally, by utilising the existing knowledge in the company through the internal research and development or externally by outsourcing from other companies which are external human capital development or simply exploration versus exploitation. It is like in the make-or-buy decision in the procurement process. Lattemann et al. (2015) evaluate external sourcing by Chinese companies with regards to the impact on the technological innovation process. Benefits are weighed against costs. Technology sourcing strategies or vehicles vary depending on the financial capacity of the organisation. The organisation can adopt the alliance approach, acquisition or go-it-alone (Lungeanu et al., 2015).

While external sourcing or investing abroad proved to benefit Chinese companies (Lattemann et al., 2015; Nepelski and De Prato, 2015), strategic alliances have benefited US organisations (Harrigan, 2015). Literature covers the Zimbabwean circumstances together with other developing or African countries like

Nigeria and South Africa. It has been noted that empowerment and indigenisation and local participation in economic activities have been used as policy guide in Zimbabwe. Amadi-Echendu and Mhlanga (2015:2), argue that, "Whereas it is intuitively obvious that global supply chains have wide ramifications on indigenisation and empowerment legislations, however, the local challenge is how to harness the extensive sources of the technological capabilities required for the capital development of an oil refinery." Therefore, once more, this points to the issue of economic policy analysis. Thus, ZIMASSET with its guiding concept of indigenisation and economic empowerment could be weighed against the need for technological capacity. Technology sourcing can adopt different sourcing vehicles that include: internal development; alliances; or acquisitions and these are equivalent to the build, borrow or buy decisions (Lungeanu et al., 2015). Companies can use any one of these or combine two or more to achieve their desired outcomes. According to Lungeanu et al. (2015) the choice of a technology sourcing vehicle (s) depends on the level of the financial slack of an organisation. The vehicles cited above can be appreciated in practice. Internal development or the make decision can be viewed as depending on whether an organisation has a competent research and development (R&D) department with both technological and financial capacity to develop the desired technology. This could be said to be common in developed countries or other emerging economies that have some financial leverage. Economies with technological parks are good examples of those which have decided to make the technology. Zimbabwean companies may have R&D departments but may lack the technological capacity and the financial resources to develop technologies.

On the other hand, alliances allude to strategic partnerships, where an organisation partners with another either competing or complementing organisation to have some technological, entrepreneurial or financial benefit. Alliances are universally applicable to both developed and developing countries. Alliances are dependent on the prevailing relationship between the countries involved. The relationship between nations depends on the harmony of individual economic policies between the involved nations. Zimbabwe is viewed as a nation with policies that do not promote good relations with other nations especially given the Indigenisation and Economic Empowerment Act (Kachembere, 2015). Lastly, acquisitions depend on the financial capacity of the buyer. Any company with additional financial resources can buy an existing company and benefit from the existing technology as well as the innovativeness of the existing company. The financial position of an organisation depends to a greater extent on the performance of the macro economy of a nation. Therefore, acquisitions are common by companies in developed countries. However, knowledge sharing and knowledge leaking take place in the location of the acquired organisation and benefits both the nation of the acquired company and the nation of the acquiring company. It depends on the risk of an investment (Zimeye, 2015).

Technology sourcing is also linked to the diffusion of technology. Technology diffusion describes the process through which technological knowledge spread from the point of discovery to the point of

utilisation. It also amounts to a perspective of technopreneurship. According to Hu (2015) technology diffusion takes place through various channels which include:

- International trade
- Foreign direct investment (FDI)
- Technology licensing
- The international movement of technology personnel
- The flow of disembodied knowledge

In most cases technological knowledge reaches developing countries for adoption when they are at the decline stage in developed countries. Thus, developing countries are mostly laggards when it comes to technology while developed countries are innovators. Perhaps the factors leading to such a fact include innovativeness of nations, financial capacity, infrastructure development as well as the relationship with other nations. Also, Kim and Lee (2015) indicated that technology policies in East Asia and Latin America, that is, the science and technology (S&T) policies determined the developmental contribution of acquired technological knowledge.

FDIs are important in this study since they are a clear concept of technopreneurship as it involves the transfer of technology from the country of origin to the host country. The FDI concept was covered in this study in such issues of the research as government policy, global factors and foreign partnerships.

4.9 Value addition (VA)

Mabuwa (2014:13) as the Deputy Minister of Industry and Commerce in her presentation indicated that:

- Value addition and Beneficiation has been singled out as one of the four key clusters under the ZIMASSET development agenda.
- Several agro-processing areas are earmarked for development through the value addition initiative. In the leather industry, for example, in order to encourage value addition, Government levied an export tax of US $0,75 per kg as a deterrent measure to the exportation of raw hides and skins.
- The government is encouraging the establishment of business ventures that are centred on value adding our primary products, agricultural output included.
- The Green Fuel Project in Chisumbanje is an example where economic development, environmental sustainability and social inclusion are all at play as a result of a value addition initiative. When it reaches its peak, the project is expected to generate direct employment of between 5000 to 6000 people.

The concept of value addition covers a wide spectrum of raw materials that are supposed to be processed to consumable commercial products. The concept applies to food products as well. Value addition is a policy guide for the Ministry of Industry and Commerce in Zimbabwe as enshrined in the Value Addition Presentation by Mabuwa (2014). The policy identifies opportunities for value addition in the food sector which include:

- Beef canning
- Fruit juice manufacturing
- Oil expression
- Fruit jam and avocado processing
- Cotton and clothing industry development
- Leather and allied industries development

While these are entrepreneurial ideas and opportunities, the issue of technological capacity requires serious consideration to turning dreams to reality. The fact points to the need of technopreneurship as a guiding concept of industrialisation. Fingaz (2015:1) the 2nd point of the 25 August 2015 Ten Point Plan for sustained economic growth reads, "Advancing Beneficiation and/or Value Addition to the agricultural and mining resource endowment." The statement acknowledges the importance of value addition as a concept of technopreneurship. That is, it has to be realised that value addition needs to be spearheaded by technological innovation and entrepreneurial drive. Thus the realisation of technopreneurial approaches to employment and wealth creation.

Value addition is basically taken as an industrial food processing guide. As such it assists an organisation to realise that when dealing with especially agricultural food produce, processing does not only mean changing the natural state but also include packaging and preserving. The concept was covered in the study under industrial food processing that is the object of technopreneurship. Specifically, it was dealt within internal processes and key success factors.

4.10 Technological parks (Technoparks)

Internationally, technological parks are taken to be there to support organisational production as well as to host innovative companies while scientific parks are there to bridge the gap between the establishments of universities or research and development institutions and industry (Kecskés and Kovács, 2015). Technoparks can also be in the form of industrial parks, which would be there to support a specific sector like the automotive industry with special services and infrastructure (Kecskés and Kovács, 2015). The Hungarian perspective combine all of these terminologies to refer to the same thing, the argument being based on the fact that in practice, the parks may not be separated (Kecskés and Kovács, 2015; Espitia-

Escuer et al., 2015; Stephen, 2015). Wojewnik-Filipkowska and Kowalski (2015) call them industrial-technology parks (ITPs) which are "a combination of the infrastructure function and performance which enable the exchange of information between scientific organisations and entrepreneurs".

This study will take the perspective of one term referring to all whether technology parks, technological parks, science parks, scientific parks, industrial parks or whichever. There is a difference in how technoparks are managed, in developed and developing countries. Developed and upcoming economies can separate the role of, for example, technological parks and scientific parks whose role can be combined in developing countries. That is if they are in the first place found in developing countries which in most cases have not yet thought of these as development drivers. There is, however, vast evidence that technoparks are one of the key elements of knowledge management approaches of knowledge-based economies. Globally, academic research and industrial innovation are seen to be well pronounced in few economies such as the USA, Japan, and the European Union. However there are other emerging economies that are also promising such as India, China and Brazil. In the USA, Silicon Valley, in San Francisco, gave birth to several start-up as well as global technology companies. There is also Silicon Valley of India. Guzman and Stern (2015) describe Silicon Valley (USA) as typical high-impact entrepreneurship, demonstrating the role of entrepreneurship in economic development which can guide policy-makers to develop non-self- contradictory economic policies. The success of Silicon Valley is based on the harmonised efforts by all contributors in the technopark systems, which include: government, universities, entrepreneurs, venture capital, mature corporations, industrial development centres, management and service providers (Guzman and Stern, 2015). The Silicon Valley model has been copied by most countries, examples being: Taiwan (Silicon Island); Malaysia (Multimedia Super Corridor); Bangalore (Silicon Plateau); Cambridge, U.K. (Silicon Fen); Austin, Texas (Silicon Hills) and New York (Silicon Alley).

In Zimbabwe, the institution which is closely related to the technopark concept is the Scientific and Industrial Research and Development Centre (SIRDC). From its website its mission is that:

"The Scientific and Industrial Research and Development Centre (SIRDC) was established by the Government of Zimbabwe in February 1993 under the provisions of the Research Act of 1986. SIRDC's mandate is to carry out strategic research and development (R & D) for the benefit of the manufacturing, service, agricultural and mining sectors of Zimbabwe as well as to commercialise R & D outputs. Our mission is to provide Zimbabwe and the region with technological solutions for sustainable development. Our vision is to become the leading Centre for the development of Zimbabwe and the region through reduction to practice of technologically developed products and processes."

It can be noted that, in principle, this is a good idea that however requires cooperation from all stakeholders as has been noted in the case of Silicon Valley (USA). In any case, SIRDC made some meaningful contributions by giving birth to some incubations of industrial food processing and other biotechnological organisations. The off-springs of SIRDC are currently, however, facing the same viability challenges that are being encountered by all other organisations in Zimbabwe. Also, what may lack is the policy implementation support and collaboration with other stakeholders in the economy. Perhaps, the existing government has not received the required recognition from the stakeholders, hence also losing the necessary cooperation.

Technoparks have the objective of linking researchers and industry and assist organisational research and development. The concept was covered in the study under government support, internal processes and partnerships as factors influencing technopreneurship.

4.11 Business Clusters

It has to be noted that the concept of technoparks is taken as a form of clustering (Mohan, 2014). According to Soviar (2015:529), "a business cluster (clusters, industry cluster, competitive cluster, Porterian cluster, and more) is a geographic concentration of interconnected businesses, suppliers and associated institutions in a particular field." It seems in literature, authors refer to Michael Porter as the father of business clusters (Nguyen and Martin, 2015; Soviar, 2015; Rauch et al., 2014; Kulakova, 2014).

Business clusters have a positive impact on economic development, knowledge transfer, innovation, and organisational performance (Rauch et al., 2014). Kulakova (2014) outlines benefits of business clusters as:

- Access to specialised information
- Better access to employees and suppliers
- Access to institutions and public goods
- Complementarities and better motivation and measurement

Business clusters have been used by several nations to tap into the benefits of the concept such as Slovak Republic (Soviar, 2015), Vietnam (Nguyen and Martin, 2015) and Wales (Abbey, 2012). Developed economies in the UK, USA and Europe, have extensively adopted and succeeded in the use of business clusters that, in most cases are knowledge based business clusters. In all the cases the issue of the cluster has been facilitated by the government and there is the important element of economic policy on clusters development and success. Abbey (2012) refers to Porter's model of economic policy on cluster development.

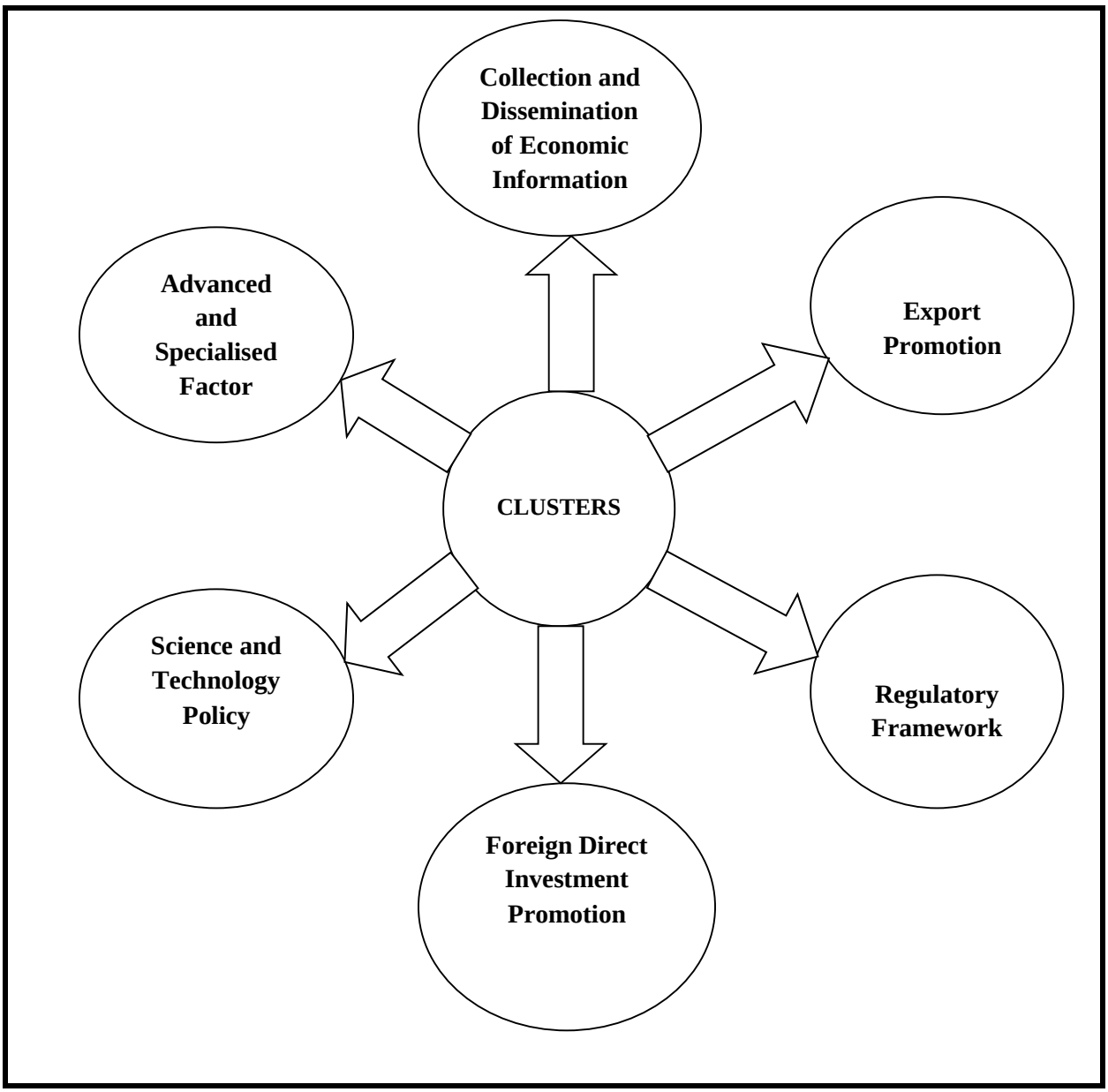


Figure 4.2: Aspects of economic policy in cluster development

Source: Abbey (2012)

In Zimbabwe, the issue of business clusters has been mentioned in economic policy documents. Section 3.9 of the Industrial Development Policy (IDP 2012-2016) outlines the cluster initiative of the nation. The proposed industries include the clothing and textile industry to be clustered in Gokwe; steel and allied products in the Midlands and Diamond cutting in Manicaland.

Applying Porter's (2000) model of aspects of economic policy on cluster development, it can be pointed out that the requirements for successful business clusters include foreign direct investment promotion, regulatory reforms and science and technology policy. Some of such requirements are not really in

harmony with the development of clusters such as the promotion of FDIs, given the Indigenisation and Economic Empowerment Act which discourage foreign investors. Thus, the industrial clustering concept is still on paper and has not yet taken off.

Business clusters were taken as a strategic concept, where an organisation can benefit technologically and logistically. It overlaps to other concepts like FDIs and technoparks. The idea was covered under partnerships and government support in the research instrument.

4.12 Summary

There are theories, perspectives or approaches that are advocated in theory and practice that can be interpreted to represent technopreneurship at the end of the day. These include knowledge spillover theory; innovation theories, technology transfer; technology parks; business clusters; foreign direct investments (FDIs); value edition and technology sourcing. The list may continue with different terms used. However, the common thread is that these are guiding concepts that a technopreneurial organisation can embrace so as to exploit opportunities emanating therefrom. The aspects have been discussed and their application internationally, regionally, locally and in the food processing sector in Zimbabwe have been analysed.

Each concept was found to be aiding the development of the research instrument and fulfilment of the research objectives in one way or another. The coverage of the concepts helps to understand further and have a broader picture of technopreneurship and supporting concepts, but the idea remains the same, that of exploiting technological opportunities to revive existing businesses or starting new ones. While it is appreciated that the concepts are generic, it has to be noted that they facilitated in the understanding of factors influencing technopreneurship, the role of technopreneurship and key success factors; that is, the perspectives aided in the development of the research instrument. Knowledge spillover theory was used in the human factors, partnerships and global factors. Innovation theories and value addition were utilised under internal processes and key success factors. Technology transfer and business clusters were utilised under partnerships and government support while foreign direct investment and technology sourcing were utilised global factors, partnerships and government support. Technology parks were utilised in questions to do with internal processes, partnerships and government support.

The chapter discussed the perspectives of technopreneurship. Having exhausted the possible preliminary information that can be pertinent about technopreneurship, the next chapter covers the methodology and methods adopted to gather and analyse the data as stipulated by the research objectives.

CHAPTER 5: RESEARCH METHODOLOGY

5.1 Introduction

Research methodology is the way in which the researcher carried out the research (Jonker and Pennink, 2010). It covers both the research plan, methods of data collection and analysis. Others distinguish between research methods and methodology, where methods represent how the research was executed and methodology is the general science or philosophy guiding the research (Adams et al., 2007). Also, Creswell (2009) holds that research methods are research techniques and procedures while methodology is the guiding framework that joins methods to the research outcomes.

This section indicates the methodological issues adopted in this study to achieve the research objectives. It covers the theory informing the methods used, the location of the study, population, sampling plan, inclusion/exclusion criteria, data collection process, data management, data analysis, reliability and validity as well as ethical considerations.

In deciding on which methodology and methods to adopt, the research objectives were considered. The research objectives are to: establish factors that influence technopreneurship in the food processingsector in Zimbabwe; determine the role of technopreneurship in the food processingsector in Zimbabwe; determine the feasibility of technopreneurship in the food processingsector in Zimbabwe; and identify critical success factors that influence technopreneurship in the food processingsector in Zimbabwe.

5.2 The research onion

Saunders et al. (2007) developed the research onion to illustrate the stages that a researcher should cover when a research strategy is developed. In this study, the researcher adopted the research onion as illustrated in Figure 5.1. The usefulness of the research onion lies in the fact that any research methodology in a variety of contexts can be adapted to the research onion (Bryman, 2012).

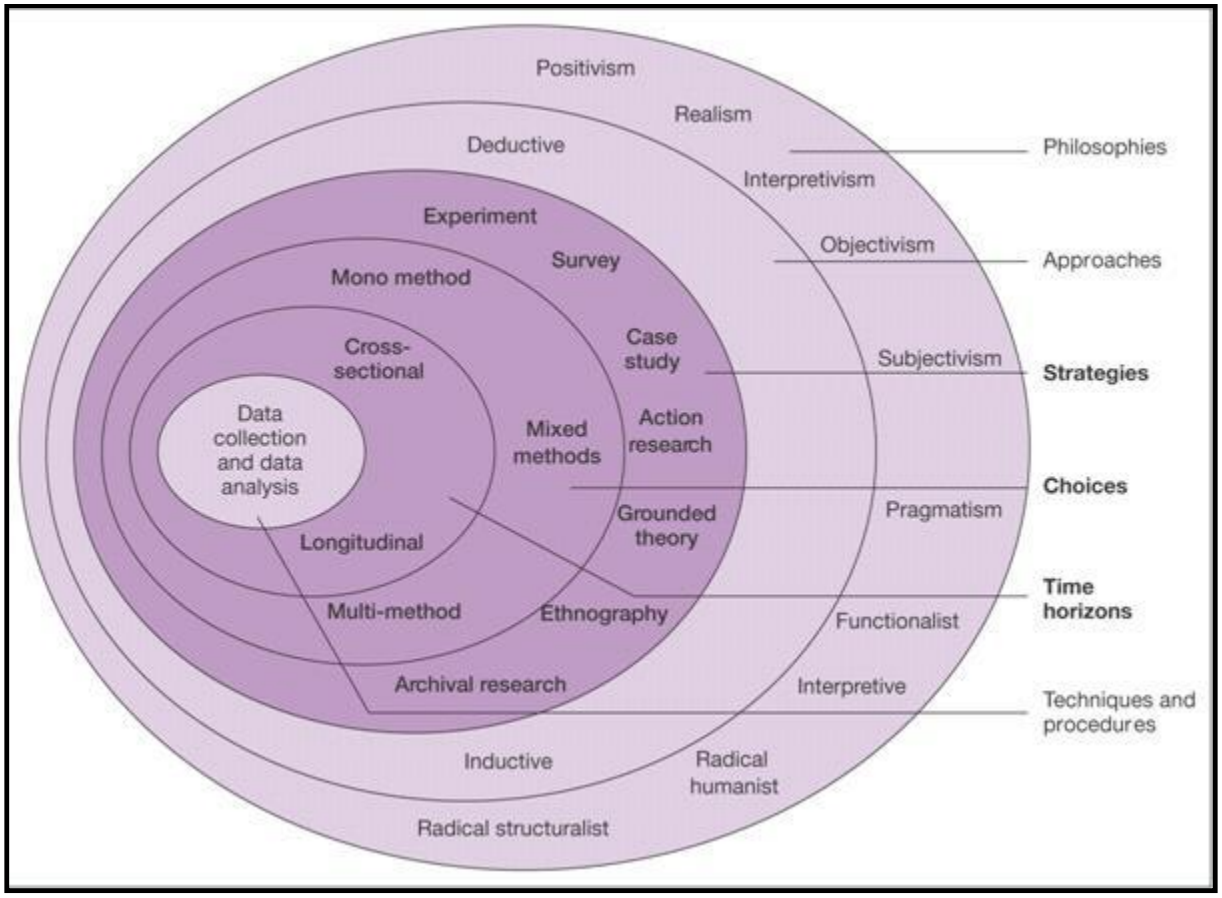


Figure 5:1 Research onion

Source: Saunders et al. (2007:132)

The research onion from the outer layer to the inner covers: Philosophies, that is, pragmatism, subjectivism, objectivism, interpretivism, radical structuralist, realism, radical humanist, interpretive, functionalist and positivism; approaches that include inductive and deductive; strategies consisting of survey, case study, grounded theory, ethnography, experiment, action research and archival research; choices cover multi-method, mono method and mixed methods; time horizons include cross-sectional and longitudinal; techniques and procedures referring to data collection and data analysis (Saunders et al., 2007). The research onion is a comprehensive guide to research but requires the researcher to design a relevant research thread that links relevant research methodologies. That is, in practice specific philosophy can only lead to particular approaches that are in harmony with a particular strategy, choices, time horizons up to techniques and procedures (Saunders et al., 2007). However, different terminology could be employed as the researcher dealt with the research methods as covered by the vast literature of research methods. Such terms like the research design, quantitative and qualitative researchers were used to inform this study.

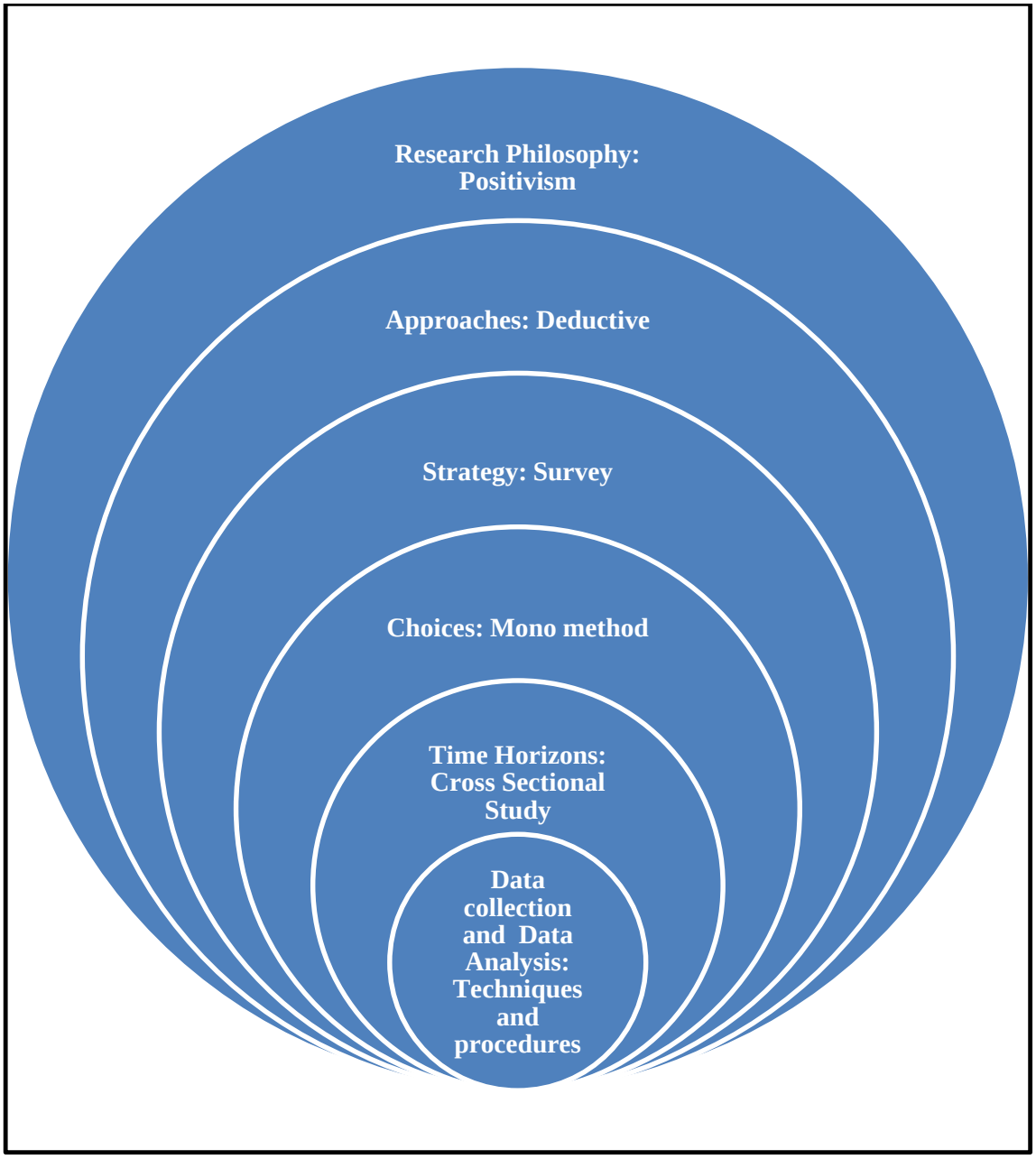


Figure: 5.2: Research onion for the study

Source: Adapted from Saunders et al. (2007)

The research theory used to inform this study was classified into two; that is the research philosophy and the research design. These were taken to guide the courses of action taken by the researcher to scientifically find answers to the research questions. Thus, the relationships between phenomena are explained by science that leads to the development of a theory that in turn informs future decision makers. While the scientific approach can be viewed as either inductive or deductive (Adams et al., 2007), this study took the deductive reasoning method or deduction. It started out with general statements and endeavoured to reach a specific and logical conclusion. The scientific approach used deduction to review the general concepts to reach the conclusion.

To fulfil the objectives of the study, the researcher modified the research onion of Saunders et al. (2007) and came up with a research onion suitable for the study as shown in **Figure 5.2**. **Figure 5.2** will be explained and discussed layer by layer in the following section.

5.3 Research philosophy

According to Saunders et al. (2007), a research philosophy is viewed as the process of developing knowledge and determining the nature of the knowledge. It is also known as scientific thought (Bhattacherjee, 2012) thus implying that the research process has to follow mainly the scientific approach (Adams et al., 2012). Cohen et al. (2007) view different kinds of research as referring to research philosophies. Research philosophy can be categorised into three: epistemology, ontology and axiology (Saunders et al., 2007). Axiology is that area of philosophy that looks at judgements about the value (Saunders et al., 2007). Ontology concerns the nature of reality and has sub areas of Objectivism, Subjectivism and Pragmatism (Saunders et al., 2007). Epistemology concerns what constitutes acceptable knowledge in a field of study and covers positivism, realism and interpretivism (Saunders et al., 2007:102). Interpretivism philosophy believes "that the best way to study social order is through the subjective interpretation of participants involved, such as by interviewing different participants and reconciling differences among their responses using their subjective perspectives" (Bhattacherjee, 2012:19). The interpretivism philosophy covers two areas that are phenomenology and symbolic interactionism.

This study is guided by the positivism philosophy which also called positivist/postpositivist research, empirical science and postposivism (Creswell, 2009). Positivism research holds that: "the social world exists externally and is viewed objectively; research is value-free; and the researcher is independent, taking the role of objective analyst" (Cooper and Schindler, 2011:17).

5.4 Role of theory

According to Adams et al. (2007), theory consists of a systematic definition and proposition of the relationship between interrelated concepts which can be used to explain and predict facts. The term theory is distinguished from other terms like paradigm, proposition and hypothesis. A proposition is a statement assuming the relationship among variables (Adams et al., 2007). A paradigm is a knowledge claim about a phenomenon (Creswell, 2009). A hypothesis is an assertion about the relationship between variables that is empirically testable (Jonker and Pennink, 2010); that is, theories have underlying paradigms and propositions and these can be the basis for hypotheses formulated to guide research to support or revise a theory. Thus, research can be seen as based on theory testing or gathering empirical/practical evidence. This study was based on gathering empirical data without testing any theory or hypothesis. There are two

approaches to research; that is, starting with a theory or ending with a theory. This is the essence of deductive and inductive reasoning. Deductive reasoning "begins with a universal view of a situation and works back to the particulars; in contrast, induction moves from fragmentary details to a connected view of a situation" (Gray, 2013:16). The deduction process starts with theory and gathers facts to test the theory while induction starts with facts and construct a theory (De Vaus, 2014; Babbie, 2015).

This study adopted the deductive research process. The study started by referring to theoretical and empirical evidence with regards to factors that influence technopreneurship, business operations and the manufacturing industry in general. The scope of the information was the global, international, regional, industrial and sectoral geographical parameters. The indicated factors were linked to the Zimbabwean food processing sector situation and a conceptual framework was designed. This was the starting point of the deduction process. However, it should be pointed out that there was no model of factors influencing technopreneurship that were taken as this could have limited the results of the study. Furthermore, the major theoretical and empirical models were based on different environments and situations. Most of the theoretical and empirical models of factors influencing technopreneurship pertained to developed countries. Perhaps the closest were the annual surveys by CZI (2011-2015) which pertained to the whole manufacturing sector of Zimbabwe and limitations with regards to validity and reliability.

The adopted theoretical framework, **Figure 3.4** in **Chapter 3** was based on reviewed empirical and theoretical literature which pertained to factors influencing technopreneurship as gathered in chapter 3 and 4. The results and findings from other researchers on factors influencing technopreneurship were gathered and modelled to come up with the theoretical or conceptual framework. The conceptual framework was also backed by the reviewed literature on technopreneurship so as to take concrete and refined factors influencing technopreneurship through a test process into the field to achieve the objectives of the study. Issues considered to develop the conceptual framework also included that the research was not supposed to duplicate existing research or leave out other pertinent factors thatwere put through the testing process. According to Gray (2013) and De Vaus (2014), the deductive and inductive approaches are not mutually exclusive since, in practice, research is about constructing theories and testing theories. That is, it has to be appreciated that, the deductive approach has elements of the inductive approach in that the conclusion of the deductive reasoning ends up modifying the existing beliefs. This modification can be deemed to be a new construct thatis based on a model that could be taken to be general since it may not be taken as pure as it maybe (Bryman and Bell, 2015).

5.5 Research design

A research design stipulates the purpose of the research (Gray, 2013). According to Kothari (1990:39), "a research design is the arrangement of conditions for collection and analysis of data in a manner that aims

to combine relevance to the research purpose with economy in procedure." It concerns research decisions regarding, where, how many, what, when and how. "A research design is primarily the model you propose to use to analyse the data, but it also must include the plans for measuring the major variables and collecting data" (Baker, 1999:451). Research designs describe the data to be gathered by a research study. Research designs can be categorised into three, that is, descriptive, explanatory or predictive research.

It has to be appreciated that while the three research designs may be considered different, these tend to build on each other. They move from the most basic, that is the descriptive design, through the intermediate, that is explanatory design, to the most advanced, that is predictive research design. While a study may assume one of the designs, an element of each design is found in all designs. This study adopted a descriptive research design (Saunders et al., 2007).

Descriptive research design

According to Adams et al. (2007) descriptive research design aims to provide a simple description of phenomena and is not specifically concerned with considering why behaviour may be the way it may be. The study did not focus of establishing a cause-and-effect relationship but a correlational relationship which is basically descriptive in nature and not causal. In this case, the study aims at describing what is going on in the Zimbabwean food processing sector with regards to technopreneurship. So the descriptive research design became the best suitable design for that purpose. This study mainly assumed a descriptive research design using the survey research approach, thus, it sought to find out what it is or "what was going on" (descriptive research) (Greenfield, 2002). Thus through asking questions to the employees of food processing companies the researcher could be told what was going on and given the design its suitability.

Descriptive research describes a phenomenon only (De Vaus, 2014). In this study, the purpose of the descriptive design was to describe the factors that influence technopreneurship in the food processing sector in Zimbabwe. The design has its disadvantage mainly from the fact that it cannot establish cause and effect relationship.

However, its advantages include:

1. Its ability to generate much information through description. Given that the factors influencing technopreneurship are being sought, the best way to know these is by describing them and their association with the dependent variable (adoption of technopreneurship).
2. Can identify variables and hypothetical constructs. Through the design, the independent and dependent variables were identified as factors influencing technopreneurship and technopreneurship in the Zimbabwean food processing sector respectively. The variables were modelled into a conceptual framework that assisted to focus the study.

3. Descriptions can be utilised in a direct test of a theory or model. From this view, the conceptual framework, **Figure 3.4** in **Chapter 3**, which is based on literature can be put to test and results useful to review existing models and beliefs about factors that influence technopreneurship.
4. Some situations can only be studied through description. In this case, it can be appreciated that, given the aim of the study, that is, to know which factors influence technopreneurship in the Zimbabwean food processing sector, the only description could fulfil the purpose.

Explanatory research design

Adams et al. (2007) indicate that explanatory research goes deeper than descriptive research in the logic that it describes phenomena, as well as attempting to consider why behaviour may be what it may be. The research design is seen as a step further than descriptive or exploratory research designs and does not describe only but goes further to give reasons for the nature of phenomena. It is aimed at describing and linking relationships among variables and revise theories and models. The design is not used in this study since this study does not aim at revising any theory or model in technopreneurship. The aim of the study is to describe and discuss what is going on in the Zimbabwean food processing sector with regards to technopreneurship.

Predictive research design

Predictive research takes research one step further than explanatory research and attempts to explain behaviour, as well as to predict future behaviour suppose with a change in one or more of the determining variables relevant to the particular phenomenon (Adams et al., 2007). Thus explanatory research design explains how something is happening. It advances the notion of cause and effect. It is a full experimental design that suits experiments that formulate theories and models to guide future decisions. The explanatory research design was not used in this research study since the aim of this study was not to explain how technopreneurship was happening but what was happening with regards to technopreneurship in the Zimbabwean food processing sector.

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5.6 Research approaches

Research approaches consist of two research domains namely, qualitative research and quantitative research (Adams et al., 2007). Others add a third approach, namely the mixed research domain (Saunders et al., 2007).In this study, the quantitative research approach was adopted as opposed to the qualitative research.

Quantitative Research

Regardingthe type of data gathered, the study assumed a quantitative research approach. Ingham-Broomfield (2014) highlighted that quantitative research is in line with research which attempts to establish statistical significance, and addresses questions through measuring and describing. As such quantifying and describing were the aims of this research hence justifying the adoption of the qualitative domain. According to Babbie (2015:24):

"Every observation is qualitative at the outset, whether it is our experience of someone's intelligence, the location of a pointer on a measuring scale, or a check mark entered in a questionnaire. None of these things is inherently numerical or quantitative, but converting them to a numerical form is sometimes useful. Quantification often makes our observations more explicit. It also can make it easier to aggregate, compare, and summarise data. Further, it opens up the possibility of statistical analyses, ranging from simple averages to complex formulas and mathematical models. Quantitative data, then, offer the advantages that numbers have over words as measures of some quality."

Quantitative research finds answers to questions such as: how much, how often, how many, when, and who (Cooper and Schindler, 2011). In this study quantification of responses to specific issues was sought to fulfil the objectives. Merits of quantitative research include:

1. It is believed to be more objective.
2. It uses statistics to generalise research results.
3. It can model a complex problem to simple terms.
4. It tests hypotheses and theories.
5. It assumes a representative sample of the population.
6. It easily assumes the scientific approach.
7. It does not require much detail.

However quantitative research may lack in the richness of explanations which is often required to have a full description and understanding of phenomena (Babbie, 2015). Quantitative data needs to be qualified at times for the data to convey its full meaning and answer all pertinent questions. In this study, this

limitation was minimised by exhausting all possible answers in the multiple choice questions, for example where alternative answers were given, an 'Any other' would be included to open for those who could not be accommodated on the alternatives. Also cross checking for consistency was used through determining the relationship between outcomes of different questions during data analysis.

5.7 Survey research strategy

Saunders et al. (2007) describes seven research strategies namely: experiment, survey, case study, action research, grounded theory, ethnography and archival research. This study adopted a survey research strategy. Zikmund and Babin (2012:61) define survey research as "a technique in which a sample is interviewed in some form or behaviour of respondents is observed and described in some way". The definition points to the issue of sampling, interviewing and observation. On the other hand, De Vaus (2014) holds that survey research is mostly regarded as quantitative research and observation and focus groups regarded as qualitative.

In this study survey research was used to gather data by asking questions. Questions can be asked through various means that include: telephone interviews, personal interviews, mail interviews or questionnaires. The study adopted the questionnaire as a survey strategy. Surveys are compatible with phenomenological philosophy, descriptive research design and quantitative research.

Surveys are regarded as the most popular research strategy because of its merits which include:

- Easy to execute
- Cheaper to administer
- Can gather large quantities of data
- Rely on people and not the researcher

However surveys have their weaknesses emanating from:

- Respondents may not cooperate
- Respondents may not be able to answer the questions.

In this research study, while taking advantage of the merits of the survey method, the researcher minimised the weakness of lack of cooperation by negotiating for access (Saunders et al., 2007).

5.8 Time horizons

Research time horizons can be categorised into two, that is, cross-sectional and longitudinal (Saunders, 2007). Time horizons include research timing that has to do with planning or scheduling of the research.

Longitudinal research

Adams et al. (2007: state that "longitudinal research involves the study of a sample (or cohort) on more than one occasion. In other words, longitudinal studies cover a long period, at times several decades, and follow the sample a repeated number of times."When the researcher has control over the research process, the longitudinal approach can be adopted. Longitudinal research is appropriate when the research involves monitoring or observing the subjects at a constant or given time interval and the research has no time constraints. This approach did not suit the situation and circumstances of this study.

Cross-sectional research

Rindfleisch et al. (2008) view cross-sectional research as a survey research in which each respondent complete the survey at one point in time. The study adopted the cross-sectional approach since the researcher was expected to work over a limited period. According to the University regulations, the study had a minimum period of two years and a maximum of five years. The cross-sectional approach has advantages of suiting various academic and industrial situations and circumstances regarding its pragmatic and cost advantages. However it is viewed as prone to common method variance (CMV) which can be minimised by using the cross-sectional approach in conjunction with the longitudinal approach (Rindfleisch et al., 2008). In practice, this is not an easy or practical issue that leaves the cross-sectional approach being suitable on its own.

Questionnaire pilot testing

Pilot testing is the launching of the questionnaire at a limited scale to eliminate any problems before the questionnaire is distributedat a large scale (Shukla, 2008). The principal purpose of pilot testing is to improve the reliability and validity of the questionnaire (Cohen et al., 2007; Saunders et al., 2007). 20 people from 10 organisations which had shown consent were used to complete the questionnaire in the pilot test. The questionnaire pilot test was one of the major techniques to achieve reliability of the research instrument and the validity of the gathered data thatare further discussed under reliability and validity.

The results were as follows:

- Some of the terminology, such as technopreneurship, was given common meaning. Some of the terminologwere adjusted to suit the language, jargon was removed and the definition of technopreneurship was included on the instruction of the questionnaire. As such, to some extent, thecommon meaning was achieved.
- Two out of the twenty respondents had completed the consent letter. A follow-up indicated that respondents wanted to keep themselves and their organisations anonymous. The researcher indicated orally to respondents that the consent letter was optional so as to increase the response rate. Questionnaires offer anonymity and avoid interviewer bias and can be effective, the high response

rate for an educated target population that has a strong interest in the topic (Neuman, 2012). Data were gathered from industrialists who were taken to be involved in technopreneurial decisions.

- Some of the questions were not properly aligned to the objectives. These questions were realigned to gather the desired data and address the objectives. The gathered data included production constraints, possible innovations and business attitudes. Questions for successful technopreneurs included what they could point to as success factors and their view towards manufacturing as a business in Zimbabwe.

5.9 Population of the study

According to Bhattacherjee (2012) population refers to all people, items, units or elements with the characteristics that the researcher wishes to study. A population is the total collection of units about which the researcher intends to make possible inferences (Cooper and Schindler 2011). On the other hand, Adams et al. (2010) view a population as consisting of a well-defined set of elements. In this case, all the food processing technopreneurs in Zimbabwe and their employees are identified as the population of this study. The employees are classified as either engineers, administrators, scientists or managers.

The population statistics from ZIMSTAT (2015) show that the employment rate in the manufacturing industry reduced from 118 600 to 93 100 from the year 2012 to 2014.There are 11 sub-sectors in the manufacturing industry according to the International Standard for Industrial Classification (2014)with two which include the foodstuffs and beverages sectors. For the industrial sector in general, ZIMSTAT (2015) indicated that about 83 percent of the employed is unskilled, that is 17 percent skilled and professionals; while employment at the managerial level is 1 percent of those employed and with about 72 percent being male. From the above statistics, it can be estimated that from the 93 100 employees in the manufacturing industry, two sub-sectors fallintofood processing sector thatincludes foodstuffs and beverages. These two sub-sectors employs about 16 927 employees. That is 2 out of 11 of 93100 assuming equal employment across the manufacturing industry produces 16 927.From the 16 927 employees in the food processing sector, 17 percent are skilled according to ZIMSTAT (2015) which is a population of 2 878 workers and these workers are targeted in this study according to this approach.

In this study, the population is represented by all food processing technopreneurs in Zimbabwe. food processing technopreneurs manufacture food products distributed through retail outlets. The food processing sector in Zimbabwe is made up of mainly small-scale companies (Macheka et al., 2013). This could mean employing approximately 100 to 200 people. Respondents included employees within the food processing technopreneurs who are management, administrators, technicians, engineers and other staff within the food processing companies in Zimbabwe. Information with regards to the companies was obtained from the Confederation of Zimbabwe Industries (CZI), Zimbabwe Stock Exchange (ZSE),

Industrial Directories and websites. From the sources, it was established that there are 14 major food processing technopreneurs in Zimbabwe which were still operating in 2014. The researcher contacted more than half of these industrial food processing technopreneurs.

5.10 Sample design

Sampling can be defined as a process or technique of choosing a suitable portion of the population in order to determine parameters of the whole population (Jonker and Pennink 2010; Bhattacherjee 2012). Sampling is the selection of some of the elements in the population from which to draw conclusions about the entire population (Adams et al., 2007; Salaria, 2012). A sample design is a procedure used by the researcher to obtain the sample from the population (Adams et al., 2007). It includes details of the sampling unit, sample size and sampling techniques. The rationale behind sampling include, according to Adams et al. (2007):

- Cost minimisation
- Speed
- Practicality and Feasibility
- Higher Data Quality
- Public Acceptability

However, sampling has such challenges as

- Variance and Bias - Sampling Bias and Non-response Bias
- Imperfect Coverage

To minimise the impact of the limitations of sampling the researcher strived to contact more than 50% of the food processing companies in Zimbabwe. That is nine companies out of an estimation of 14 viable and operational food processing companies in Zimbabwe.

Sample Unit

The sampling unit refers to a single aspect or group of aspects subject to inclusion in the sample (Adams et al., 2007). In this study, the sample unit was an individual employee in the food processing industry. In particular, the sample unit covered managers, administrators, engineers, scientists and technicians in the food processing sectors in Zimbabwe. These were taken as the relevant target respondents since they are rich in the organisational information with regards to information on technopreneurship. The sample unit is further described under sample size and in section 5.11 of this chapter, that is, under inclusive/exclusive criteria.

Sampling techniques

Sampling techniques/approaches can be sub-divided into two categories, which are probability/random sampling and non-probability/non-random sampling (Adams et al., 2007).

Probability sampling procedure

Probability sampling is an approach in which every element in the universe has a known chance of being chosen in the sample of which can be determined accurately (Bhattacherjee, 2012). The sampling procedures can be utilised where there is a sampling frame. A sampling frame is a completely documented list of all units in the target population from which the sample is to be drawn (Saunders et al., 2007; Adams et al., 2007). In this probability sampling techniques were not utilised.

Non-probability sampling procedure

Bhattacherjee (2012) view non-probability sampling as a sampling procedure in which some elements of the population have no chance of being chosen or where the probability of their selection may not be accurately determined. The selection of elements is based on assumptions regarding the population of interest, which forms the criteria for selection. Sample units are chosen based on non-random criteria such as the researcher's judgement, convenience, referrals or willingness to participate (Saunders et al., 2015).The researcher used non-random sampling procedures owing to lack of a sampling frame and the need for gatekeeper's consent and respondents' consent as an ethical requirement.

The researcher had to involve companies that showed consent through their gatekeepers and employees that also showed consent of which the process could not be probabilistic. This study adopted non-random sampling techniques since the chance of selection of sample units to the sample was not known (Adams et al., 2007). In this study, the researcher established that food processing companies could not all be found in some database hence the rationale behind using non-random sampling.Non-random sampling techniques are sub-divided into five types, which are, convenience sampling, purposive / judgemental sampling, self-selection, snowball sampling and quota sampling (Saunders et al., 2007). Literature could add more or have different nomenclature.

Purposive Sampling

Purposive sampling also known as judgemental sampling enables the researcher to use own judgement to select sample units that best meet the criteria so as to gather data to satisfy the objectives of the research (Saunders et al., 2007). Important features are the researcher's judgement, criteria and research purpose. It is also seen as a non-probability sampling procedure that conforms to some criteria (Adams et al., 2007). In this instance, the issue of conformance and criteria are important elements of the definition. Furthermore, Cohen et al. (2007:114-115) expressed that: "In purposive sampling, often (but by no means exclusively) a feature of qualitative research, researchers handpick the cases to be included in the sample

on the basis of their judgementof their typicality or possession of the particular characteristics being sought."

Cohen et al. (2007) confirm that in most cases, purposive sampling is used to contact knowledgeable people. In this case, the researcher wanted to access knowledgeable employees in the food processing companies. The technique became suitable since the researcher wanted to select employees who could provide the desired information that could be obtainable from managers, administrators, engineers, technicians and scientists. Such employees were assumed to be rich in the desired information about the food processing companies. Thus, those who did not meet these criteria would not provide the desired information and could not be respondents of the questionnaire.

Quota Sampling

Adams et al. (2007) indicated that purposive sampling covers two types of sampling, namely judgement sampling and quota sampling. Judgement sampling has been defined and presented how it was used. Quota sampling is defined as where the researcher seeks to have more of the groups not represented in the total sample (Adams et al., 2007). Quota sampling was used at company level selection. In this case, as many food processing companies as possible were required to be substantially represented in the final sample. The researcher continuously sought gatekeepers' consent so as to increase the number of participating food processing companies. This was used to reduce bias against companies not represented in the final sample (Adams et al., 2007).

Sample Size

The issue of sample size has no clear-cut answer since the correct sample size depends on the purpose of the research and the nature of the population under study (Cohen et al., 2007; Adams et al., 2007). However, Bartlett and I (2001:43) indicated that "a common goal of survey research is to collect data representative of a population since the researcher uses information gathered from the survey to generalise findings from a drawn sample back to a population, within the limits of random error". For the sample size to be representative, it could be statistically tested. The sample size was not statistically determined but **Table 5.1** was used to guide the determination of an optimum sample size. However, the collected data was quantitatively analysed. Quantitative analysis of data assists the generalisation of sample statistics to population parameters (Creswell 2009; Bartlett et al., 2001).

There are statistical tables like **Table 5.1** which can be used to select appropriate sample sizes for a research problem from a population depending on alpha level and a set error rate (Bartlett et al., 2001). According to Kazemi et al. (2007), the general guiding principle for determining a suitable sample is that a 5% level of significance (alpha level of 0.05) is satisfactory for most survey research. "For most statistical analysis, α is set to 0.05" (Bhattacherjee, 2012:125).

Bartlett et al. (2001) indicate that at a 10% level of significance (alpha = 0.10)or more may be suitable if the survey is mostly after determining insignificant differences, associations or other statistical phenomena as antecedent to further research; while 1% level of significance (alpha = 0.01) may suit situations where the survey results are critical and errors may have substantial cost implications (Bartlett et al., 2001).

Using **Table 5.1**, the population of employees of food processing companies who meet the criteria is around 10 000. As a result, a sample of at least 119 respondents from at least 50% of the food processing companies would be significant and representative of the population.

Table 5.1: Table for determining minimum returned sample size for a given population size for continuous and categorical data

	Sample size					
	Continuous data (margin of error=.03)			**Categorical data (margin of error=.05)**		
Population size	**Alpha = .10, t=1.65**	**alpha = .05, t= 1.96**	**alpha = .01, t= 2.58**	**alpha = .50, t=1.65**	**alpha = .50, t= 1.96**	**alpha =.05, t=2.58**
100	46	55	68	74	80	87
200	59	75	102	116	132	154
300	65	85	123	143	169	207
400	69	92	137	162	196	250
500	72	96	147	176	218	286
600	73	100	155	187	235	316
700	75	102	161	196	249	341
800	76	104	166	203	260	363
900	76	105	170	209	270	382
1,000	77	106	173	213	278	399
1,500	79	110	183	230	306	461
2,000	83	112	189	239	232	499
4,000	83	119	198	254	351	570
6,000	83	119	209	259	362	598
8,000	83	119	209	262	367	613
10,000	83	119	209	264	370	623
NOTE: The margins of error used in the table were .03 for continuous data and .05 for categorical data. Researchers may use this table if the margin of error shown is appropriate for their study. However, the appropriate sample size must be calculated if these error values are not appropriate.						

Source: Bartlett and Ik (2001)

The sample size had to be determined at two levels; that is the company level and employee level. At the company level, there was no sampling frame from which the sample could be drawn (Adams et al., 2007). The registrar of companies had no list of food processing companies since most of them were no longer operational because of the economic meltdown. The researcher used product packages at retail stores to identify operational companies in Zimbabwe and identified 14.The researcher managed to reach nine companies using mainly quota sampling.

Also, participants in the study, who were employees of the cooperating companies, were non-randomly selected through judgemental sampling and only those who cooperated participated in this study. Eriksson and Kovalainen (2008) indicate challenges like access to companies and cooperation from respondents, as well as how to deal with these as a researcher are important aspects to consider when the sample size is determined. The challenges were anticipated and measures were taken to minimise the effect of this on the study. Measures taken to enhance respondent cooperation were such as identifying influential people within the organisations and use them as contact persons in advance beforehand delivery of the questionnaire. In additions, appointments could be sought with gatekeepers to negotiate access. However appointments could hardly be secured and negotiations could also be hardly entertained as the gatekeepers could pretend to be very busy. The original intention was to identify qualified employees per company and get a representative sample of at least 10% that could amount to 20 respondents per company. However because of field challenges this was not achievable. A total of 147 participants from nine food processing companies were obtained as shown in **Table 5.2.**

Table 5.2: Sample size

Target Respondents	Number of Organisations	Sample Unit	Actual Sample Size
Food processing sector in Zimbabwe	9	Managers, Scientists, Administrators, Engineers, Technologists	147

At the organisational level, nine out of an approximate population of 15 companies constituting 60% of the population can be said to be representative although some of the companies had a low response rate.

5.11 Inclusive/exclusive criteria

The concepts of inclusion/exclusion criteria are often most applicable to experimental designs (Tuszynski et al., 2007). They refer to the specifications made by the researcher that define inclusion and exclusion qualifications for participants to achieve the objectives of the study (Tuszynski et al., 2007). Inclusion

criteria are specific attributes that the prospective subjects must possess for them to be considered in the study while exclusion criteria are those specific attributes that disqualify prospective subjects from being considered in the study (Wilmot, 2005). In this study, the inclusion/exclusion criteria included such characteristics as company sector, job position, educational qualification and cooperation. These can further be explained as follows:

Company Sector

The study focused on the food processing sector in Zimbabwe only. The organisations in the food processing sector are the subjects of this study. Industrial food processing in Zimbabwean organisations is either 100% or less; that is, some manufacturing companies apart from industrial food processing are engaged in the manufacturing of other consumer or commercial products like cosmetics, sanitary products and stock feeds as well as retailing. All organisations doing industrial food processing to some extent were to be included as subjects of the study.

Job Position

To be able to achieve the objectives of the study, the researcher had to reach the correct organisations and then contact the right people within the organisations. One of the criteria for the right people within the right organisation was their job position. Questionnaires were distributed to employees who could fit in the following categories: top management, middle management, first line managers, scientists, engineers and technicians. People occupying such positions were taken to possess the level of information about the organisation as sought by the questionnaire. People occupying lower positions may lack the information about the organisation sought by the questionnaire. In most cases people occupying lower positions in the Zimbabwean manufacturing industry are unskilled and tend to lack technopreneurial knowledge. However, this criterion has weaknesses in that terms used for job positions in different organisations vary regarding nomenclature.

Educational Qualifications

This criterion held that if someone has, at least, a diploma in an area of specialisation they could be respondents. A minimum of a diploma ensures that the person is literate enough to answer the questionnaire and has enough content to appreciate the issues within the questions. It was assumed that someone with a lower qualification may not understand the subject matter of the enquiry. Technopreneurial issues in the questionnaire covered both strategic and operational questions. Those without at least a diploma could hardly attend to questions seeking responses with regards to strategic issues.

Cooperation

Apart from the above criteria, there was a need to consider cooperation from the respondents. In fact, consent can be and was taken as one of the inclusion/exclusion criteria (Chandrika and Vasudha, 2010).The organisation could be in the food processing sector with people of the correct level and qualifications, but if they were not willing to participate in the study, they were excluded. However, the researcher did his best to persuade the organisations and their employees to take part in the study and it was donewithin the ethical considerations of the study.

5.12 Data collection instruments

Surveys involve collecting data through asking questions. In this study, a questionnaire was chosen to be the questioning method (research instrument). According to Jonker and Pennink (2010), a questionnaire is a widely applicable instrument of gathering data through surveys, experiments, field research or even any other modes of observation.

Stone (1993) holds that a questionnaire should be: unbiased, intelligible, appropriate, unambiguous, omnicompetent, appropriately coded, ethical and piloted. To achieve such criteria, Stone (1993) suggested a process that could be followed in designing a questionnaire:

1. Decide what data you need.
2. Select items for inclusion.
3. Design the individual questions.
4. Compose the wording.
5. Design the layout and presentation.
6. Think about coding.
7. Prepare the first draft and pretest.
8. The pilot and evaluate the form.
9. Perform the survey.

The process was also used in this study and this will be explained by focusing on the following specifically: the questionnaire, measurement scales, types of questions and question arrangements.

Questionnaire

A questionnaire is a document containing questions and accompanying relevant information for the respondent and is systematically designed to solicit appropriate information from the respondent to satisfy the research objectives (Jonker and Pennink, 2010). Essentials of this definition include the issue of

questions and accompanying information for the respondent. The accompanying information (see **Appendix 1**) included:

- The introductory letter introducing the research study, researcher, institution and the supervisor with contact details for transparency purposes.
- The informed consent letter for the respondent to complete and endorse as evidence that the respondent was free to participate or not to participate; participation or no participation had no negative repercussion to the individual.
- On the questionnaire, instructions were included to guide the respondent as to the required action.
- Lastly, the definition for technopreneurship was included to contextualise the subject matter.

Types of Questions

Questions to be included in a questionnaire can be classified into open-ended questions (unstructured questions) and closed-ended questions (structured questions) (Shukla, 2008). Open-ended questions are those in which respondents are requested to describe issues in their words or write their views and feelings (Adams et al., 2007). Such questions are often used for qualitative studies. Adams et al. (2007) assert that in open questions responses are given in the form of textual statements and hence the following challenges arise:

- How to analyse the answers is both time consuming and difficult, especially if the respondents deviate from the question or misinterpret it
- Some respondents are wary of open questions as they find writing prose difficult or get concerned about grammar or spelling

The researcher did not use open-ended questions in the questionnaire for this study. Open-ended questions would bring in the issue of qualitative data analysis thatwas not originally intended. Numerical data is easier to handle and analyse that words and statements

Closed-ended questions also known as closed questions or forced-choice questions as it providesa number of optional answers from which respondents are instructed to choose (Saunders et al., 2007). Closed-ended questions were used in this study.

Adams et al. (2007:132) summarise the advantages and disadvantages of closed ended questions as:

Advantages

- Easy to process answers
- Enhances comparability between cases
- Clarify meaning to the respondent
- Completion is easier
- Reduces variability in analyst's interpretation

Disadvantages

- Loss of spontaneity of respondent
- Difficult to make forced choice answers or mutually exclusive responses
- Difficult to make forced choice answers or exhaustive responses
- Can be irritating
- Makes questionnaire long
- Wide variation by respondents in the interpretation of forced choice answers

To deal with the shortcoming of close-ended questions, the researcher resorted to the use of five-point Likert scales that accommodate most possible alternative responses. In other instances that did not use Likert scales, the alternative response 'any other' was used.

There are three types of closed-ended questions namely: dichotomous questions, multiple choice questions and scale questions (Shukla, 2008). Dichotomous questions are closed-ended questions that give respondents a choice of two alternative responses (Saunders et al., 2007). The type of question was used to solicit for the gender of each respondent. It is some form of a nominal scale which only was meant to identify the respondent regarding either male or female (Question 5.4 on the questionnaire). Multiple choice questions are closed-ended questions that give respondents more than two choices of alternative answers that are discrete/free from overlaps and mutually exclusive (Cohen et al., 2007). Such questions are also nominal scales or ordinal scale. In the questionnaire questions thatwere nominal scales were: question 5.1, 5.2 and 5.3. Question 5.5 is a typical multiple choice question that is an ordinal scale. Scale questions or rating scales are multiple choice questions that give respondents three or more alternative answers that rate a variable (Shukla 2008; Cohen et al., 2007). Scaled questions are examples of ordinal scales. The questions can be categorised as Likert scales, semantic differential scales, Thurstone scales and Guttman scaling (in Cohen et al., 2007). The questionnaire of the study was mainly five-pointLikert scales. The latter has merits of being accommodative and exhaustive regarding responses and are easy to analyse through SPSS version17.

Content of questions

According to Shukla (2008), the content of each question is determined by such elements as the wording, the order of the words and tense. To decide on what data was required the researcher used the research objectives and reviewed literature and research methodology to generate possible questions. The activity also worked as a criterion to determine what items were to be covered by the questionnaire. Also, it functioned as questionnaire validation since the questionnaire was being alignedwith the research objectives. Saunders et al. (2007) assert that internal validity in questionnaire design refers to the ability of the questionnaire to measure what it is intended to measure. Individual questions were crafted and each

aligned with a specific objective. In principle, to design the questions the researcher formulated questions that measured the adoption of technopreneurship at each of the companies (respondents) and then went on to find out what factors were present at these companies. The aspects of innovativeness of the company and entrepreneurship management were of the essence in the questions. Thus, the researcher wanted to find out what was happening in reality.

According to Shukla (2008), questionnaire content challenges can be dealt with by avoiding common content errors which include:

- Use of jargon and 'big' words
- Ambiguous words
- Leading questions
- Implicit words
- Generalisations
- Double barreled questions
- Difficult or taxing questions

The challenges were anticipated and a pilot test was used to minimise these challenges. The details of the pilot test are covered under questionnaire pilot test. The other issues of question content such as the order of words and tense were dealt with using technical guidance from the statistician as well as the comments from the supervisor.

Administering the questionnaire

Questionnaire administration answers the questions of who should complete the questionnaire and how should the questionnaire be completed). According to Cohen et al. (2007), a questionnaire can be administered either by self-administration; post; face-to-face interview; telephone or the internet. The self-administered questionnaire was completed at the workplace of the respondent.

Question order, layout and order

According to Shukla (2008), a questionnaire can be subdivided into three parts that is the opening questions, the generic questions and the specific questions. The questionnaire was presented by starting with opening questions that focused on the role of technopreneurship. The questions were structured in a way that aroused the respondent's interest. The next section consisted of specific questions that attended to the major research objectives (Shukla 2008). The questions focused on factors influencing technopreneurship; feasibility of technopreneurship and critical success factor of technopreneurship. These questions aimed to find answers to the research objectives. The last part of the questionnaire focused

on generic questions that can also be termed demographic questions. In the Zimbabwean society, most of the demographic data like gender, the level of education, the department at work, the position at work, are considered sensitive. As a result, to avoid possible distortions, the questions seeking this information were placed towards the end of the questionnaire. Shukla (2008) confirms that most researchers agree on the layout and the formulation of the opening questions, then with the specific questions and ending with the classification and identification questions.

Measurement scales

Shukla (2008) view a questionnaire as a formal document of questions consisting of at least one measurement scale designed to collect particular primary data. The major element of interest in the definition has to do with measurement scales. A scale may be viewed as a measuring instrument for suitable quantification of variables (Adams et al., 2007). Measurement scales vary regarding their fundamental properties to include: nominal scale – assignment property; ordinal scale – order property; interval scale – distance property and ration scale – origin properties (Shukla, 2008). The measurement scales have implications to the type of data or information they provide and the type of questions to be asked. The measurement scales were all used each on the relevant situation and circumstances.

Likert scale

The questionnaire used in this study did not have other types of scaled questions but only utilised Likert scales that are mainly ordinal scales. A Likert scale (from Rensis Likert, 1932) provides several alternative responses to the respondent rating a variable ranging from one extreme to another (Cohen et al., 2007). Likert scales vary from a three-point scale (three alternative answers) to as far as ten-point rating scale (ten alternative answers). The principle is that the middle point is neutral in the case of an odd number rating scale. A commonly used rating scale is a five-point Likert scale (Cohen et al. 2007; Shukla, 2008). The Likert scales were presented in the form of a grid or matrix so as to enable recording of responses of two or more similar questions (Saunders et al., 2007).

Kothari (2009:86) outlines the advantages of Likert scales as:

- It is relatively easy to construct the Likert-type scale in comparison to Thurstone-type scales because the Likert-type scale can be performed without a panel of judges.
- More reliable because it also provides more information and data than does the Thurstone-type scale.
- Permitting the use of statements that are not manifestly related (to have a direct relationship) to the attitude being studied.
- Easy to use in respondent-centered and stimulus-centered studies.
- Less time consuming to construct and is frequently used by the students of opinion research.
- Being reported in various research studies that there is a high degree of correlation between Likert-type scale and Thurstone-type scale.

Furthermore, Kothari (2009) indicates the disadvantages of Likert scales as:

- Not giving the interval between two consecutive alternative responses.
- Responses may lack validity since explanations to qualify the responses are not possible.

To limit the effect of such limitations, the researcher used the proper wording of statements on the scale and tested for relationships between different statements on the Likert scale and other questions.

The Likert scale was used in the form of importance and agreement scales. On the questionnaire, question 1 and 3 were grids of importance scales while question 2and 4 were grids of agreement scale. Final questions were mainly multiple-choice questions in the form of five-point importance scales and agreement scales. Importance scales employed five-point alternative responses from 'not at all important to extremely important. The possible responses were coded as 1 represents*not at all important*, 2 represents*not really important*, 3 represents *neutral*, 4 represents *important* and 5 represents *extremely important*. Questions were numbered continuously using multi-level lists. That is, question 1 had 1.1 to 1.3, and question 2 had 2.1 to 2.20 and so on. Possible responses were then coded using ordinal numbers to facilitate data capturing and analysis. Agreement scale questions had five possible responses to each statement where1representsstrongly agree, 2 represents *agree*, 3 represents *not sure*, 4 represents *disagree*, and lastly 5 represents *strongly disagree*. For objective number four, a five-point importance scale was designed which ranged from, 'definitely yes' to 'no, not at all'. The possible responses were then coded as, 1 represents *definitely yes*; 2 represents *yes, to some extent*; 3 represents *neutral*; 4 represents *no, not really*; 5 represents *no not at all*. Likert scales are easy to develop and understand, as well as making data analysis through statistical packages such as MS Excel and SPSS easy.

According to Shukla (2008:81), a robust and appropriate measurement scale can be developed to measure a phenomenon but errors in measurement should always be anticipated and their impact minimised. Errors in measurement happen because of the following reasons:

- Respondent error – respondent characteristics such as intelligence and education can affect the test score.
- Short-term personal factors – such as fatigue, stress and anxiety.
- Situational factors – such as noise in the surroundings and presence of other people.
- Clarity errors – such as poor framing of questions and scale.
- Mechanical errors – such as poor printing, recording the error and poor design.
- Analysis error – inappropriate methods of analysis used.

The cited causes of errors seem to be affecting the validity of the research results. To deal with the respondent error, the researcher stipulated who can participate in the study using inclusion / exclusion criteria. Control questions were used in the questionnaire, such as job position. Positions that did not meet the criteria were eliminated. The major uncounted error in this study had to do with short-term personal factors. The target population had low morale due to economic and political circumstances and situations that placed their employment at risk as outlined in chapter 2. There was the threat of further massive retrenchment without terminal benefits because of a 17 September 2015 Zimbabwe Supreme Court Ruling (The Citizen 2015) which saw about 30000 employees retrenched with a three month notice period without terminal benefits (Martel 2015). According to the Citizen (2015) (online):

"The current dismissals follow a wave of job losses in the last few years, which have reportedly seen more than 4 610 companies filing for liquidation or closing shop. Zimbabwe's finance minister Patrick Chinamasa said in a mid-term monetary policy statement last year that the closure of companies had resulted in more than 55 443 people losing their jobs."

This led to a depressed workforce, who could hardly give attention to a questionnaire that seemed not to attend to their personal and current problems. The challenge was dealt with by identifying influential people within each organisation and used them as contact persons who would assist to distribute and collect the questionnaire. Clarity errors, analysis errors and mechanical errors were minimised by employing a specialised statistician who assisted in the designing of the questionnaire as well as the analysis of the gathered data.

5.13 Data collection process: fieldwork

Barkhuus and Brown (2012) assert that fieldwork poses some problems that are beyond the researcher's control, but which the researcher encounters and has to be resolved.Data collection refers to the process of gathering the facts and figures on variables of interest, according to the preplanned procedure that enables the researcher to achieve the research objectives. Adams et al. (2007) look at data collection as the actual implementation of the research methods; in this case, the survey.

It should simply be taken as the research stage during which the researcher gets into the field to gather data specified by the research plan. In other words, it is the implementation stage of the research plan. Self- administered questionnaires were hand-delivered at workplaces and respondents could complete it in their own time. Follow-ups through calling at different times of day as well as on different days every week were made to remind the respondents were necessary (Saunders et al., 2007).A collection of data was donefor three months– March, April and May 2015. The research sought and identified a contact person in each organisation who were responsible for the distribution and collection of the questionnaires.

The risk of manipulating people by the contact person was minimised by working closely with the contact person. Some of the answered questionnaires were obtained as hard copies while others were returned as soft copies.

Data collection proved to be one of the challenging research activities. High costs were involved from travelling, telephoning and reprography. It called for a lot of patience since employees in the industry are often very busy and could hardly give researchers enough attention. There was low morale in the Zimbabwean industry since almost everyone was not motivated because of low income and at times going for months without salaries. Furthermore, industrial workers were uncertain of their future since most manufacturers were closing. Lastly, some respondents did not understand the purpose of the contributed information. As a result, those who did not understand the purpose did not complete the questionnaire. There is a hostile relationship between universities and industries in Zimbabwe as previously indicated and this point to a lack of knowledge management in the nation. However, the 98% literacy rate makes Zimbabwe a researchable area since the people have information that could be interrupted by the political situation.

5.14 Data management

According to the Pennsylvania State University Libraries (PSUL) (2015) data management involves controlling the information produced during a research project. That is control of research data is considered from the source, preparation, capturing, processing and safekeeping. In other words, there is a need for control regarding accessibility, integrity, and timeliness to meet the needs of data users. PSUL (2015) asserts that data management approach depends on the type of data, data collection and storage procedures and intended usage, that is, it encompasses data description, access and sharing; storage and back-up, archiving and preservation; intellectual property rights. To facilitate proper data management, the researcher, through the guidance of a statistician, used two data management software programmes, that is, MS Excel and Statistical Package for Social Scientists (SPSS).

Data management software packages

For the purpose of this study, the researcher used MS Excel and SPSS to facilitate data management. Bella (2013) compared the computer software packages in **Table 5.3** which assisted in the choice of the packages.

Microsoft Excel

According to Businessdictionary.com (2015) (online) MSExcel "allows users to organise, format, and calculate data with formulas using a spreadsheet system broken up by rows and columns." The important aspects of the definition include such aspects as organising, formatting and calculation of data as well as the aspect of the spreadsheet and formulas features. They point to the merits and demerits of MS Excel. According toMS Excel Online (2009) the advantages and disadvantages of Excel are:

Merits

1. Easy connection to Online Analytical Processing (OLAP).
2. Can be secured with a password.
3. It can manipulate figures, prepare reports and word-process.
4. It can be sent through emails and can be viewed by most smart phones which make it more convenient.
5. It is part of the Microsoft Office package.
6. An All in One Program.
7. Availability of Training Programs and Training Courses.

Table 5.3: Comparison of MS Excel, SPSS and SAS

Criteria	Excel	SPSS	SAS
Maximum number of rows	Approx 1.048 million	Approx. 2.15 billion	Approx. 2.15 billion
Maximum number of columns	16,383	32,767	32,767
Price	Cheap	Expensive	More expensive than SPSS
License	Perpetual	Perpetual	Year on year
General Use	Easy to learn and use	Easy to learn and use	Hard to learn and use
Typical user	Non programmer	Non programmer	Programmer
Statistical Analysis	Very limited	Advanced Analysis	Advanced Analysis

Data Manipulation	Ok	Powerful	Very Powerful
Macro Programming	Powerful (VBA)	Ok	Very Powerful
Documentation (Help Guide)	Ok	Excellent	Good
Popularity	Most widely used tool	Popular in market research field	Popular in data mining and business modelling

Source: Bella (2013)

Demerits

1. Viruses can attack it.
2. It does not readily execute the one sample t-test.
3. It is slow in execution.
4. It can easily lose data.
5. It can be difficult to use if not trained.
6. It has limited space.

However from the above points, it can be appreciated that the merits outweigh the demerits given the situation and circumstances of this study.

During this study, after successfully designing the questionnaire with the aid of the professional statistician, the statistician recommended a MS Excel template to the researcher for data imputation. The template included all the questions and their alternative answers and data codes. That is all the answered questionnaires were captured on MS Excel after validation and numbering the questionnaires as they were being returned from the food processing companies. The other strength was that data in MS Excel can be exported to, or shared with, other packages like the Statistical Package for Social Sciences (SPSS) for further analyses.

Data coding

According to Bhattacherjee (2012), data coding is the process of adapting data into a numeric format. In this study data codes were created and placed on the template as a key for all questions to guide the imputation process. Since most questions were based on the five-point Likert scales, codes were assigned to each alternative answer that were 1 for Not at all important; 2 for Not that important; 3 for undecided; 4for important and 5 for very important. The codes could fit questions 1.1 to 1.3 as well as questions 3.1 to question 3.19. Furthermore numerical codes of 1, 2, 3, 4 and 5 were assigned to the agreement scales

of questions 2.1 to 2.20 as follows: 1 for Strongly agree; 2 for Agree; 3 for Not sure; 4 for Disagree and lastly 5 for Strongly disagree (Bhattacherjee, 2012). Also numerical codes ranging from 1 to 5 were given to variable of questions4.1 to 6.6 as follows: 1 for Definitely yes; 2 for Yes, to some extent; 3 for Neutral; 4 for No, not really and lastly 5 for No, not at all. Other questions were given numeric codes. Numerical codes of 1, 2, 3 and 4 were assigned to question 5.1 as follows: 1 for engineering only; 2 for Business only; 3 for both engineering and business and lastly 4 for other (Which was to be specified). Question 5.4 variables were also assigned numerical data codes as 1 for Male and 2 for Female. Question 5.5 was also given numerical data codes as follows: 1 for O-level; 2 for Certificate; 3 for Diploma; 4 for the degree; 5 for Honours; 6 for Masters and 7 for Ph.D.

Question 5.2 and 5.3 were modified and responses classified into categorical responses that are converting the answers from qualitative to quantitative. This was done as follows:
Positions were classified to for categories as either Top management; Middle management, First-line management or Non-managerial. Numerical codes were then assigned as follows: 1 for Top management; 2 for Middle management; 3 for First-line management and 4 for the Non-managerial position.

Departments were classified into three categories as engineering, administrative or support services. Numerical data codes were then assigned as 1 for Engineering; 2 for Administrative and 3 for Support services. During capturing, any question that was not attended to either by error or omission by the respondent would warrant that the cell is left blank. Thus, the MS Excel system recognised it also as not answered and automatically adjusted the actual sample size for the particular question accordingly.

Statistical Package for Social Sciences (SPSS)
According to Bella (2012), SPSS is a software package employed to conduct statistical analyses, data manipulation, and generation of tables and graphs that compress raw facts and figures. In other words, SPSS can calculate and present descriptive statistics that include averages and frequencies and advanced inferential statistics including regression models, variance analysis and factor analysis.

Stumm (2011) outlined capabilities and limitations for using SPSS to study individual differences in psychology as:

Capabilities

- Screen data for frequencies and errors; check labels and missing data codes.
- Latent traits of crystallised and fluid intelligence (each derived from three indicator variables/ observed test scores).
- Build composite scores from z-scores.

- The composite score for Need for Cognition and Internal Consistency.
- Correlations and regression models.

The research theory used to inform this study was classified into two; that is, the research philosophy and the research design. These were taken to guide the courses of action taken by the researcher to scientifically find answers to the research questions. Thus, the relationships between phenomena are explained by science that leads to the development of a theorythat in turn informs future decision makers. While the scientific approach can be viewed as either inductive or deductive, this study took the deductive reasoning, or deduction (Adams et al., 2007). It started out with general statements and endeavoured to reach a specific and logical conclusion. The scientific approach used deduction to review the general concepts to reach the conclusion.

To fulfil the objectives of the study, the researcher modified Saunders et al. (2007) research onion and came up with a research onion suitable for the study as shown in **Figure 5.2.**

Limitations

- Does not support Structural Equation Modelling (by and large, an extension method of regression models based on covariance matrix).
- Does not allow for simultaneous estimation of regression parameters and associations between independent (predictor) variables.
- Does not provide model fit indices to evaluate how well data is represented.
- Does not allow including latent traits without building composite scores or extracting factor regression scores

After capturing, the hard copies of the answered questionnaires were kept in a locker to allow electronic data processing to progress to the end before they were destroyed. The MS Excel file was kept as a soft copy also to allow progress with data presentation and analysis up to the end. The data was then transferred to a compact disc that is secured in a lockable cabinet until the data use could be completed for 5 years.

5.15 Data analysis

Cooper and Schindler (2001) look at data analysis as involving editing and reducing collected facts and figures to a manageable size; summarising, looking for patterns, and application of statistical techniques. The essentials of the definition can be observed as:

- Data editing
- Data reduction
- Data summaries

- Determining data patterns
- Application of statistical techniques

Data analysis is viewed therefore as a process involving all the five phases. On the other hand, Jonker and Pennink (2010) define data analysis as composed of three synchronised flows of activity:

- Data reduction
- Data display
- Conclusion drawing/verification

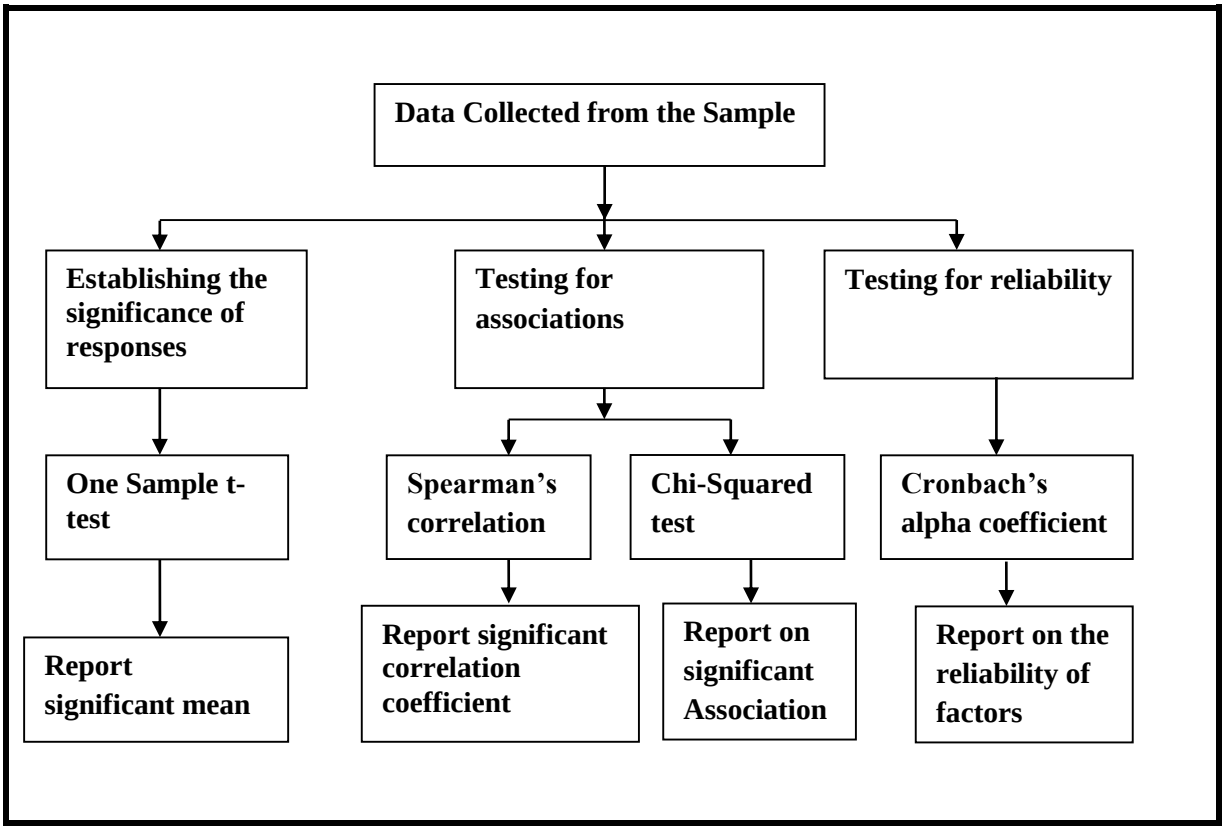

Figure 5.3: Data analysis decision tree

Source: Own Compilation

Saunders et al. (2007) hold that data analysis for quantitative data involves preparation, the input of the data into the computer and cross-checking the data. The major decisions are:

- Choice of the most appropriate ways of data presentation: tabulation and diagrammatic presentation
- Decide on descriptive statistics to explore the data
- Choosing the most appropriate inferential statistics to examine relevant relationships among the variables

In making such decisions in quantitative data analysis, Saunders et al. (2007) recommend that the researcher considers the following items:

- Type of data regarding the level of numerical measurement
- The data format in which there are input to the analysis software
- The impact of data coding for different data types on subsequent analyses
- Need to assign weight
- Methods of data error checks

For the purpose of this study, a combination of the two definitions was utilised as data analysis activity of the research process.To enhance the process of data analysis, the researcher employed the computer software packages MS Excel and SPSS as described under data management. **Figure 5.3** summarises the data analysis techniques adopted to analyse the collected data. These are explained in the data analysis process in this section.

Data validation/ editing

In this study, "Data validation is the process of ensuring that data to be processed is correct, free of unnecessary or unwanted data, and typically involves testing against a list of valid items or algorithms" (Jenks et al., 2015). On the other hand, De Waal et al. (2011) define statistical data editing as the process of enhancing the quality of collected data by manually or automatically detecting and correcting data errors. Data errors and missing data can arise because perhaps the respondent is not willing or does not know how to respond to the particular question and, as a result, leave blank spaces on the questionnaire (De Waal et al., 2011). This was a common occurrence in the study and necessitated both manual and automatically editing the data. Manual data editing is done by the researcher or other assistants during or after imputation. In this study during imputation, the researcher had to leave questions with no responses blank. These are ignorable data errors that had no significant increase in the standard error of parameter estimates and no significant reduction in the sample size (De Waal et al., 2011). Automatic data editing was affected as the computer automatically reduced the effective sample size and increased standard error of parameter estimates for the particular question that had a non-response.

De Waal et al. (2011) indicate that a surveyor anticipates the occurrences of non-responses by oversampling and moreover the losses of precision can be qualified when standard error is estimated. In this study, a sample of 119 respondents was statistically determined at 5% level of significance (alpha = 0.05) (Bartlett et al., 2001). The effective sample size was 147 and could be slightly reduced because of non-response and because of oversampling; the results remained statistically valid.

Data reduction

Data reduction can be defined as the process of selection, simplification, summarising, and transformation of data that appear as raw facts and figures (Jonker and Pennink, 2010).On the other hand, Jonker and Pennink (2010) explain data reduction as the questioning or interrogation of the meanings or categories

that have been assigned to the data, that is, looking at alternative ways of viewing the data. This is the process that involves selection and abstraction from raw facts and figures to written data. In this study, the reduction could be done after the data was displayed and analysed. Insignificant responses were not reported on and reporting concentrated on significant responses.

Data tabulation

According to Kothari (2009), tabulation refers to the procedure of summarising raw facts and figures and displaying them in the compact structure for further analysis. Tables are extremely helpful data summary and display tools (Adams et al., 2007). Adams et al. (2007:184) outline 10 guidelines for the production of tables as:

1. The table must have a clear purpose.
2. The table must have an explanatory title.
3. The table must clearly indicate the units of measurement of the data.
4. The table should clearly indicate the source of the data.
5. Lines should be drawn where appropriate to draw attention.
6. Row and column totals should be shown where meaningful.
7. Percentages and ratios should be computed if appropriate.
8. Do not present too many significant digits.
9. It is easier to look down a column of numbers than across a row.
10. Give attention to the spacing and layout of the table.

Data tabulation is the initial display and summarisation of captured data. The major type of table commonly used is the frequency distribution table. According to Bhattacherjee (2012), a frequency distribution summarises a variable through the display of the frequency (or percentages) of each value or range of values for the variable. Adams et al. (2007) look at a frequency as the number of occurrence of each class in a certain variable or the tally of each category for a particular variable that can be expressed in as an absolute figure; percentage measure or cumulative percentage figure. Frequency distribution tables can be bivariate– displaying one variable values; or multivariate – displaying more than one variable values. The researcher took advantage of the questionnaire design which presented questions in a grid form (Saunders et al., 2007). Thus, the system could easily convert these to display frequency of responses in a table showing one variable or more. Apart from the five possible responses for a Likert scale, one more possible response was added to the tables, that is the non-response row; being the bottom row. In other words, the total frequency always added to the total possible sample of 147 for absolute frequency and 100% for percentage frequency.

Tables are a simple and fundamental summaries of data and readers and analysts can make some observations by merely looking at the table especially based on percentages. Kothari (2009:127) outlines reasons of using tables as:

- It conserves space and reduces the explanatory and descriptive statement to a minimum.
- It facilitates the process of comparison.
- It facilitates the summation of items and the detection of errors and omissions.
- It provides a basis for various statistical computations.

However, tables may not be conclusive on their own but are enhanced by graphical presentations and statistical calculations.

Graphical presentations

From the tables, statisticians extend data presentations to graphs and charts. Adams et al. (2007) assert that charts and graphs are very helpful in explaining difficult concepts and however, they need to be clearly titled, explained and discussed in the text. To help the researcher to omprehend the biggerdata picture, graphs were utilised to aid in the presentation of data in chapter 6.

Statistical analysis

Kothari (2009) views statistical analysis as the process of computing certain indices or measures and searching for a pattern of relationships that exist among the groups of data. In this case thus it "involves estimating the values of unknown parameters of the population and testing of hypotheses for drawing inferences" (Kothari, 2009:130).The study employed descriptive and inferential statistics to analyse the collected data (Bhattacherjee, 2012; Kothari, 2009).

Descriptive statistical analysis

Descriptive analysis mainly concerns the development of some indices from the raw facts and figures and is the study of distributions concerning one variable in the form of unidimensional analysis; bivariate analysis or multivariate analysis (Kothari, 2009). In this study, measurement of magnitude and shapes of distributions are worked out as well as measures of relationships between two and among more variables (Kothari, 2009). The statistics involved in the descriptive analysis include measures of central tendency or averages; measures of dispersion; measures of asymmetry; and measures relationships (Kothari, 2009). It has to be appreciated that all the formulae of all the descriptive and inferential statistical calculations are contained in the software packages MS Excel and SPSS which were used for data analysis. The stakeholders can only view the results of their calculations and utilise these for reporting and basing their conclusions.

Measures of dispersion / variability quantify the degree of scatteredness / spread of values of a variable around the central tendency (Bhattacherjee, 2012). While there are different types of measures of

dispersion, the study mostly utilised the standard deviation and the variance. There are also other measures of dispersion thatwere not utilised in the study for data analysis such as the range and mean deviation. *Standard deviation* (**σ** pronounced sigma) is the most popularly employed measure of dispersion. Kothari (2009) defines *standard deviation* as "the square-root of the average of squares of deviations when such deviations for the values of individual items in a series are obtained from the arithmetic average". On the other hand, the*variance* is the square of standard deviation and is mostly utilised for analysis of variance (Kothari, 2009). *The standard error* is the inherent sample error that is due to the differences between a sample and the population (Bhattacherjee 2012). The *standard error* is the square root of the variance (Adams et al., 2007).

Advantages

- Do not ignore the arithmetic signs of values in a series
- Not affected by outliers
- Not affected by fluctuations of sampling
- It is the basis for inferential statistical analysis

Measures of Relationships

Measures of relationship determine whether there is any relationship between two variables (regression analysis) and the strength of the relationship (correlation analysis) or what part or portion of the dependent variable is determined by the independent variable (coefficient of determination). In this study, the *Pearson's coefficient of correlation or rank correlation (Rho)* was utilised. In this study, Pearson's correlation was used and only significant relationship were used to know whether there was an association between two variables.

Inferential statistical analysis

The inferential analysis also known as sampling statistical analysis concerns the methods of generalisation and deals mainly with two major types of problems: estimating population parameters; and hypothesis testing or significance testing (Kothari, 2009). The mostly utilised inferential statistical analysis was the significance testing. It was the ultimate statistical analysis on which conclusions were based.

Although inferential statistical analyses vary, for SPSS one sample t-test used various concepts need some definition/identity: The common concepts used in inferential statistical calculations include: the p-value; the significance level (α pronounced alpha) and degrees of freedom (df). For the t-tests using SPSS version 17, various concepts need some definition/identity:

Bhattacherjee (2012) looks at each of these as:

- The p-value – where p stands for probability is "the probability that a statistical inference is causedby pure chance." (Bhattacherjee 2012:125)
- The significance level (α pronounced alpha) – the maximum level of risk that one may be willing to take that the inference/deduction is incorrect, which is 0.05 in this study
- Degrees of freedom (df) – is the number of values that can vary freely in any calculation of a statistic; in this case df = N-1
- N is the actual sample size that could vary from 147 or less
- The Meanis the calculated sample mean
- Std. Deviation is the sample standard deviation
- Std. Error mean is the sample standard error
- rho – correlation coefficient depending on α and df

According to Whitley and Ball (2002:513) the advantages and disadvantages of non-parametric methods are:

Advantages of nonparametric methods

- Require no or very limited assumptions to be made about the format of the data, and they may, therefore, be preferable when the assumptions required for parametric methods are not valid
- Can be useful for dealing with unexpected, outlying observations that might be problematic with a parametric approach
- They are intuitive and are simple to carry out by hand, for small samples at least
- They are often useful in the analysis of ordered categorical data in which assignation of scores to individual categories may be inappropriate

Disadvantages of nonparametric methods

- May lack power as compared with more traditional approaches
- They are geared toward hypothesis testing rather than estimation of effects. It is often possible to obtain nonparametric estimates and associated confidence intervals, but this is usually not straightforward
- Tied values can be problematic when these are common, and adjustments to the test statistic may be necessary
- Appropriate computer software for nonparametric methods can be limited although the situation is improving. Also, how a software package deals with tied values or how it obtains appropriate P values may not always be obvious

One sample t-test

According to Kothari (2009:196), the "*t-test* is based on *t*-distribution and is consideredan appropriate test for judging the significance of a sample mean or for judging the significance of difference between the means of two samples in case of small sample(s) when population variance is not known (in which case we use variance of the sample as an estimate of the population variance)."

The concepts are built in the statistical software SPSS version 17 that was used for statistical inferences. To test the significance, the p-value is compared with the significant level (α). The difference between the p-value and significant level (α) determines whether the null hypothesis is accepted or rejected. If the p-value is less than significant level (α) it means the null hypothesis is rejected and vice versa.

Significance testing was used on three occasions in the study. The relevant t-test statistic was employed to do so. The t-value is calculated from the sample data and then compared with its probable value based on *t*-distribution (to be read from the table that gives probable values of *t* for different levels of significance for different degrees of freedom) at a specified level of significance for concerning degrees of freedom for accepting or rejecting the null hypothesis.

Significance testing was mostly used to determine significant responses that could be worthy of reporting on. This was done by calculating the probability (or p-value) of a distribution. The P-value was used to reduce the bulkiness of the report by eliminating all insignificant responses.

Spearman's correlation analysis

According to Kothari (2009), "*Charles Spearman's coefficient of correlation* (*or rank correlation*) is the technique of determining the degree of correlation between two variables in case of ordinal data where ranks are given to the different values of the variables. The main objective of this coefficient is to determine the extent to which the two sets of ranking are similar or dissimilar." Its values range from -1 to +1 and any value close to -1 denotes strong negative linear relationship while any value close to +1 denotes a strong positive linear relationship (Bhattacherjee, 2012). If the value of r is negatively or positively close to zero it shows a weak positive or negative linear relationship (Bhattacherjee, 2012). The strength of the relationship between variables indicates how responsive the dependent variable is to the changes in the independent variable. Through SPSS version 17, the significance of the relationship between variables was tested and only significant relationships were reported (Adams, 2007).

Cross tabulation

The essentials for the test process wereanother useful way of presenting bivariate data in cross-tabulation (often abbreviated to cross-tab, and sometimes called more formally as a contingency table). According to Bhattacherjee (2012), cross-tabulation makes a table that presents the frequencies or percentages of

every combination of at least two nominal or categorical variables. Cross tabulation was also used to test relationships between some of the variables in this study.

Chi-Square (X^2) tests

X^2-test is a significance testing based on chi-square distribution and is a parametric test used for comparing sample variance to theoretical population variance (Kothari, 2009). It is used to ascertain if categorical variables are associated (Adams et al., 2007). In this study, the area of specialisation is typical categorical data. To test whether there was an association between area of specialisation and the role of technopreneurship required the use of chi-square test.

5.16 Reliability and validity

Validity and reliability of research results depend on both research methods and methodology used in the research process. According to Cohen et al. (2007:133), validity is, "essentially a demonstration that a particular instrument, in fact, measures what it purports to measure, although more recently validity has taken many forms". This view is supported by Bryman (2012) who states that validity of a measure is determined by whether it measures the right thing and achieves what it is supposed to achieve. On the other hand, validity looks at the degree to which the research measured what it was supposed to measure, that is the consistency between the research problem and the research process and its methods.

According to Adams et al. (2007), there are four types of validity namely: internal validity; external validity; constructive validity and conclusion validity. To ensure that the study and its results were valid, the researcher followed the scientific approach to research. Cohen et al. (2007:133) indicate that "in quantitative data validity might be improved through careful sampling, appropriate instrumentation and appropriate statistical treatments of the data". Given the research problem as defined by the research objectives the researcher adopted the research onion to decide on research methodology and research methods. The desired data determined the research philosophy, research design, research approach, research instrument, and the sample unit and contact methods. That is, the methodology and the research methods were purposively chosen so as to measure what was supposed to be measured. Furthermore, the ensured that research conclusions and recommendations were based on the collected data. That is the link between the stages of the research process was ensured. At each stage, measures were taken to ensure validity. For example, the pilot test of the questionnaire was a measure to ensure that the instrument measured what it was supposed to measure. Face validity of a questionnaire "consists of content, concurrent, and construct validity" (Jalink et al., 2015). Face validity of the questionnaire was tested through a rigorous process of linking each question in the questionnaire to a specific objective and the vice versa. Cohen et al. (2007: 146) hold that "reliability in quantitative research is essentially a synonym for dependability, consistency and replicability over time, over instruments and over groups of

respondents". In practice this means that the research process and techniques used can be repeated and that similar results can be expected if high Cronbach Alpha coefficients are recorded.

The internal reliability of each factor that influences the adoption technopreneurship was tested using Cronbach's alpha coefficient. Reliability was mainly considered during the designing of the questionnaire and choice of data analysis techniques. The questionnaire was designed in such a way that most of the respondents could interpret the wording and layout in more or less the same way. The wording of the questionnaire was reduced to suit people of different professions. The key term, 'technopreneurship' was defined on the introductory part of the questionnaire in the simplest way that the researcher wanted the respondents to interpret it. The questionnaire was made up of multiple choice questions to simplify the answering process and the demographic questions that could offend the respondents were placed at the end of the questionnaire. Data analysis techniques were chosen on the basis of the type of questions, that is, Likert scales. Different quantitative analysis techniques can be used, but they lead to the same conclusions and thus ensuring the reliability of the research process.

This study adopted a suitable research methodology to determine or establish the factors that influenced technopreneurship in the food processing sector in Zimbabwe. Thus, the research problem was pertinent and worth researching, thereby contributing to a knowledge gap in the Zimbabwean industry and even other developing countries. Furthermore, the research methods adopted also aimed at achieving the reliability and validity required for the research results. In other words, the guiding research philosophy, design, methods, instruments, sample design and data analysis techniques all were synchronised towards the same objective.

5.17 Ethical considerations

For the research to be above board regarding ethical standards, the researcher attained an ethical clearance letter (reference number: HSS/1456/014D) from the University's ethical committee.

According to Saunders et al. (2007:178) "research ethics relates to questions about how we formulate and clarify our research topic, design our research and gain access, collect data, process and store our data, analyse data and write up our research findings in a moral and responsible way". Thus, morality and responsibility are of the essence in this case. The ethical dilemma faced by the researcher was not new in research. Cohen et al. (2007:51) highlight that "a major ethical dilemma is that which requires researchers to strike a balance between the demands placed on them as professional scientists in pursuit of truth, and their subjects' rights and values potentially threatened by the research".

To observe high standards of ethical consideration the researcher benefited from the ethical academic requirements by the University of KwaZulu-Natal. The University has a research code of ethical conduct which binds all researchers (Creswell, 2009). The code requires that several documentations be done to ensure high ethical standards. The documentation includes: Gatekeeper consent letters and Informed consent letters. The gatekeeper's letter was endorsed by the company gatekeeper who could be the Chief Executive Officer (CEO), Human Resources Manager (HRM) or any senior member of the organisation with authority to approve circulation of questionnaires in the organisation. This was required to be endorsed before data collection and a submission to the University for Ethical Clearance. On the other hand, the informed consent accompanied each questionnaire for each respondent to read and agree to participate in the research. The questionnaire was also accompanied by an introductory letter introducing the researcher and the institution so as to give full information for the respondent to make a free and informed decision. The University acted as an ethical review board (Bhattacherjee 2012). After the proposal had been approved by the university, the researcher was required to go through a process of ethical clearance. The ethical clearance sought mainly to confirm the observance of participants' right to freedom of participation. This was achieved by requiring the gatekeeper to approve the circulation of the researcher's questionnaire. Furthermore, the questionnaire had to be accompanied by a cover letter giving all necessary information to the individual participant as well as an informed consent letter giving the respondent freedom of participation. After the ethical clearance, it was not allowed to make changes to the research methods. That is, the university offered strong ethical guidance through its academic leadership. Principles of ethical conduct in research could be followed through the guidance, that is, voluntary participation and harmlessness, anonymity and confidentiality, disclosure as well as analysis and reporting (Bhattacherjee, 2012).

This study observed all stakeholder values and from the topic through the methodology to the dissertation, confidentiality and professionalism were of priority. The topic was chosen with the understanding that it is of social interest and the subsequent procedures had to follow the same notion. As such no names of participating organisations and individuals were included anywhere in or on source documents or the dissertation. Source documents were stored in a locked cabinet in the researcher's office until all possible publications have been made including the publication of the thesis. Data were stored off-line on the personal laptop and flash disc also until publications have been made. All respondents in the research did it voluntarily and withdrawal was free since participants could easily be replaced.

5.18 Summary

Research studies can be planned according to the 'research onion' (Saunders et al. 2007) which can be adapted to suit any research study (Bryman, 2012). All researchers cover aspects of research philosophy; design; strategy; time horizons; methods and data analysis. While research theory stipulates the

harmonisation of research philosophies, designs, strategies and so on, dovetailing each other, it has been discovered that each research is unique. Each research study is executed by creating a suitable mix of philosophies, designs, strategies and methods to attain the research objectives.

In this study, the research onion was adapted to suit the situation and circumstances of this study. For the first three layers of the research onion, the researcher adopted the phenomenological research philosophy, deductive research approach and survey research strategy. The next layers of the research onion of this study, quantitative research and cross-sectional research study were adopted to guide data collection and analysis. The chapter covered the research methodology and methods that were adopted to gather the desired information. The results are presented in the next chapter.

CHAPTER 6: RESEARCH RESULTS

6.1 Introduction

In this chapter, the results of the quantitative data are presented through frequency distribution tables, interpretation of graphical presentations, relative statistics and inferential statistics. This is applied to Likert scale questions. All tabulation, descriptive and inferential statistics were interpreted accordingly to assign meaning to the gathered data. The results are presented according to the objectives, starting with the demographic data of the sample.

The chapter presents, analyses and interprets demographic data that include the respondents' areas of specialisation; gender, the level of education; position at work and the working department. The findings are then presented, analysed and interpreted as per set objectives; that is, the role of technopreneurship and the results of its three questions, namely:(1) factors influencing the successful adoption of technopreneursip categorised as internal processes with the results of its six questions, (2) human factors with the results of its three questions, venture capital with the results of its two questions, partnerships with the results of the two questions, government support and the results of its four questions and lastly (3) global factors with the results of its three questions. The findings of objective number three, with nineteen critical success factors, were presented, analysed and interpreted. Lastly, findings of objective number four, with regards to the feasibility of technopreneurship were presented, analysed and interpreted. Feasibility of technopreneurship was covered by six questions.

6.2 Response rate

Table 6.1 shows the actual sample size from participating organisations of the 14 food processing companies in Zimbabwe. The table also indicates that there was a low response rate from the Companies. The non-response error was catered for by the quantitative analysis of data that made it representative of the population (Eriksson and Kovalainen, 2008). Other details of the composition of respondents regarding demographic characteristics are in the presentation of findings.

Table 6.1: Sampling data

Target Respondents	Number of Organisations	Sample Unit	Actual Sample Size
Food processing sector in Zimbabwe	14	Managers, Scientists, Administrators, Engineers, Technologists	147

From the 250 questionnaires distributed 147 were returned completed and one uncompleted giving a response rate of about 59% that is slightly more than half. Whelan (2015) suggests an updated benchmark of an organisational survey response rate of 51%. As such this study response rate was slightly above the benchmark. Also, Baruch and Holtom (2008) concluded an average response rate for individuals in organisational research to be 52.7% while 35.7% was the average response rate for organisational responses from 2000 to 2005. Allen et al. (2015) also concluded that there was a general decline in survey response rate in academic research from 1960-1995 and the overall response rate was determined by the type of sample and procedures used to influence response rate. The major determinant of response rate in this study was the willingness of the gatekeepers of the food processing companies. It can be appreciated that among the 14 operational food processing companies in Harare, only nine cooperated. This is a 64% cooperation rate. Some of the gatekeepers could simply continuously postpone appointments or simply indicate that the researcher leaves the documentation but they would just ignore it to the frustration of the researcher. The issue in Zimbabwe is that there are no good relations between universities and industry. The industry is sceptical about academic research and would take it negatively. The responses were not equally distributed among the nine companies that participated. Company situations vary so the employee circumstances and atmosphere would determine the mood of each employee which would determine whether they responded or not. While a low response rate is common in survey research, the major contributing factor to the low response rate, in this case, was the low staff morale in the Zimbabwean industry in 2015. As was presented in chapter 2, workers were massively retrenched and felt they had no job security (Mataranyika, 2015; Kariati, 2015). As a result, attending to questionnaires that seem not to directly address their cause, was not important from their view. Also, there are no good relations between industry and universities in Zimbabwe. Industry, for example, feels their information is confidential and cannot be shared with academic institutions. Three of the gatekeepers refused to approve the circulation of the questionnaire, while two others who had previously approved the circulation, said the researcher was late and there was a need for reconsideration.

To deal with the challenges, the researcher had to make follow-ups calling the link persons twice a day and visiting each company in person at least once a week. The snowball approach assisted in getting in touch with influential people in some food processing companies and more responses could be obtained.

6.3 Internal reliability test and face validity

As was indicated in **Section 5.16**, the internal validity of each factor that influence the adoption of technopreneurship in the food processing sector in Zimbabwe was tested using Cronbach's alpha coefficient. The results in **Table 6.2** shows that items in Human factors and Government support were not measuring the same things with coefficients of 0.185 and 0.285 respectively. All other factors have reliable measures.

Table 6.2: Internal validity of factors influencing technopreneurship

Factor	Questions	Cronbach's alpha coefficient	Comment
Internal processes	q2.1 – q2.6	0.820	Internally reliable
Human Factors	q2.7 – q2.9	0.185	Items in this factor were not measuring the same thing
Venture Capital	q2.10 – q2.11	0.874	Internally reliable
Partnerships	q2.12 – q2.13	0.802	Internally reliable
Government Support	q2.14 – q2.16	0.285	Items in the factor were not consistent
Global Factors	q2.18 – q2.20	0.916	Internally reliable

Given the rigorous process of questionnaire development and testing, it was concluded that face validity of the research instrument existed.

6.4 Demographic details

In this study, five sets of variables were used to demographically describe the target respondents. The demographic variables included: area of educational specialisation; position at the workplace; the department in which the respondent worked, gender and the highest level of education of the respondent. The aim was to ensure that the sample represented the respondents. These were expected to represent the population's characteristics.

6.4.1 Area of specialisation

Area of specialisation had four categories, namely, engineering only, business only, both business & engineering and other. The idea behind the identification of areas of specialisation was to determine the skills in possession by the respondents. The results are presented in **Table 6.3** and in the pie chart, **Figure 6.1** below. Although the areas of specialisation were so general, its function was basically to collect data about the skills that the companies had. From **Table 6.3,** it can be noted that 144 out of 147 respondents answered the question that represents 98% response rate and makes it a substantial response rate.

From **Figure 6.1** it can be noted that almost half the respondents, 47%, indicated that they were specialists in business while one-fifth were specialists in engineering, 20%, and also, almost one-fifth were both engineering and business specialists, 18% and others 13%. Indications on others could include such areas as information technology and supply chain activities like logistics and transport who felt they were neither engineering nor business. This can be viewed as the composition of most manufacturing industries,

regarding areas of specialisation given the capital intensity of engineering activities and labour intensity of business functions. In terms of areas of specialisation, the response rate was 100% of the questionnaires returned.

Table 6.3: Frequency distribution table showing responses for area of specialisation

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Engineering only**	30	20.4	20.8	20.8
	Business only	69	46.9	47.9	68.8
	Engineering and business	26	17.7	18.1	86.8
	Other	19	12.9	13.2	100.0
	Total	144	98.0	100.0	
Missing	**System**	3	2.0		
Total		**147**	**100.0**		

Figure 6.1 compares responses to areas of specialisation. A total of 47% represents business only while 20% and 18% represent engineering only and engineering and business respectively. In this case, business only meant professional qualifications in business management and related areas. On the other hand engineering only referred to professional qualifications in any engineering area. This seems that food processing technopreneurs have more employees in business operations than in engineering operations.

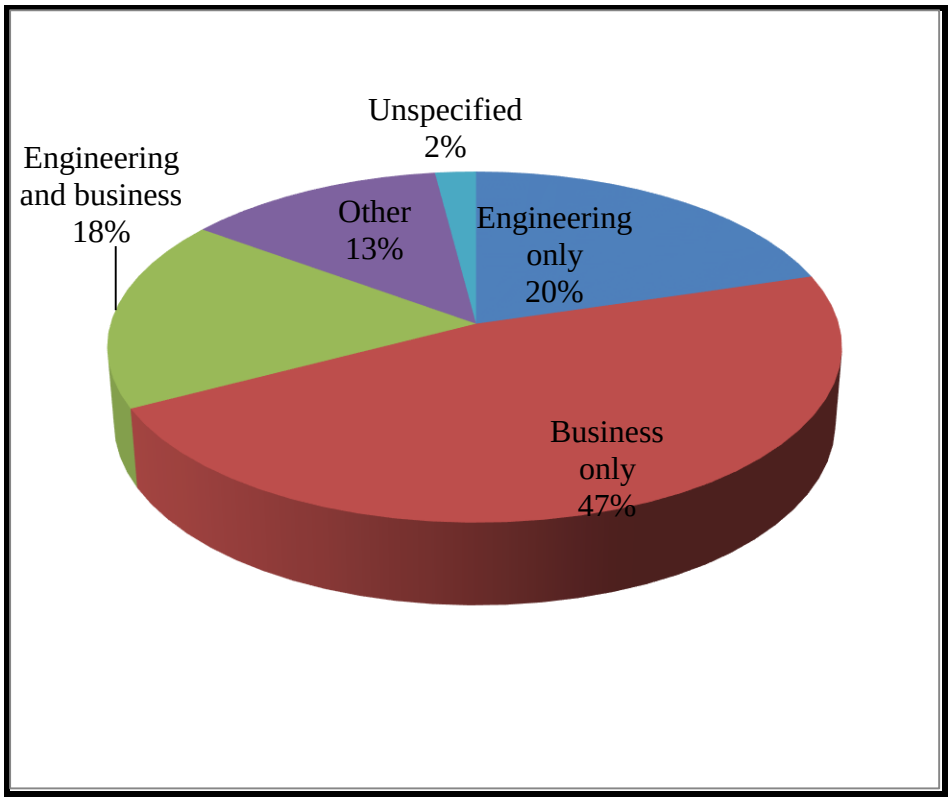

Figure 6.1: A pie chart showing responses of areas of specialisation

6.4.2 Gender

From **Table 6.4** it can be observed from the valid responses that about 68% were male while about 32% were female. This can be taken as a correct reflection of the population composition of staff regarding gender in the food processing sector. That is compared with ZIMSTAT (2015) labour statistics in the industrial sector which stated that the composition is 72% male and 28% female.

Table 6.4 A frequency distribution showing gender composition of the respondents

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percentage**
Valid	**Male**	99	67.3	68.3	68.3
	Female	46	31.3	31.7	100.0
	Total	145	98.6	100.0	
Missing	**System**	2	1.4		
Total		147	100.0		

6.4.3 Educational level

The Zimbabwean educational system progress from Ordinary level, through certificate, diploma, general degree, honours degree, master's degree to Ph.D. for people who are employable by the manufacturing sector. The question was used to gather data with regards to the levels of education of the respondents. Areas of specialisation assisted in determining the skills available in the food processing sector and the levels of education assisted in further determining the extent to which the employees were professionally trained. From **Table 6.5**, it can be observed that the majority of respondents had degrees, 33.6%, followed by those with diplomas, 29.3%.

Table 6.5: A frequency distribution table showing highest educational levels for respondents

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**O-levels**	7	4.8	5.0	5.0
	Certificate	9	6.1	6.4	11.4
	Diploma	41	27.9	29.3	40.7
	Degree	47	32.0	33.6	74.3
	Honours	23	15.6	16.4	90.7
	Master's	13	8.8	9.3	100.0
	Total	140	95.2	100.0	
Missing	**System**	7	4.8		
Total		147	100.0		

It is also important to note how gender composition and levels of educational attainment compare. This was done in **Figure 6.2** and it can be noted that 50% of the respondents had undergraduate qualifications, that is, 32.6% degrees and 15.6% honours degrees. This was followed by diploma holders who were 27.9%.

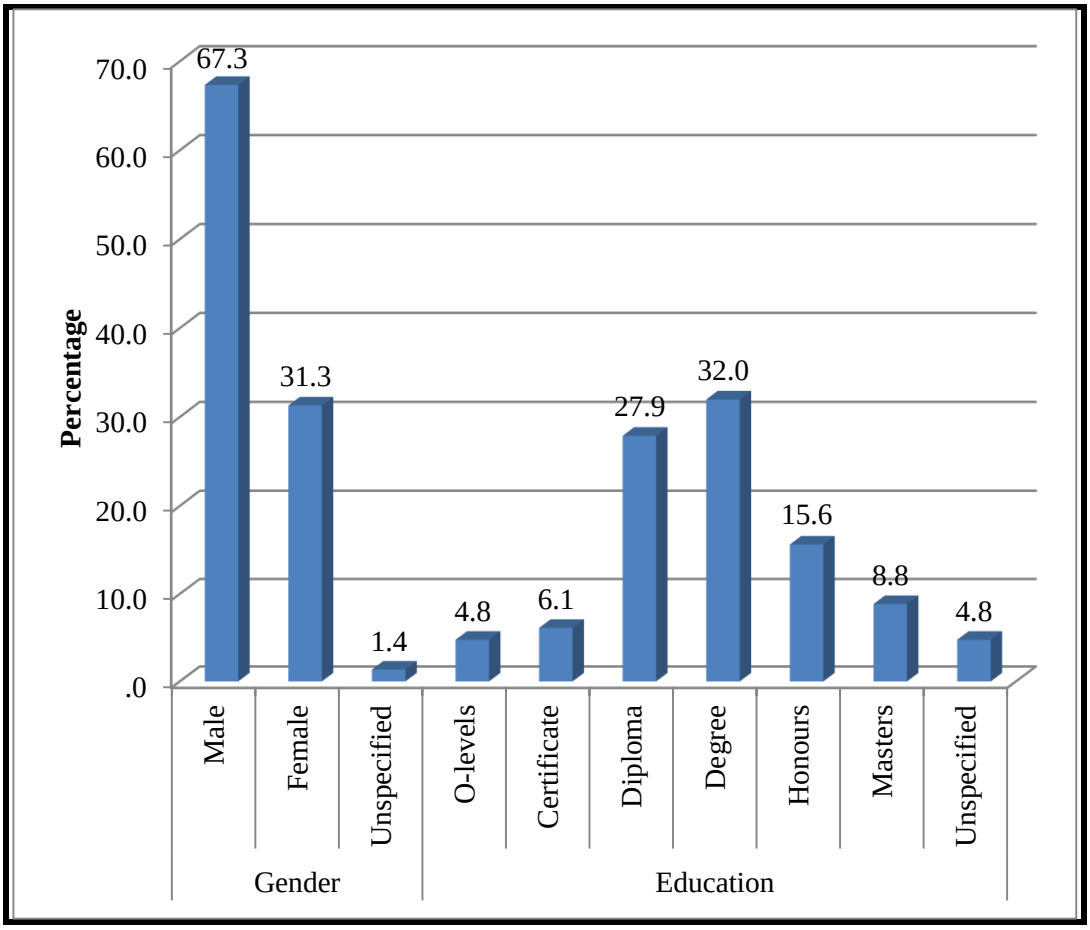

Figure 6.2: Gender composition and educational levels for respondents

6.4.4 Positions at work

Positions at workplaces represent the degree of responsibility and degree of influence respondents have on organisational decision-making. Positions were classified regarding organisational hierarchy and included top management, middle management, first-line management and non-managerial employees. Non-managerial employees include practitioners like scientists and technicians. From **Table 6.6**, it can be observed that the majority (39.9%) of respondents were first-ine managers, followed by middle management (37.8%); non-managerial level (16.3%) and top management (5.4%). The responses seem to fit an organisational setup where top management should be the minority, specialised support staff who are non-managerial are the second minority while the majority being supervisors and middle managers the third majority. Positions at work were used as a control measure in the study to ensure a range of positions are covered like managers, administrators, scientists, engineers and technicians.

Table 6.6: Level of position at work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Top management**	8	5.4	5.6	5.6
	Middle management	54	36.7	37.8	43.4
	First-line management	57	38.8	39.9	83.2
	Non-managerial	24	16.3	16.8	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		**147**	**100.0**		

6.4.5 Respondent's department

A department of the respondent is the organisational unit responsible for a specific function that contributes to the overall goal of the organisation. Since the nomenclature of departments varies from organisation to organisation, the researcher simplified the matter by using generic classifications like administrative, engineering or support staff. **Table 6.7** shows that the majority (47.2%) of the employees worked in the administrative departments followed by engineering departments with 38.2% and lastly support services with 14.3%. The results are to some extent consistent with the composition of staff at most organisations with the majority of administrators having a business specialisation. However, it is possible to have administrators with engineering qualification or both.

Table 6.7: A frequency distribution table showing categories of departments of respondents

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Administrative**	68	46.3	47.2	47.2
	Engineering	55	37.4	38.2	85.4
	Support services	21	14.3	14.6	100.0
	Total	144	98.0	100.0	
Missing	**System**	3	2.0		
Total		**147**	**100.0**		

A comparison of positions and departments may also be necessary also to verify consistency. From **Figure 6.3**, it can be noted that the majority of respondents were from middle management; that is, 36.7% and first-line management, that is, 38.8%. Most of the respondents came from administrative departments; that is, 46.3% followed by respondents from engineering departments (37.4%). Thus administrative duties are assumed mostly by middle and top management. Engineering duties are carried out by first-line managers while support staff carries out non-managerial responsibilities. Thus again the results are consistent.

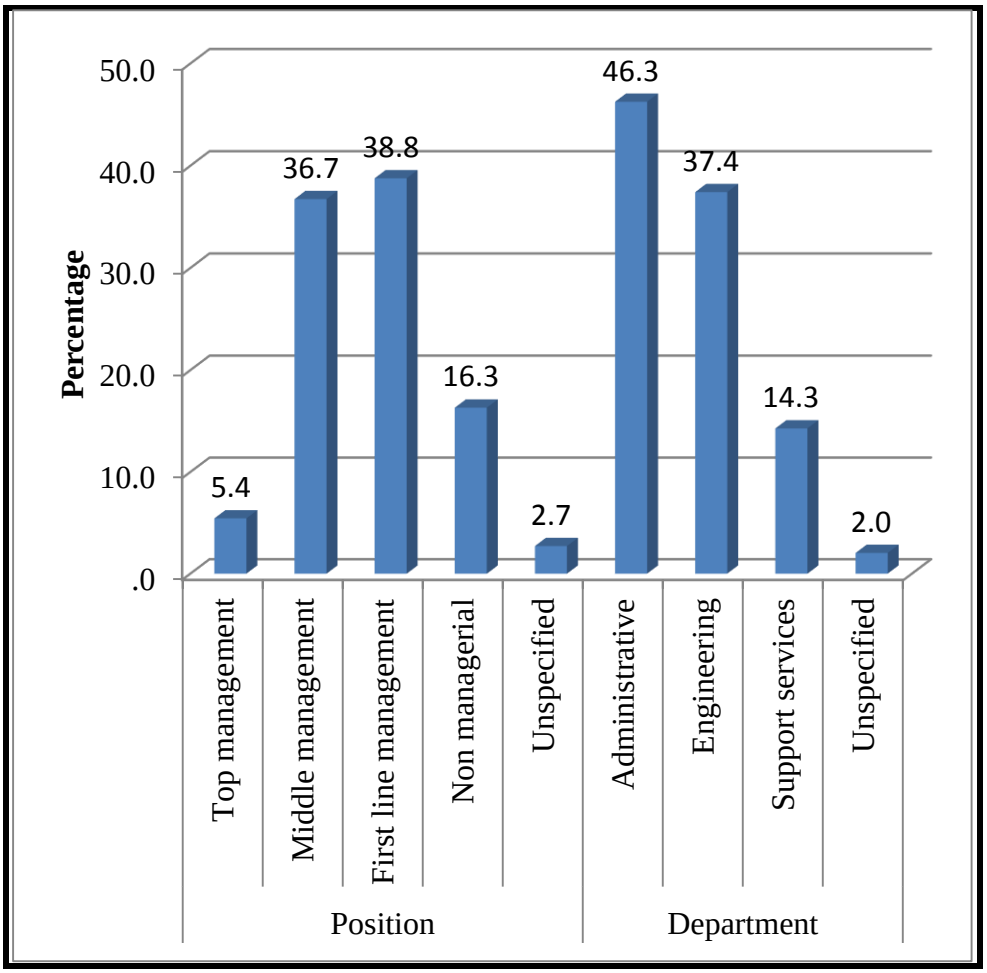

Figure 6.3: Position levels and categories of departments

6.5 One sample t-tests

Having presented the demographic variable results, it was pertinent that the results of other elements as measured by the objectives were to be presented. The results were presented according to the research objectives. In the presentation, frequency distribution tables, graphs and charts are used. Data analysis is done through descriptive and inferential statistics. The inferential statistical analysis was done to test whether there was significant agreement/disagreement; importance/unimportance. The one-sample t-test was used to test whether the average score was significantly different from the neutral score of '3'.

The study involved a quantitative strategy as presented in the methodology section; as a result, the gathered data was quantitatively analysed. To determine which results to report on and which ones to leave out, the researcher used one sample t-test of significance. That means all the responses that were not statistically significant was not reported on. According to Kent University (2015), one sample t-test determines the statistical difference between the hypothesised population mean and sample mean. Given that the instrument (questionnaire) consisted mainly of the 5-point Likert scales, one sample t-test was used to determine the "statistical difference between the sample mean and the sample midpoint of the test

variable" (Kent University, 2015). In this case, the sample midpoint was 3 and sample means were calculated for each question and compared to the midpoint. The significance of the difference between test statistic or calculated t and the critical t-value (determined by the degrees of freedom and the confidence level) is determined by the corresponding p-value denoted by sig. (2-tailed). Depending on the direction of the Likert scale, the corresponding p-value is compared with the significance level alpha (α), which is the significance level that is 0.05 or 5%. When the p-value is less than 0.05 and the Likert scale ranges from 'strongly disagree' it implies disagreement and vice versa. When the p-value is greater than 0.05 and the Likert scale ends with 'strongly agree' it implies agreement. This applies to other Likert scales, that is, the importance scale, that is question 1 and that of the feasibility of technopreneurship (question number four). The tables showing the one sample statistics and one sample test statistics are found in **Appendix 2** and not in the presentations where only the sample statistics and the test statistics are quoted to avoid data overload.

It has to be noted that the test value is the mean score. However the t statistic is indicated since it has an equivalent p-value, the size of which has implications to the significance of the difference from the mid-point. The p-value is compared to α (alpha) which is the level of significance 0.05 which is expressed as 0.0005 in SPSS. If the p-value is 0.000 it is reported as $p< 0.0005$ which implies mean score significantly different from the mean score in this case of 3. To avoid overcrowding the presentation, the researcher concentrated on the p-value and mean score for reporting. The researcher also used percentage simple component bar charts to show the composition of responses for each question and simple bar charts. In the simple bar charts, mean scores of the average company responses are compared to the mean score of 3. The mean score of three is the midpoint of the 5-point Likert scale. The majority of the tables showing sample statistics results and tables showing test statistic results are presented in **Appendix 2**.

6.6 The importance of technopreneurship in the food processing sector

One of the research objectives was, "To assess the importance of technopreneurship in the food processing sector in Zimbabwe." The value given to technopreneurship was measured through finding out the degree of importance assigned by the companies to elements of technopreneurship. The elements of technopreneurship were: industrial food processing technology; entrepreneurship orientation and; technopreneurship. Three basic Likert scale questions were asked to achieve this research objective. **Figure 6.4** presents the results of the three questions in terms of percentage responses.

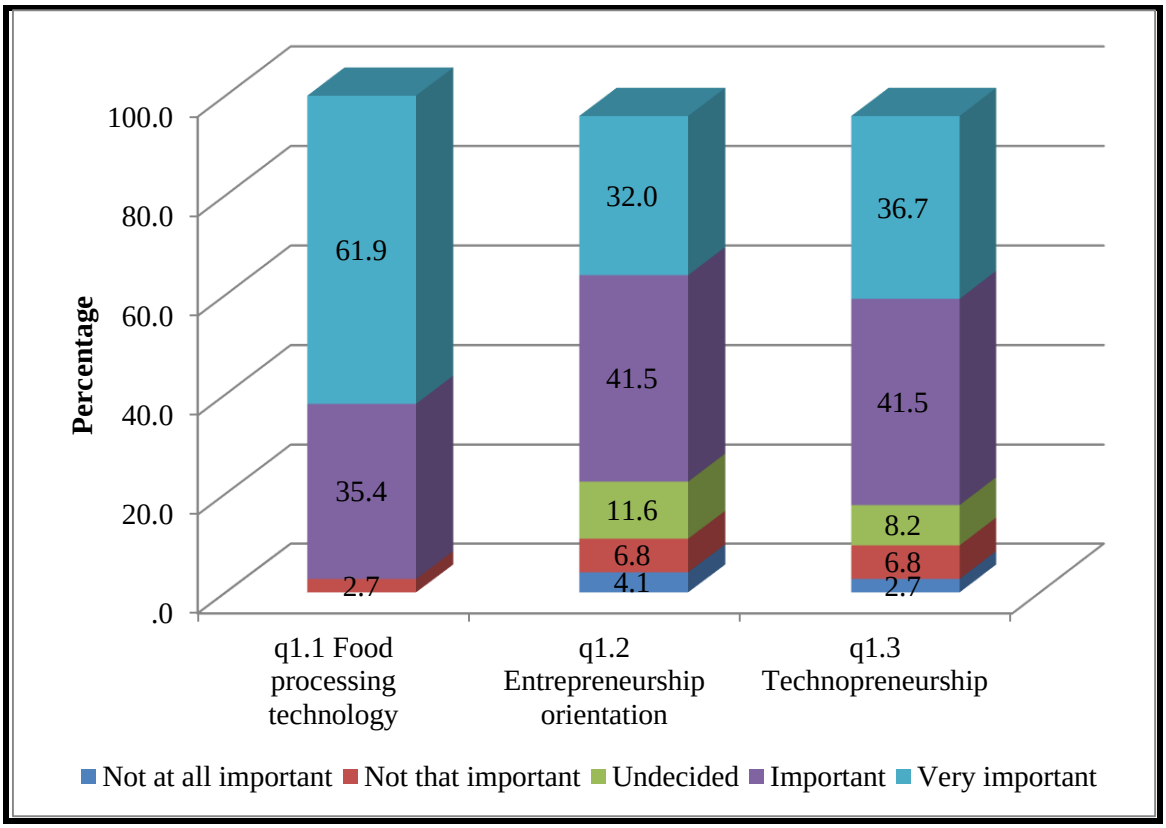

Figure 6.4: Importance attached to three elements

It can be observed that 'very important' and 'important' responses are dominating on the bar chart for the three questions on the importance scale. This indicates that the 'important' and 'very important' responses were dominating and as a result, all the three facets seem to be valued by the food processing technopreneurs. The three facets measured in the three questions were industrial food processing technology, entrepreneurial orientation and technopreneurship.

The significance of the responses was statistically tested and analysed using the one sample t-test. Using the results of the test statistic and its p-value, analysis shows that significant importance was indicated for all the three elements as follows:

- Industrial food processing technology is significantly important to the companies [$t(146) = 29.558$, $p < 0.0005$]
- Entrepreneurial orientation is significantly important to the companies [$t(140) = 10.559$, $p < 0.0005$]
- Technopreneurship is significantly important to the companies [$t(140) = 12.658$, $p < 0.0005$].

The three facets had mean scores >3 which implies the importance of technopreneurship in the food processing sector to the companies as shown in **Table 6.8,** figures. The table shows that industrial food processing technology had a mean score of 4.56; entrepreneurial orientation 3.94, and technopreneurship

4.07. This indicates that there was significant importance attached to the three facets by the companies and that technopreneurship plays an important role in the food processing sector.

Table 6.8: One sample test statistics for the importance of technopreneurship

	N	Mean	Std. Deviation	Std. Error Mean
q1.1 Food processing technology	147	4.56	.642	.053
q1.2 Entrepreneurship orientation	141	3.94	1.061	.089
q1.3 Technopreneurship	141	4.07	1.005	.085

6.7 Factors influencing the adoption of technopreneurship in the food processing sector

The other research objective of the study was, "To examine the factors that influence successful adoption of technopreneurship in the food processing sector in Zimbabwe." To examine these factors as presented in the conceptual framework, **Chapter 3, Figure 3.4**, Likert scale questions were used. The factors were categorised into six, namely: internal processes; human factors; venture capital; partnerships; government support and global factors. The results were presented, analysed and interpreted for each factor influencing technopreneurship below.

6.7.1 Internal processes

Internal factors influencing technopreneurship were examined through six questions q2.1 to q2.6 in the questionnaire. The results regarding percentage responses are shown in **Figure 6.5**. Looking at the component bar chart, observations can be made for the different questions that the purple colour is dominant, indicating 'disagreement' in most questions (s q2.2, q2.3, q2.4 and q2.5). On the other hand, there seems to be a balance between the 'agree' and 'disagree' responses in q2.1 that implies to some balance between disagreement and agreement. Lastly, in q2.9 the red colour is dominant which implies disagreement. However, while such observations can be made, the dominance of these responses has to be statistically tested for significance.

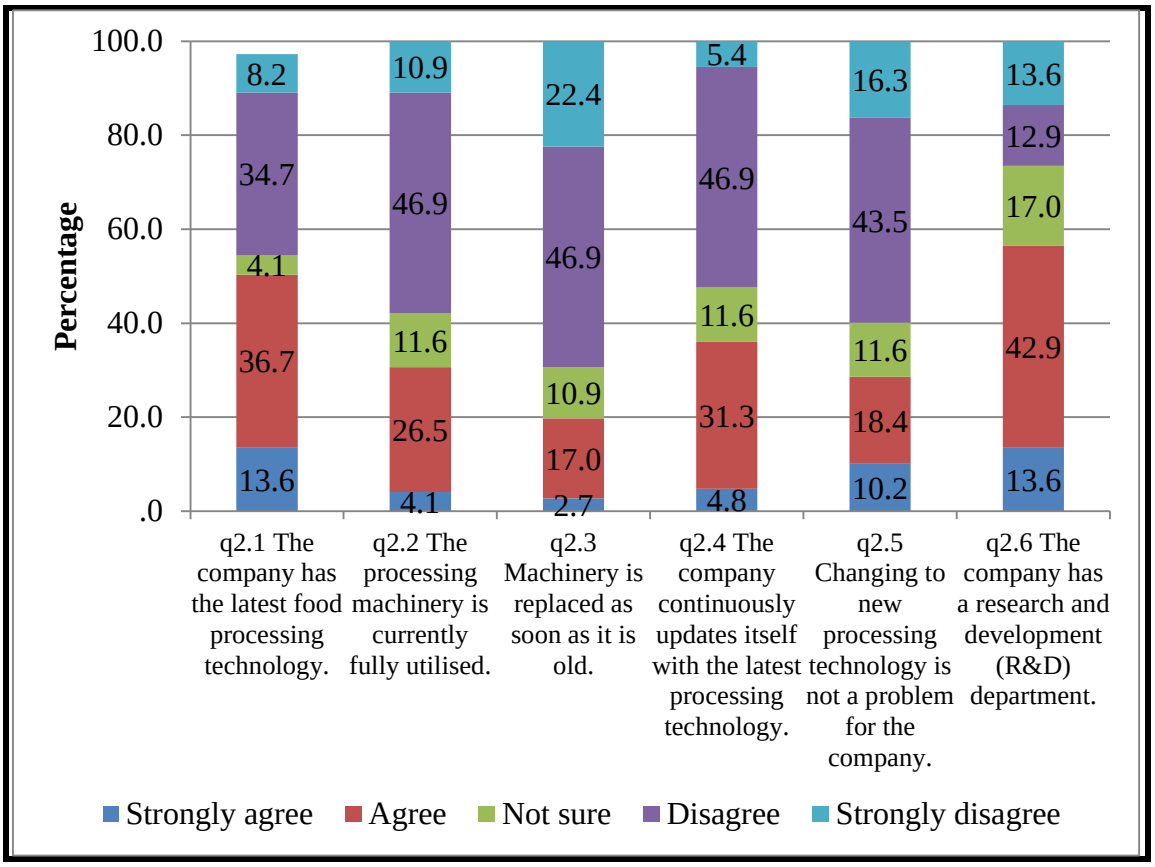

Figure 6.5: Percentage responses to agreement scales of internal processes

To establish the significance of the responses, the one-sample t-tests were used for all the questions (q2.1 to q2.6). The analysis shows that significant disagreement was indicated by the companies for:

- Full utilisation of current processing machinery [$t(146) = 3.725$, $p < 0.0005$];
- The replacement of machinery as soon as it is old [$t(146) = 7.768$, $p < 0.0005$]
- Changing to new processing technology being not a problem to the company [$t(146) = 3.643$, $p < 0.0005$].

On the other hand significant agreement was indicated for:

- The company having research and development (R&D) department [$t(146) = -2.899$, $p = 0.004$].

Furthermore, with three as the test statistic for mean scores, the results of the questions were presented, analysed and interpreted accordingly. From **Figure 6.6**, it can be observed that q2.2, q2.3 and q2.5 all have mean score > 3 which implies disagreement. Q2.6 shows significant agreement since the mean score < 2.

The mean scores were as follows:

- The companies have the latest food processing technology, a mean score of 2.87
- Current machinery being fully utilised, a mean score of 3.34
- Machinery being replaced as soon as it gets old enough, a mean score of 3.17
- Changing to new technology not being a problem to the companies, a mean score of 3.37
- The companies having research and development departments, a mean score of 2.7

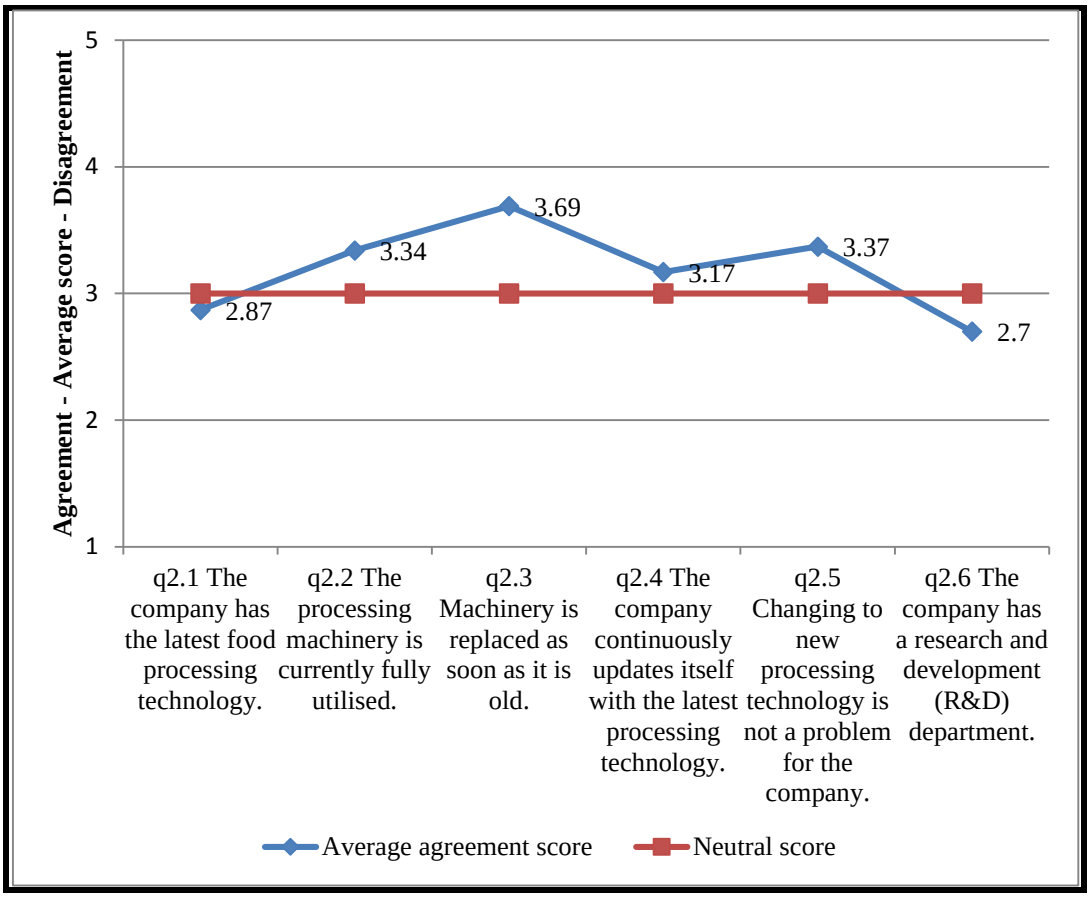

Figure 6.6: Average agreement scores of internal processes as they compare to the mean score of 3

For the internal processes, as factors influencing the adoption of technopreneurship, reporting concentrated on q2.2; q2.3 and q2.5 since they have significant responses. According to the respondents, processing machinery is not currently fully utilised; machinery is not replaced as soon as it gets old and changing to new food processing technology is a problem to the companies.

6.7.2 Human factors

Human factors influencing the adoption of technopreneurship were measured by asking three questions that had to do with knowledge, staff development and staff patriotism (q2.7- q2.9 respectively). The

human factors questions used the same Likert scale as internal processes. From **Figure 6.7** it can be noted from the component bar chart that the 'agree' and 'strongly agree' scales dominated the responses. However further analysis can show how significant these responses are.

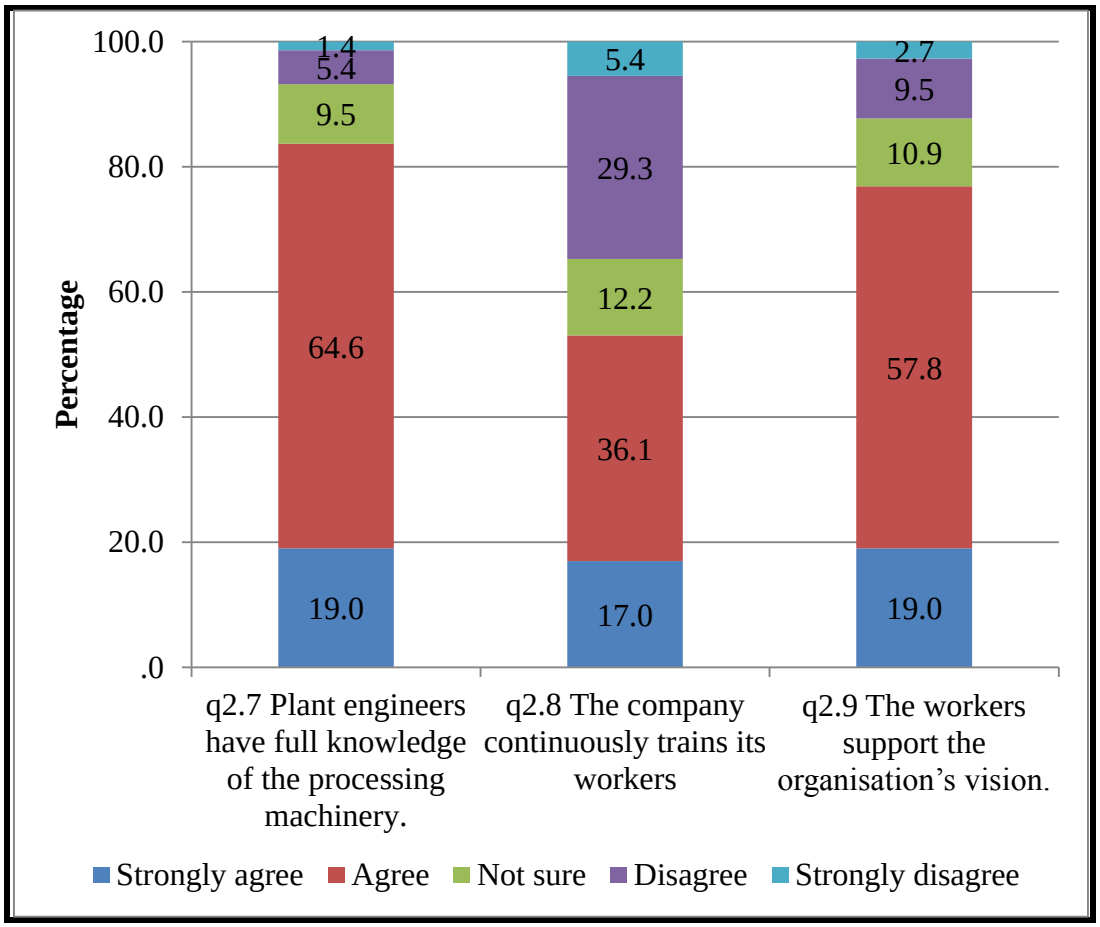

Figure 6.7: Percentage responses to questions on the 'human factors'

Analysis shows that significant agreement is indicated for:

- Plant engineers having full knowledge of the processing machinery [$t(146) = -14.477$, $p < 0.0005$]
- The company continuously training its workers [$t(146) = -2.992$, $p = 0.003$
- The workers supporting the organisation's vision [$t(146) = -10.375$, $p = < 0.0005$]

From **Figure 6.8** it can be observed that all human factor questions have mean scores of < 3 which implies agreement. That is, the respondents indicated that engineers have full knowledge of the processing machinery and that the companies continuously train their workers. Also, the companies indicated that the workers in the companies support organisational visions.

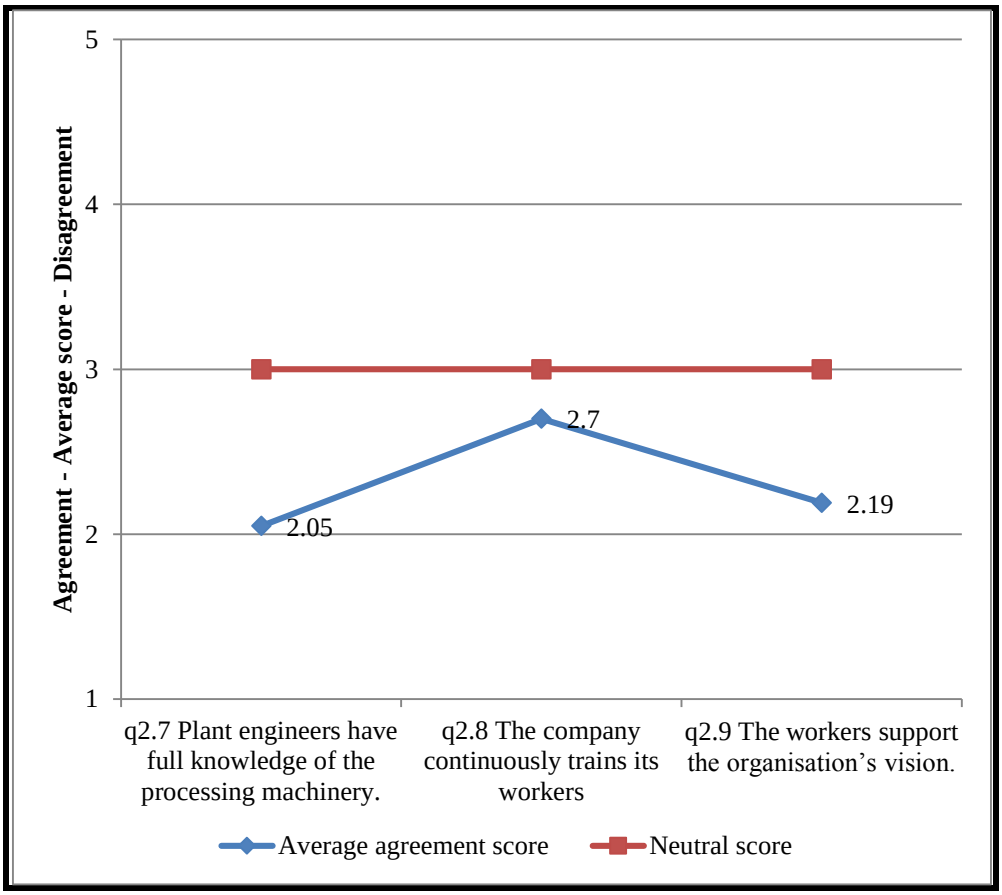

Figure 6.8: Mean scores for human factors questions

6.7.3 Venture capital

The influence of venture capital was measured by asking two questions, that is, q2.10 and q2.10. The questions had to do with access to venture capital loans and relations with local and foreign venture capitalists. **Figure 6.9** shows the results and it can be observed that the 'agree' and 'not sure' responses dominate in both questions that imply agreement.

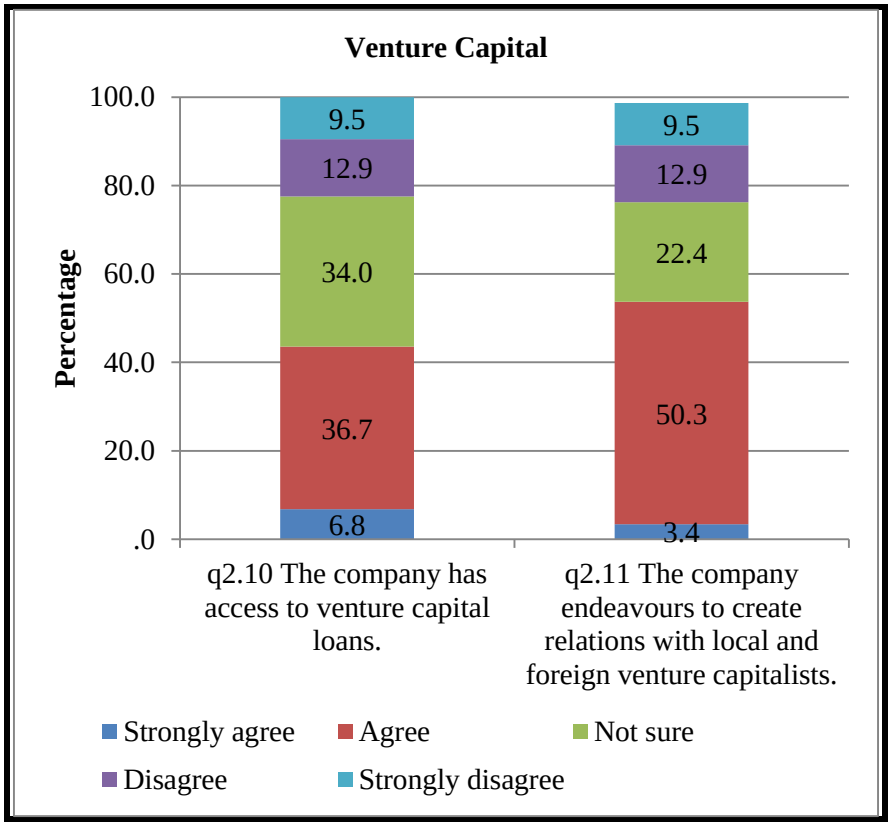

Figure 6.9: Percentage responses to the two 'venture capital' questions

Analysis shows that significant agreement is indicated for:

- The companies having access to venture capital loans [t(146) = -2.101, p = 0.037]
- The companies endeavouring to create relations with local and foreign venture capitalists [t(144) = 0.004).

Also from **Figure 6.10**, it can be observed that both questions of venture capital had mean scores of <3 which implies agreement. Q2.10 had mean score of 2.82 and q2.11 had mean score of 2.74 both of which are significantly <3. This implies that respondents indicated that companies:

- Had access to venture capital
- Endeavoured to create relations with local and foreign venture capitalists

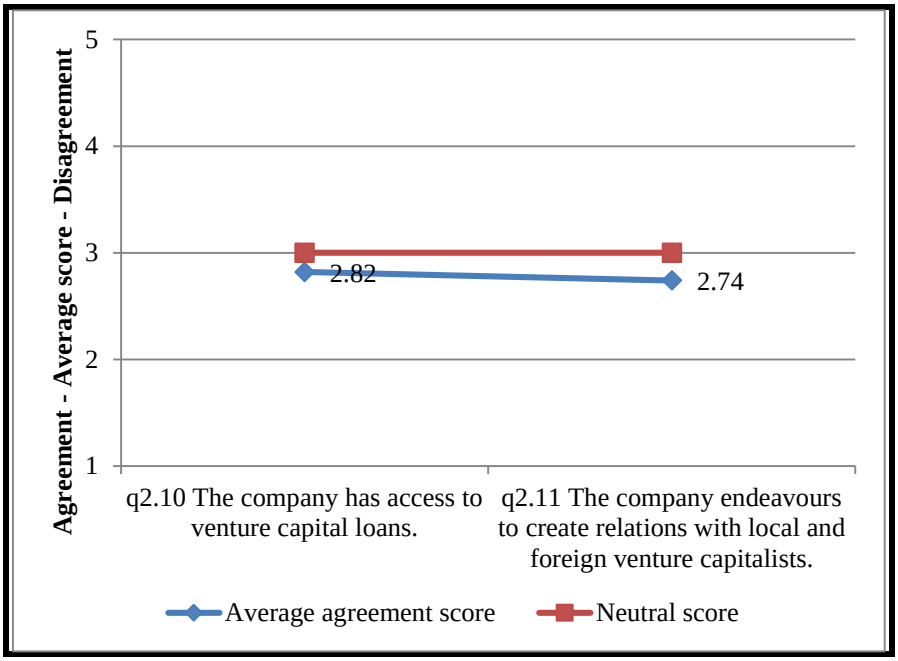

Figure 6.10: Mean scores for venture capital

6.7.4 Partnerships

Partnerships were also measured by two questions, that is, q2.12 and q2.13, which had to do with a foreign partnership in technology and finance, as well as links with research and development institutions.

Figure 6.11 shows that the 'agree', 'not sure' and 'disagree' seem to dominate in both questions on partnerships. This could mean a balance between agreement and disagreement regarding the partnership questions. However for q2.13, the 36.1% for the 'agree' response can overweigh the 23.8% for the 'disagree' response. Significance testing can help reach a conclusion on these responses.

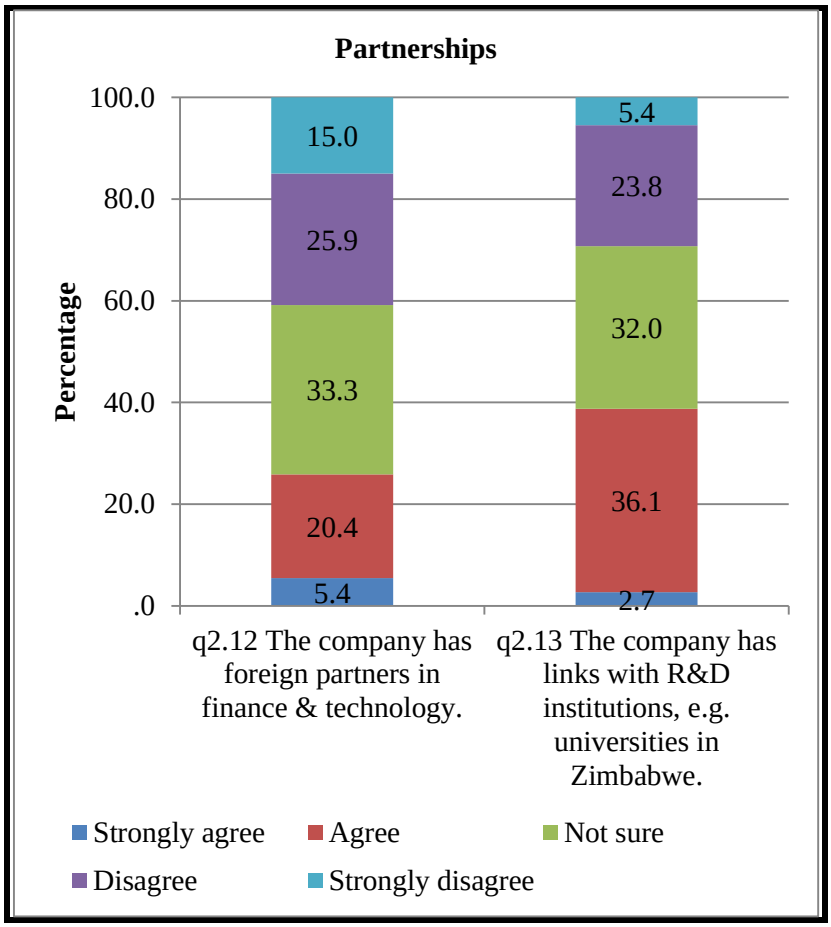

Figure 6.11: Percentage responses to the two 'partnerships' questions

Analysis shows that significant disagreement is indicated for the company having foreign partners in finance and technology [t(146) = -2.101, p = 0.037].

From **Figure 6.12** it can be observed that q2.14 has mean score > 3 which implies disagreement. That is, q2.12 had a mean score of 3.24 and q2.13 a mean score of 2.93. That means respondents indicated that companies had foreign partners in finance and technology.

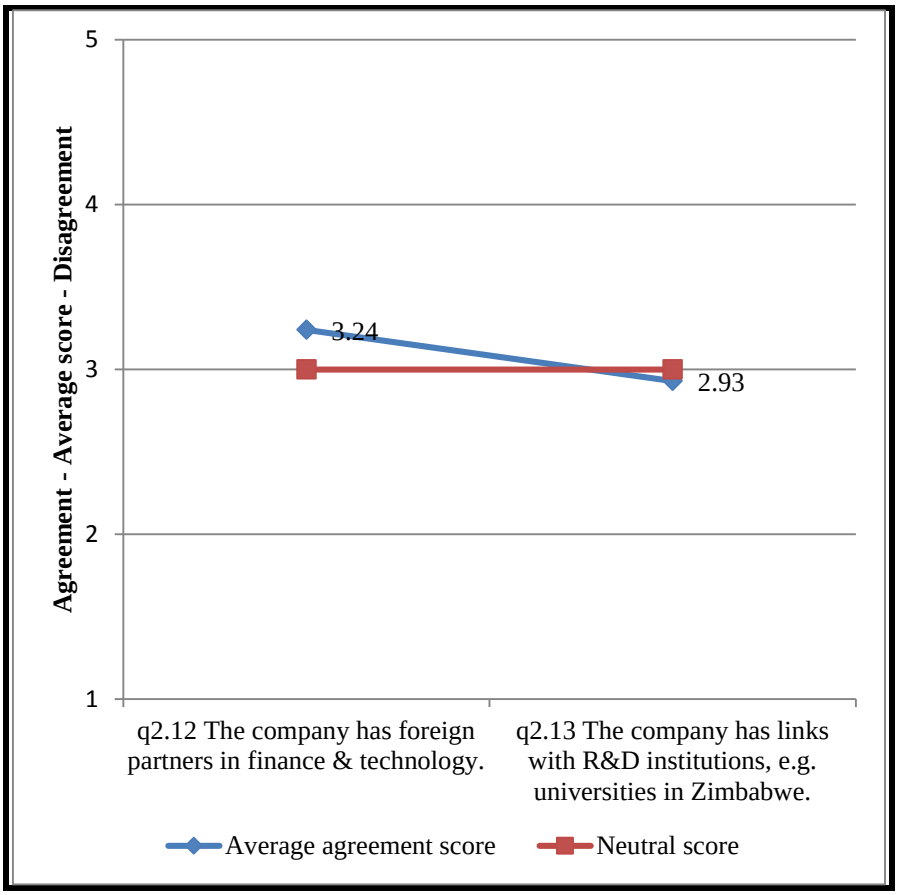

Figure 6.12: Mean scores for partnerships

6.7.5 Government support

To measure government support as a factor influencing technopreneurship, four questions were posed (q2.14 - q2.17). The questions had to do with the reliability of power supply, power costs, government taxes and government policy support. **Figure 6.13** shows that the 'agree' and 'strongly agree' dominate the responses. That is, the 'strongly agree' and 'agree' seem to be having higher percentages of responses to the four questions. Likewise, the percentage results were tested to have statistical significance support and the results are presented after **Figure 6.13**.

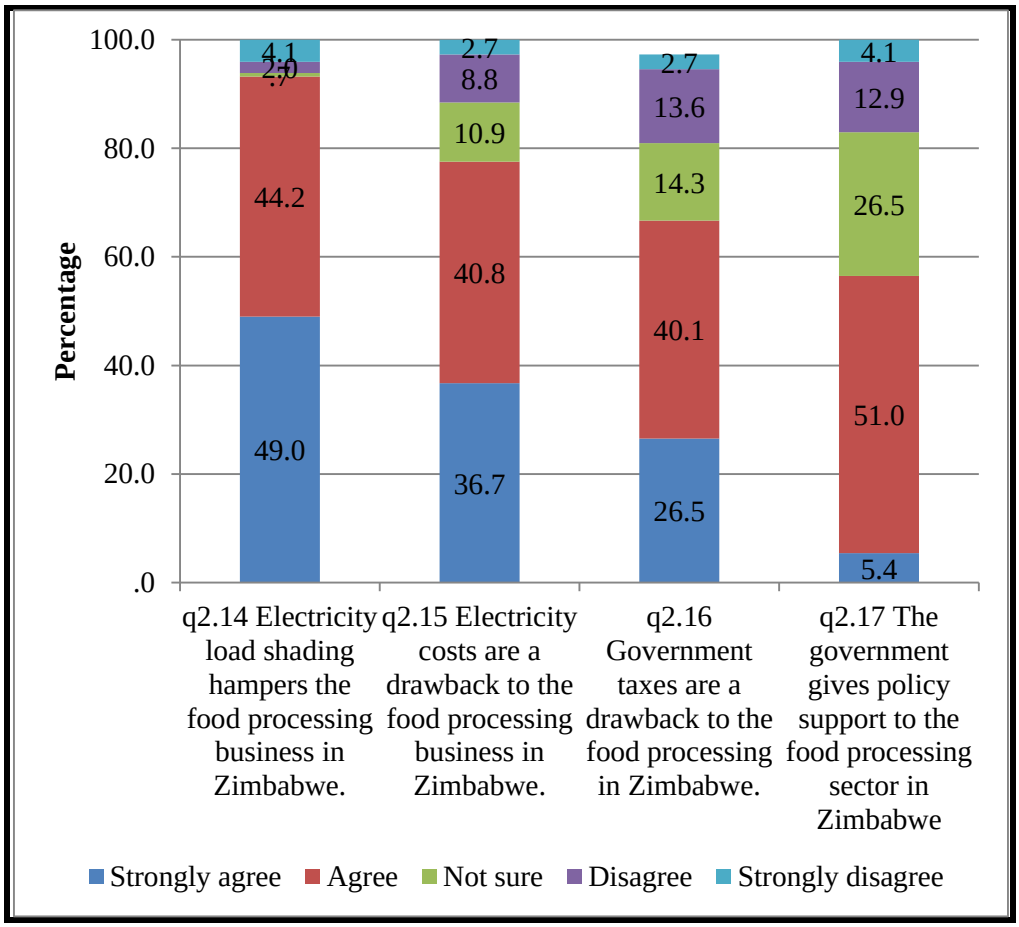

Figure 6.13: Percentage responses of the four questions on 'government support'

Analysis shows that companies agree that:

- Electricity load shedding hampered the industrial food processing business in Zimbabwe [$t(146) = -17.364$, $p < 0.0005$]
- Electricity costs were a drawback to the industrial food processing business in Zimbabwe [$t(146) = -11.655$, $p < 0.0005$]
- Government taxes are a drawback to the food processing sector in Zimbabwe [$t(142) = -8.382$, $p < 0.0005$]
- Government gives policy support to the food processing sector [$t(146) = -5.337$, $p > 0.0005$]

From **Figure 6.14**, it can be observed that all government support questions have a mean score < 3 which implies agreement. That is q2.14 has a mean score of 1.68; q2.15 a mean score of 2; q2.16 a mean score of 2.24 and q2.17 a mean score of 2.59.

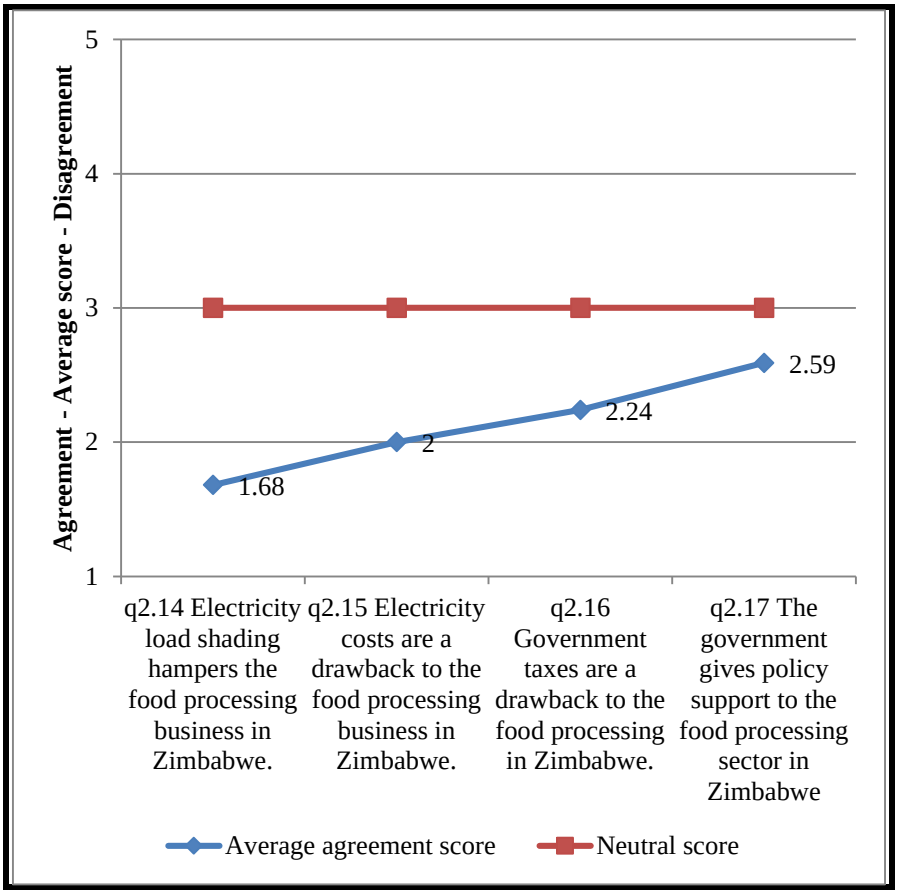

Figure 6.14: Mean scores for government support questions

From the results, it can be said that respondents indicated that electricity load shedding and electricity costs were hampering industrial food processing business of the companies. Also, government taxes and lack of policy support from the government were also drawbacks to industrial food processing operations of the organisations.

6.7.6 Global factors

The global factors were measured using three questions, q2.18, q2.19 and q2.20, which pertained to the quality of food products versus imports, keeping track of industrial food processing technology and the companies competing with neighbouring countries on food production. In **Figure 6.15**, it can be observed that the 'agree' and the 'strongly agree' dominate the responses. That means the 'strongly agree' and 'agree' responses overwhelmed the three 'global factors' questions as observed from the percentage presentations.

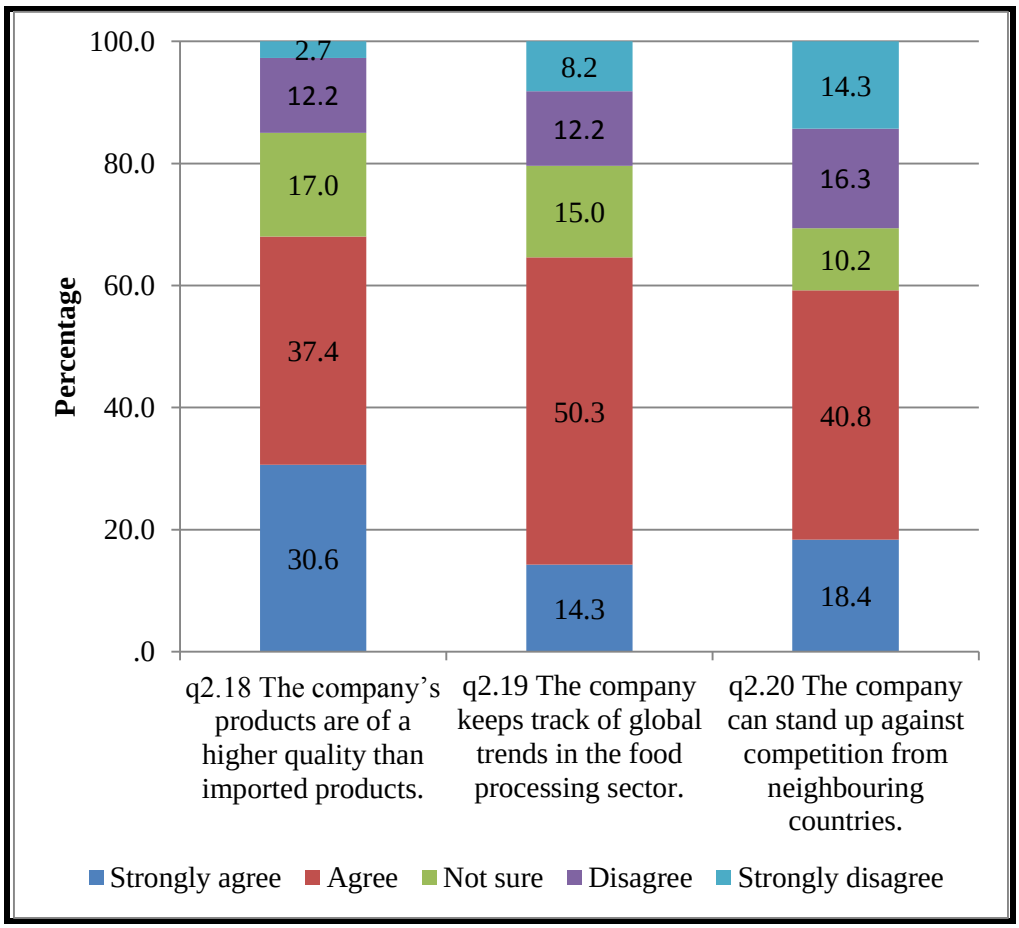

Figure 6.15: Percentage responses to 'global factors' questions

Analysis shows that significant agreement is indicated for:

- The company's products being of higher quality than imported products [$t(146) = -9.025$, $p < 0.0005$]
- The company keeping track of global trends in the food processing sector [$t(146) = -5.397$, $p < 0.0005$]
- The company being able to stand up against competition from neighbouring countries [$t(146) = -2.965$, $p = 0.004$].

From **Figure 6.16**, it can be observed that all global factors questions had mean scores of<3 that implies agreement. For q2.18 the mean score was 2.19 and for q2.19 the mean score was2.5 while q2.20 had mean score of 2.67.

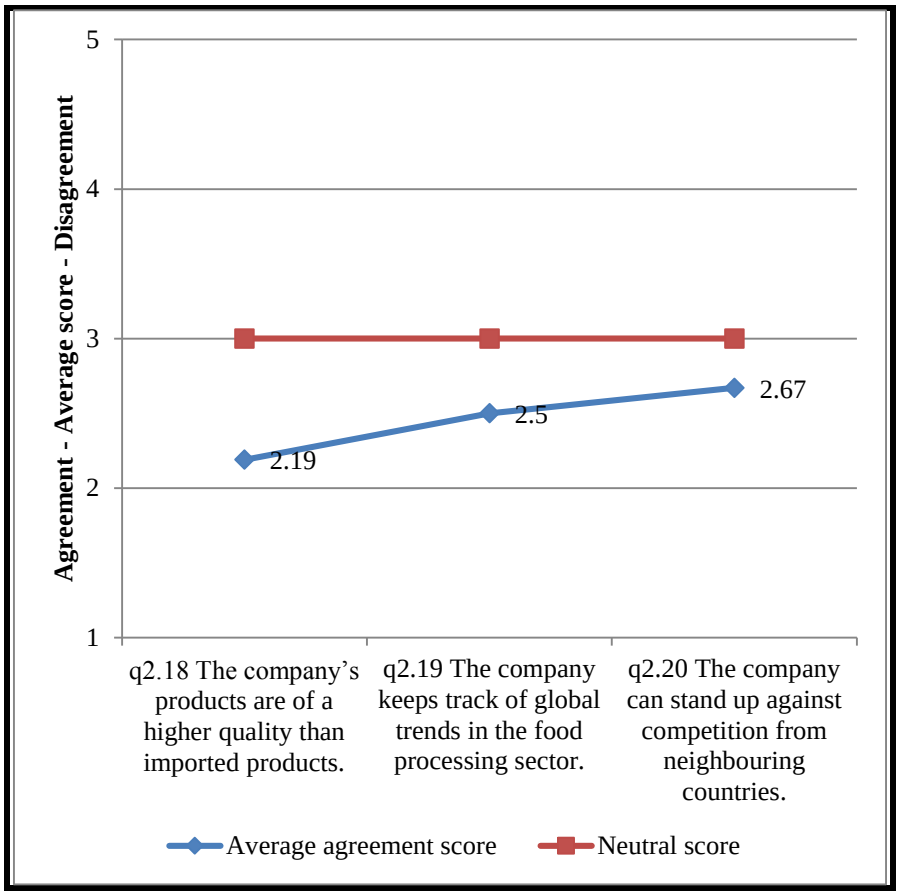

Figure 6.16: Average agreement scores for 'global factors' questions as they compare to the mean score of 3

Thus according to the results, respondents indicated that the companies': food products are of higher quality than imports; kept track of global trends in food processing; and could stand up against competition from neighbouring countries.

6.7.7 Critical success factors that influence technopreneurship in the food processing sector

One of the research objectives was, "To examine critical success factors that influence the successful adoption of technopreneurship in the food processing sector in Zimbabwe." To fulfil this research objective, the researcher used a list of 19 critical success factors that included the proposed factors influencing technopreneurship as presented in **Figure 6.17**. The elements were presented on a Likert scale in the form of an importance scale ranging from 'Not at all important' through to 'Extremely important'. **Figure 6.17** reflects that the 'important' and 'extremely important' dominate the responses. That is, 'important' and 'extremely important' responses had the majority responses of almost 50% each. That implies that the respondents viewed each of the key success factors as important. However, the responses have to be statistically quantified.

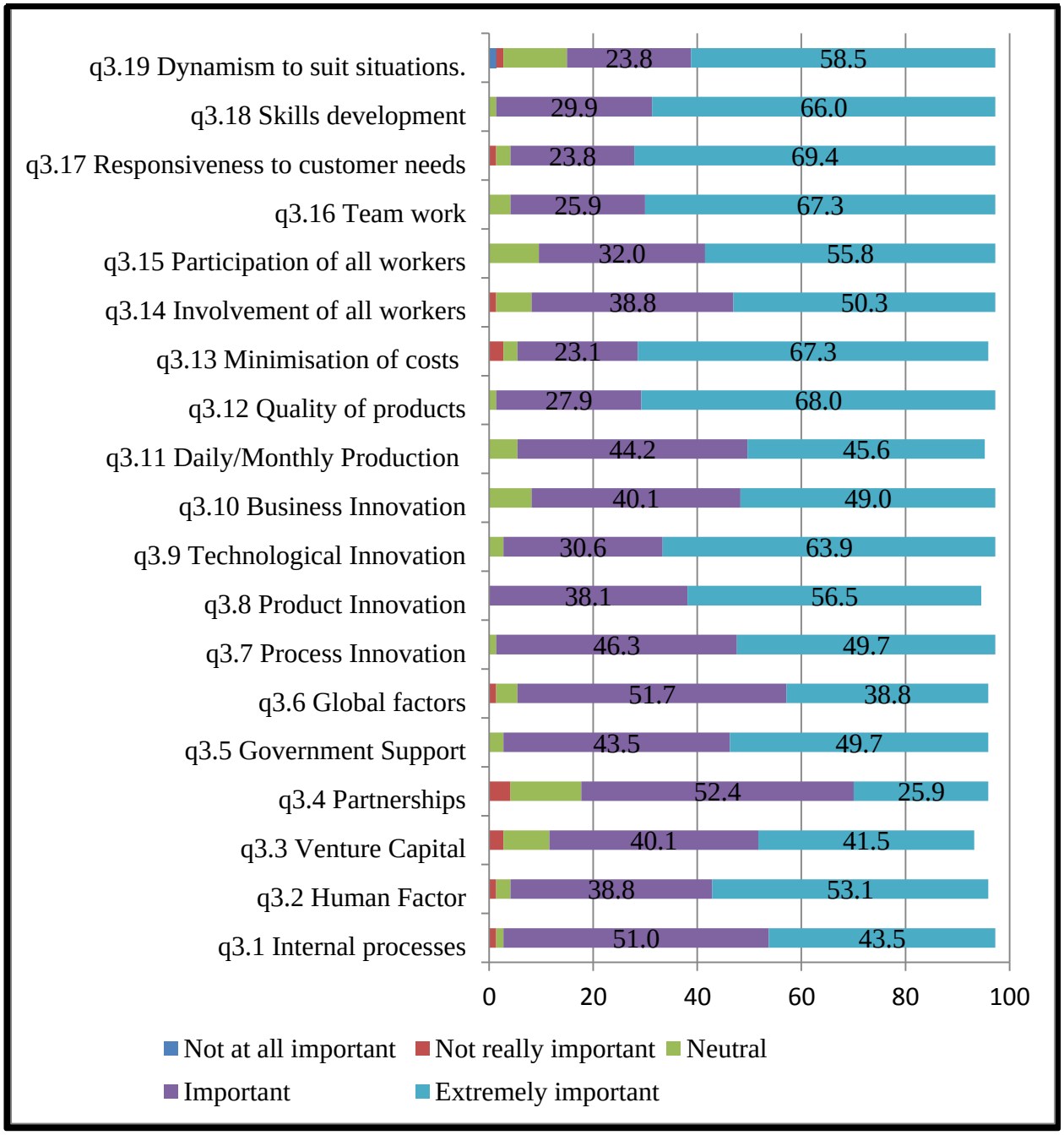

Figure 6.17: Percentage responses to 'critical success factors' questions

Table 6.9 shows that all 19 factors had mean scores of > 3 which ranged from 4.04 being the lowest to 4.69 as the highest and mean difference ranging from 1.04 to 1.69.This shows that these 19 factors are important.

Table 6.9: One sample t-test statistics for key success factors

	N	Mean	Std. Deviation	Std. Error Mean
q3.1 Internal processes	143	4.41	.596	.050
q3.2 Human factors	141	4.50	.628	.053
q3.3 Venture capital	137	4.29	.759	.065
q3.4 Partnerships	141	4.04	.764	.064
q3.5 Government support	141	4.49	.556	.047
q3.6 Global factors	141	4.33	.629	.053
q3.7 Process innovation	143	4.50	.529	.044
q3.8 Product innovation	139	4.60	.492	.042
q3.9 Technological innovation	143	4.63	.540	.045
q3.10 Business innovation	143	4.42	.644	.054
q3.11 Daily/Monthly production	140	4.42	.601	.051
q3.12 Quality of products	143	4.69	.495	.041
q3.13 Minimisation of costs	141	4.62	.683	.058
q3.14 Involvement of all workers	143	4.42	.686	.057
q3.15 Participation of all workers	143	4.48	.670	.056
q3.16 Team work	143	4.65	.560	.047
q3.17 Responsiveness to customer needs	143	4.66	.606	.051
q3.18 Skills development	143	4.66	.503	.042
q3.19 Dynamism to suit situations	143	4.41	.866	.072

The analysis shows that significant importance is indicated for all the key success factors with $p < 0.0005$. The critical success factors, in order of importance, are shown in **Table 6.10**. To be noted is the mean of the lowest important key success factor that is partnerships with a mean of 4.04. The value shows that it is still not different from most key success factors. Some thing of interest could be the top ten critical success factors. Also to be noted is the outstanding importance of product quality. Most of the types of innovation are in the top ten critical success factors that are technological innovation, product innovation and process innovation.

Table 6.10: Ordered average score from most important to least important of the critical success factors

	Factor	Mean Score
1	q3.12 Quality of products	4.69
2	q3.18 Skills development	4.66
3	q3.17 Responsiveness to customer needs	4.66
4	q3.16 Teamwork	4.65
5	q3.9 Technological innovation	4.63
6	q3.13 Minimisation of costs	4.62
7	q3.8 Product innovation	4.60
8	q3.7 Process innovation	4.50
9	q3.2 Human factors	4.50
10	q3.5 Government support	4.49
11	q3.15 Participation of all workers	4.48
12	q3.11 Daily/MonthlypProduction	4.42
13	q3.10 Business innovation	4.42
14	q3.14 Involvement of all workers	4.42
15	q3.1 Internal processes	4.41
16	q3.19 Dynamism to suit situations	4.41
17	q3.6 Global factors	4.33
18	q3.3 Venture capital	4.29
19	q3.4 Partnerships	4.04

6.8 Feasibility of technopreneurship in the food processing sector

The last research objective was, "To determine the feasibility of technopreneurship in the food processing sector in Zimbabwe." To fulfil this research objective, six questions were posed (q4.1 - q4.6) that deal with local demand, organisational capacity, technological capacity, entrepreneurial skills and competition in the market. **Figure 6.18** shows that the definitely 'yes' and 'yes, to some extent' dominate the graph. That means the 'definitely yes' and the 'yes, to some extent' have the highest responses in the six 'feasibility of technopreneurship' questions. That is, there seems to be agreement with the posed questions. For further analysis, the responses are tested for statistical significance.

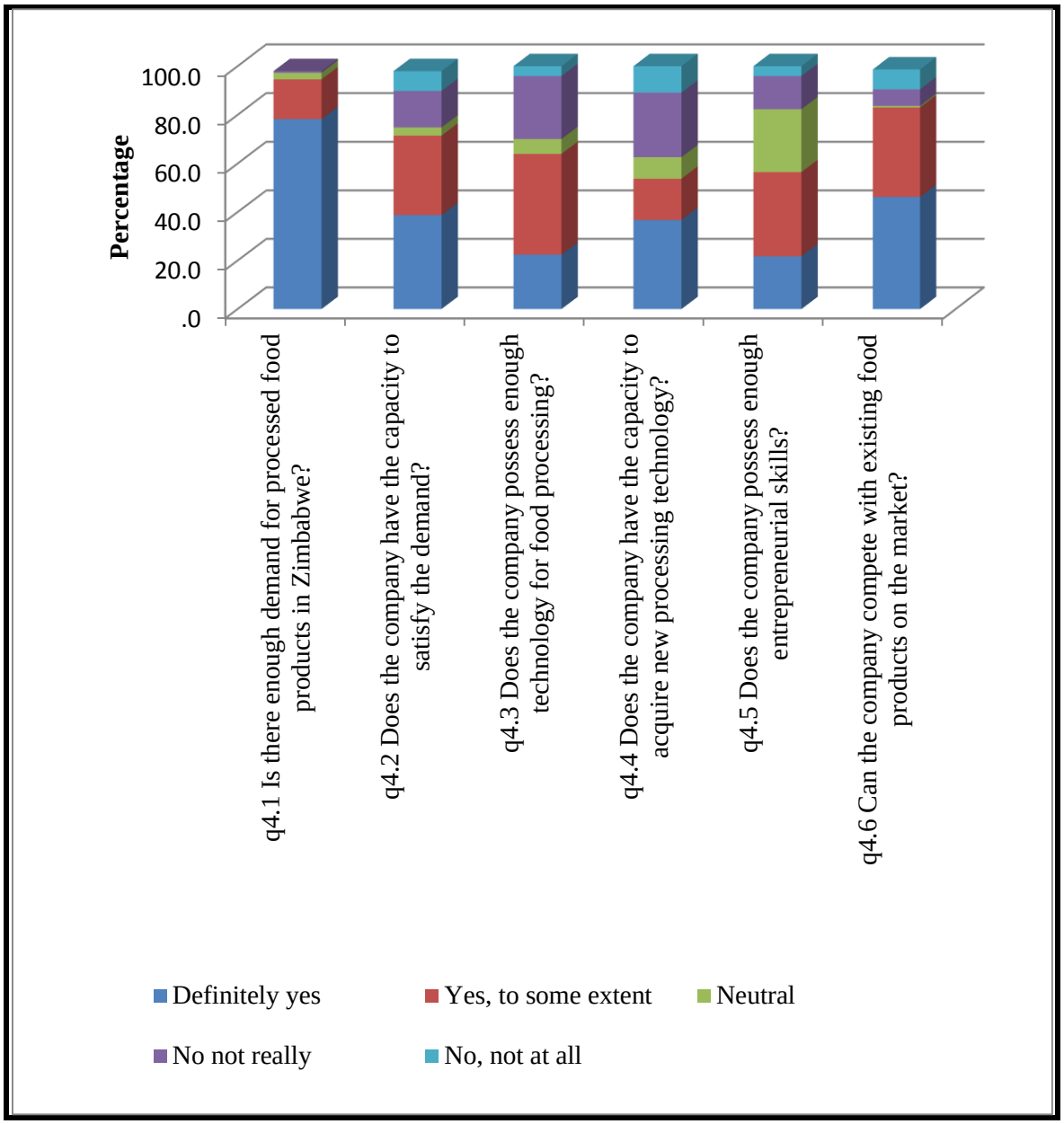

Figure 6.18: Percentage responses to 'feasibility of technopreneurship' questions

The analysis shows that significant agreement is indicated for:

- Enough demand for processed food products in Zimbabwe [Z(N = 9) = -2.668, p = 0.008]
- The company having the capacity to satisfy the demand [Z(N = 9) = -2.666, p = 0.008]
- The company possessing enough technology for industrial food processing [Z(N = 9) = -2.073, p = 0.038]
- The company possessing enough entrepreneurial skills [Z(N = 9) = -2.668, p = 0.008]
- The company having the ability to compete with existing food products on the market [Z(N = 9) = -2.666, p = 0.008]

Analysis shows that a significant positive response is indicated for:

- Whether there is enough demand for processed food products in Zimbabwe [t(143) = -39.620, p < 0.0005];
- The company having the capacity to satisfy the demand [t(143) = -7.274, p < 0.0005;
- The company possessing enough technology for food processing [t(146) = -5.238, p < 0.0005;
- The company having capacity to acquire new processing technology [t(146) = -3.466, p = 0.001;
- The company possessing enough entrepreneurial skills [t(146) = -6.233, p < 0.0005; and
- The company having the ability to compete with existing food products on the market [t(144) = -10.574, p < 0.0005].

From **Figure 6.19**, it can be observed that all feasibility of technopreneurship in the food processing sector questions have mean scores of <3, which implies positive responses to all the questions, except q4.4. The mean score for q4.1 is 1.24, for q4.2 it is 2.19, q4.3; it is 2.48, for q4.4 it is 2.58, for q4.5 it is 2.44 and for q4.6 the mean score is 1.92.

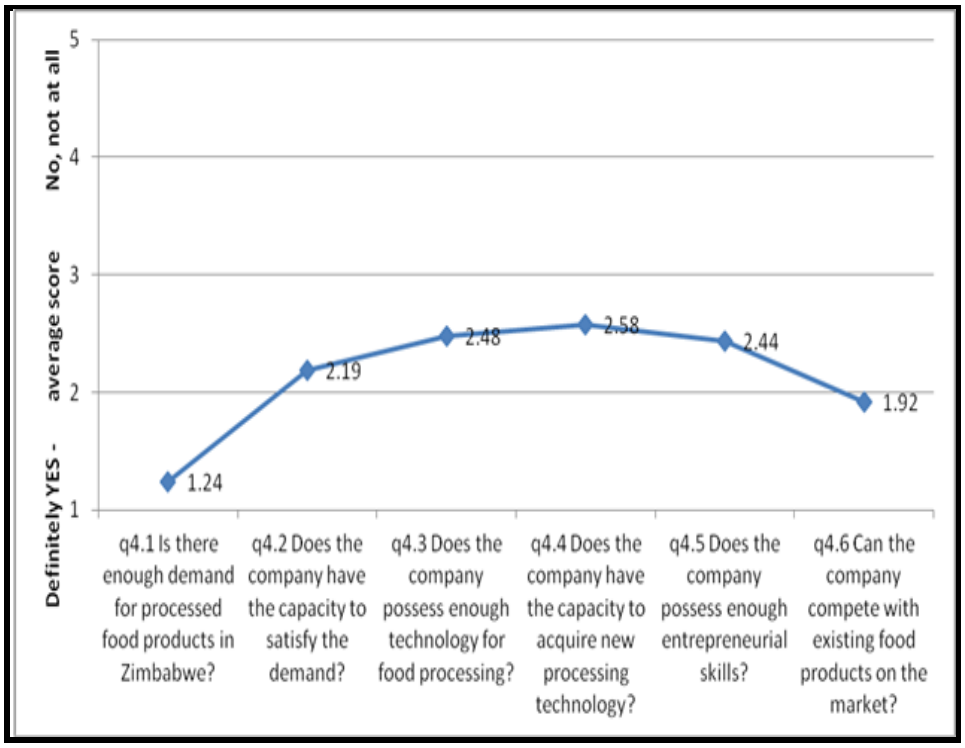

Figure 6.19: Average scores for 'feasibility of technopreneurship' questions

This means that respondents indicated that there was enough demand for locally produced food products; the companies have capacity and technology to satisfy the demand. Also the companies have the capacity to acquire new processing technology; the companies have enough entrepreneurial skills and ability to compete with existing food products on the market.

6.9 The relationship between factors that influence Technopreneurship and the role of technopreneurship in the company

To address the main objective of the study, that is, which factors influence technopreneurship, each of the items in the factor that influence technopreneurship (namely questions 2.1 – 2.20) were tested to see how it correlated with the 3 items of question 1 (the role of technopreneurship). This indicated which factors significantly correlated with the agreement that a factor is used in the company and importance of technopreneurship/ food processing technology/ entrepreneurship orientation in the company.

For this purpose, Spearman's correlation was applied. Spearman's correlation was used instead of Pearson's correlation because the scale of measurement of the variables is ordinal and not interval. The results of the correlation analysis are presented in **Table 6.11.**

Table 6.11: Correlation analysis between internal processes and the importance of technopreneurship (Question 1 and 2.1 to 2.6).

		q1.1 Food processing technology	q1.2 Entrepre-neurship orientation	q1.3 Techno-preneurship
q2.1 The company has the latest food processing technology.	**Correlation Coefficient**	-.167*	-.328**	-.075
	Sig. (2-tailed)	.046	.000	.384
	N	143	137	137
q2.2 The processing machinery is currently fully utilised.	**Correlation Coefficient**	.002	-.039	.116
	Sig. (2-tailed)	.984	.647	.170
	N	147	141	141
q2.3 Machinery is replaced as soon as it is old.	**Correlation Coefficient**	-.015	-.112	.048
	Sig. (2-tailed)	.861	.185	.574
	N	147	141	141
q2.4 The company continuously updates itself with the latest processing technology.	**Correlation Coefficient**	-.050	-.018	.097
	Sig. (2-tailed)	.546	.830	.255
	N	147	141	141
q2.5 Changing to new processing technology is not a problem for the company.	**Correlation Coefficient**	.034	.021	.152
	Sig. (2-tailed)	.687	.802	.072
	N	147	141	141
q2.6 The company has a research and development (R&D) department.	**Correlation Coefficient**	-.087	.128	.065
	Sig. (2-tailed)	.293	.130	.444
	N	147	141	141

This means that there was a significant negative correlation between the importance of food processing technology and the company having latest food processing technology. There was significant negative correlation between the importance of entrepreneurial orientation and the company having the latest food processing technology. For human factors, there was no significant correlations between q2.1 – 2.6 and q1.1. However, there was a significant negative correlation between q1.2 and q 2.9 (rho = -0.269, p = 0.001), and between q1.3 and q2.9 (rho = -0.309, $p < 0.0005$) as shown in **Table 6.12**. The disagreement with q2.9 is associated with the importance of q1.2 and q1.3.

Table 6.12: A table showing correlation analysis between human factors and the role of technopreneurship (Question 1 and 2.7 to 2.9)

		q1.1 Food processing technology	q1.2 Entrepre-neurship orientation	q1.3 Techno-preneurship
q2.7 Plant engineers have full knowledge of the processing machinery.	**Correlation Coefficient**	-.039	-.124	-.097
	Sig. (2-tailed)	.640	.142	.253
	N	147	141	141
q2.8 The company continuously trains its workers.	**Correlation Coefficient**	-.050	.011	.108
	Sig. (2-tailed)	.544	.896	.203
	N	147	141	141
q2.9 The workers support the organisation's vision.	**Correlation Coefficient**	-.019	-.269**	-.309**
	Sig. (2-tailed)	.823	.001	.000
	N	147	141	141

This means there was a significant negative correlation between the importance of entrepreneurial orientation and the workers supporting the organisation's vision. There was also a significant negative correlation between the importance of technopreneurship and the workers supporting the organisation's vision.

For venture capital and partnerships, there were no significant correlations.

For government support, there were no significant correlations between q2.14 - q2.17 and q1.1 and q1.2. There was only negative correlation between q1.3 and q2.17 (rho = -0.205, p = 0.015 as shown in **Table 6.13.**

Table 6.13: A table showing correlation analysis between government support and the importance of technopreneurship (Question 1 and 2.14 to 2.17)

		q1.1 Food processing technology	q1.2 Entrepre-neurship orientation	q1.3 Techno-preneurship
q2.14 Electricity load shedding hampers the food processing business in Zimbabwe.	**Correlation Coefficient**	.123	.052	.082
	Sig. (2-tailed)	.137	.544	.337
	N	147	141	141
q2.15 Electricity costs are a drawback to the food processing business in Zimbabwe.	**Correlation Coefficient**	.115	-.068	-.022
	Sig. (2-tailed)	.165	.424	.795
	N	147	141	141
q2.16 Government taxes are a drawback to the food processing in Zimbabwe.	**Correlation Coefficient**	.041	-.100	-.098
	Sig. (2-tailed)	.624	.243	.255
	N	143	137	137
q2.17 The government gives policy support to the food processing sector in Zimbabwe.	**Correlation Coefficient**	-.099	-.155	-.205*
	Sig. (2-tailed)	.234	.067	.015
	N	147	141	141

This means there was a significant negative correlation between the importance of technopreneurship and the government giving policy support to the food processing sector in Zimbabwe.

As for global factors, there were no significant correlations between q2.19 to q2.20 and q1.1 to q1.3. There was, however, a negative correlation between q2.18 and q1.3 (rho = - 0.198, p = 0.018.) as shown in **Table 6.14**.

Table 6.14: A table showing correlation analysis between global factors and the importance of technopreneurship (Question 1 and 2.18 to 2.20)

		q1.1 Food processing technology	q1.2 Entrepre-neurship orientation	q1.3 Techno-preneurship
q2.18 The company's products are of a higher quality than imported products.	**Correlation Coefficient**	-.031	-.069	-.198*
	Sig. (2-tailed)	.710	.417	.018
	N	147	141	141
q2.19 The company keeps track of global trends in the food processing sector.	**Correlation Coefficient**	.058	.104	.038
	Sig. (2-tailed)	.485	.220	.655
	N	147	141	141
q2.20 The company can stand up against competition from neighbouring countries.	**Correlation Coefficient**	-.058	.021	.021
	Sig. (2-tailed)	.482	.808	.808
	N	147	141	141

This means there was a significant negative correlation between the importance of technopreneurship and the company's products being of higher quality than imported products.

6.10 The relationship between area of specialisation and feasibility of technopreneurship in the food processing sector

For the purpose of testing for independence between the area of specialisation and feasibility of technopreneurship, a contingency table also known as cross-tabulation was used. Cross-tabulation was used since areas of specialisation are categorical or nominal scale data which is compared to interval scale data. In the tables, values in red indicate where there is a significant association and reporting is concentrated on them.

Table 6.15 shows that there is a significant relationship between specialisation and q4.2 ($p<.05$). More than expected: to the question whether the company had the capacity to satisfy the demand, 'Eng only' responded 'not at all'; 'business only' responded 'neutral'; 'eng and bus' responded 'no not really' and 'other' responded 'yes, to some extent'. In **Table 6.15**, red values indicate significant values while those in black are insignificant.

Table 6.15: Cross tabulation for area of specialisation and the company having the capacity to satisfy the demand

		q4.2 Does the company have the capacity to satisfy the demand?					
		Definitely yes	**Yes, to some extent**	**Neutral**	**No, not really**	**No, not at all**	**Total**
Area of specialisation	**Engineering only**	9	9	0	4	8	30
	Business only	31	18	5	12	2	68
	Engineering and business	10	8	0	6	0	24
	Other	6	11	0	0	2	19
Total		56	46	5	22	12	141

There is a significant relationship between specialisation and q4.4 ($p<.05$). More than expected: to the question whether the company had the capacity to acquire new processing technology - 'Eng only' responded 'not at all'; 'business only' responded 'yes, to some extent' or 'neutral'.

Table 6.16: A cross tabulation for the relationship between area of specialisation and the company having the capacity to acquire new processing technology

		q4.4 Does the company have the capacity to acquire new processing technology?					Total
		Definitely yes	Yes, to some extent	Neutral	No, not really	No, not at all	
Specialisation	Engineering only	14	2	0	4	10	30
	Business only	19	17	10	21	2	69
	Engineering and business	13	1	3	7	2	26
	Other	8	3	0	6	2	19
Total		54	23	13	38	16	144

6.11 Representation of areas of specialisation

To test whether the specialisation areas are equally represented in the sample or not, the chi-square goodness of fit test was used as presented in **Table 6.17** and **Table 6.18**. The result shows that the specialisation areas are not equally represented in the sample ($\chi 2$ (3, N=144) = 420.56, p<.0005). Significantly more than expected of the sample are 'business only'.

Table 6.17: Chi-Square tests for whether the areas of specialisation are equally represented

	Observed N	Expected N	Residual
Engineering only	30	36.0	-6.0
Business only	69	36.0	33.0
Engineering and business	26	36.0	-10.0
Other	19	36.0	-17.0
Total	144		

Table 6.18: Test statistics for the Chi-sSquare test

	Specialisation
Chi-Square	42.056
df	3
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5.

The minimum expected cell frequency is 36.0.

6.12 Summary

In this study data analysis was done through one sample t-tests (SPSS version 17). These would ensure that reporting concentrated on significant results and left out results that were not significant. Furthermore, SPSS version 17 was utilised to test relationships between two sets of variables through the Spearman's correlation test or the Chi-square test so as to establish any association between the variables. Data was presented numerically and textually. The guiding format for the presentation of the results was the research objectives of this study. The demographic data which is found at the end of the questionnaire was presented first to lead the presentation, as they mainly were control variables. Demographic data presentation was followed by the presentation of results of the role of technopreneurship in the food processing sector. The presentation was then followed by results of factors influencing the adoption of technopreneurship which is the main objective of this study. Results of critical success factors of technopreneurship and the results of the feasibility of technopreneurship in the food processing sector of Zimbabwe were presented in that order. Furthermore, some tests were done to determine the relationship between two sets of variables such as the relationship between the role of technopreneurship and the factors that influence technopreneurship. In addition, relationships between feasibility of technopreneurship and the areas of specialisation were also done to further get insight into the results. The results of relationship tests were presented at the end of data presentation and analysis. For the purpose of this study, the researcher managed to report on significant results only and left out insignificant responses. This was to limit the bulkiness of data and not confuse the reader. Data was presented, analysed and interpreted so as to get the findings of the research accordingly.

The chapter presented and analysed data through tabulation, that is, frequency distribution tables and cross tabulation as well as pie charts, component bar charts and line graphs. The analysis was done through descriptive statistics such as percentages, arithmetic means, standard deviation and mean deviation. Lastly inferential statistics were used such as one-sample t-tests, cross-tabulation and chi-square tests. Now the analysed data is given more meaning by discussing the results in the next chapter.

CHAPTER 7: DISCUSSION

7.1 Introduction

It can be appreciated that the previous chapter reported the results as they were. A presentation, analysis and interpretation followed, but this did not give sufficient meaning to the gathered data. There is still a need to take the data further, compare it with other empirical and theoretical findings in other research studies locally, regionally and globally. The discussion in this chapter puts the results into perspective.

In this chapter, the results were discussed about the Zimbabwean food processing sector and compared to other economies as presented in the literature. The discussion was presented regarding the research objectives of this study and the layout used in the previous chapter. It covers issues like the importance of technopreneurship; factors influencing technopreneurship; critical success factors for technopreneurship and the feasibility of technopreneurship in the food processing industry in Zimbabwe. The chapter criticises the results as comparing and contrasting it with recent findings by other researchers in related literature.

7.2 Demographic details

In this study, five sets of variables were used to demographically describe the target respondents. The demographic variables included: area of educational specialisation; position at the workplace; the department in which the respondent worked, gender and the highest level of education of the respondent. The major purpose was to ensure sample representation of the respondents. In this case, the researcher had no problems regarding coverage of the population except the response rate being lower than the target. However, the final sample size was substantial enough (147) to achieve the objectives of the research. The reasons for the low response rate include:

Gatekeepers' consent

Some of the gatekeepers denied access into their companies, even some of those who had previously signed the gatekeepers' consent letter during ethical clearance. Some simply indicated that according to their policy they do not accept private researchers and if they want research to be performed, they engage their own. Those who had previously endorsed the gatekeeper's letter indicated that the researcher was late and needed to make another arrangement later when there is an opportunity. Other gatekeepers just continuously postponed to the frustration of the researcher. In fact, there are no good relations between academic institutions and industry in Zimbabwe.

Low staff morale

The other factor was the low morale in the industrial workforce. The Zimbabwean industry was under threat of the economic hardships. The economic challenges led to a massive closure of companies and retrenchment of thousands of workers as explained in chapter 2. As a result, some workers refused to participate or simply did not return the questionnaire.

The researcher engaged different strategies like multiple distribution modes, snowball approach and the use of leads and references to secure the 147 response rate from the 250 distributed questionnaires. Thus, the researcher was guided by two major issues, that is, the ethical research standards and the adequate sample size of at least 200 as determined by abstract approaches. It can be indicated that sample size is determined by considering the population size, the size of population variance, research costs and degree of precision required in the research (Kothari 2010; Shukla 2008). Both qualitative and quantitative considerations were considered to determine the sample size but the ethical consideration of the gatekeeper and the respondents' consent ultimately determined how large the sample size was.

The demographic variables in this study included: gender, the area of specialisation, department, position and level of education. These can now be discussed one after the other and their relationship with other variables in the results.

7.2.1 Gender

Gender was used as a control variable of employees in the food processing sector. This was used to ensure the validity of the results and monitor the representativeness of the sample. Results reported that 68% were male while about 32% were female. This can be regarded as a correct reflection of the population composition of staff regarding gender in the food processing sector. That is compared with ZIMSTAT (2015) labour statistics in the industrial sector which stated that the composition is 72% male and 28% female.

7.2.2 Area of Specialisation

"Area of specialisation" had four categories, namely, engineering only, business only, both business and engineering and others. The idea behind the categories was to determine the skills in possession by the respondents. Skills are important since technopreneurship is an area of study that consist of both aptitude and knowledge and could further assist to discuss the human factors influencing technopreneurship. The results showed that almost half the respondents (47%) indicated that they were specialists in business while one fifth (20%) were specialists in engineering, and also almost one-fifth (18%) were both engineering and business specialists. Some 13% were others which included information technology and supply chain specialists who thought they were none of the specified. This can be viewed as the

composition of most manufacturing industries, regarding areas of specialisation. A chi-square goodness of fit test revealed that areas of specialisation were not equally represented in the study. The only area of specialisation that was significantly represented was business only. Regarding training and development, this is the scenario, where in colleges and universities in Zimbabwe the majority enrolment is in business studies and the other areas of study are a minority. This could have connotations to business attitude or reward systems in the industries. The idea behind technopreneurship views the above situation as not ideal for a technopreneurial organisation. The issue of specialising in any area is not desirable for technopreneurs. Those who combine both business and engineering are close to becoming skilled technopreneurs (Harlanu and Nugroho, 2015). Thus, the interplay between technology, entrepreneurship and innovation should be taken as the lifestyle for economic growth and development (Kwa et al., 2014). Technically, business is not entrepreneurship, and neither is engineering technology. The terminology was only used in the questionnaire to make it easier for respondents.

7.2.3 Respondent's department

A department of the respondent is the company unit responsible for a specific function that contributes to the overall goal of the organisation. Department of the respondent was also used as a control variable so as to ensure departmental representativeness. Departmental representativeness also enhances the validity of the study results. Since the nomenclature of departments varies from organisation to organisation, the researcher simplified the matter by using generic classifications like administrative, engineering or support staff. Results reported that the majority (47.2%) of the employees worked in the administrative departments, followed by engineering departments with 38.2% and lastly support services with 14.3%. The results are to some extent consistent with the composition of staff at most of the organisations with the majority of administrators having a business specialisation. However, it is possible to have administrators with engineering qualifications or both. A comparison of positions and departments may also be necessary to verify consistency. Results reported that the majority of respondents were from middle management, that is, 36.7% and first-line management, that is, 38.8%. Most of the respondents came from administrative departments, that is, 46.3% followed by respondents from engineering departments at 37.4%. Thus administrative duties are assumed mostly by middle and top management. Engineering duties are carried out by first-line managers while support staff carry out non-managerial responsibilities. Thus again the results are consistent.

7.2.4 Educational level

The level of educational attainment attempts to establish the amount of knowledge acquired by employees in the companies. Areas of specialisation assisted in determining the skills available in the food processing sector and the levels of education assisted in further determining the extent to which the employees were professionally trained. The majority of employees employed by the companies in the food processing

sector can be viewed as professionals with degrees and diplomas. Many can be expected from such employees regarding creativity and innovativeness because of the knowledge and skills they possess. However, that could depend on how and where the people were trained; that is, the educational thrust or orientation that can be theoretical or applied. It is also important to note how gender composition and levels of educational attainment compare. According to ZIMSTAT (2015), 2014 labour statistics shows that 57% of the professionals were male while 43% were female. This, to some extent, compares with the results of this study that had 68% male and 32% female. This also has an implication to the validity of the results of the study.

7.2.5 Positions at work

Positions at workplaces represent the amount of responsibility and amount of influence respondents have on organisational decision-making. Positions were classified regarding organisational hierarchy and included top management, middle management, first-line management and non-managerial employees. Non-managerial employees include practitioners like scientists and technicians. It was reported in the results that the majority (39.9%) of respondents were first-line managers, followed by middle management (37.8%); non-managerial level (16.3%) and top management (5.4%). The responses seem to fit an organisational setup where top management should be the minority, specialised support staff who are non-managerial are the second minority while the majority being supervisors and middle managers the second majority. Positions at work were used as a control measure in the study to ensure a range of positions are covered like managers, administrators, scientists, engineers and technicians as specified by the inclusion/exclusion criteria.

7.3 The importance of technopreneurship in the food processing sector

The original intention in this objective was '*to assess the importance given to technopreneurship by the food processing sector'*. It was taken that the importance attached to what were termed the facets of technopreneurship would indicate how technopreneurship would be able to play its role. The facets include industrial food processing technology, entrepreneurial orientation and technopreneurship. In this case, the 'role' refers to the part played or the function or the purpose served by technopreneurship in the organisation. Reza and Mona (2014) held that in the current world of the massive population, food processing technopreneurs have turned to technopreneurship to be and remain competitive in the market, as well as being able to meet the growing food demand. Given that, from the results, significant importance was indicated for technopreneurship and its facets; that is, food technology processing and entrepreneurship orientation. It could, therefore, be said that technopreneurship is valued in the food processing sector and it plays an important role in food processing. The role, in this case, referred to the part played by technopreneurship in the food processing sector and this was judged from the importance assigned to technopreneurship by the companies. The researcher used the SPSS version 17 Spearman's

correlation analysis to test the relationship between the importance of technopreneurship and areas of specialisation. There were no significant associations between the importance of technopreneurship and other human factor elements. The results indicated that there was a significant negative correlation between the importance of entrepreneurial orientation and the workers supporting the organisational vision. In corporate entrepreneurship employee support is a vital element for the success of the organisation. However it is a function of various elements. Hefti and Levie (2015) advocate for vision casting and signalling in entrepreneurial leadership so as to communicate organisational vision to the leader him/herself, the team of founders and the key organisational stakeholders. The results indicated that there was a significant negative correlation between the importance of technopreneurship and the workers supporting organisational vision. According to Hanks and McCarrey (2015) there is a five-part strategy for expanding organisational vision and this consists of: getting to know the territory; recognising the inevitability of change; revising vision in anticipation of expansion; updating the business plan; and sharing the vision at every appropriate opportunity. A shared vision attracts enough support to take the organisation to greater heights.

Results showed that there was a significant negative correlation between the importance of industrial food processing technology and companies having latest food processing technology. That means that there was association between the importance of industrial food processing technology and the acquisition of latest food processing technology. Results also showed that there was a significant negative correlation between the importance of Entrepreneurship orientation and companies having the latest food processing technology. That is, in addition there was association between entrepreneurship orientation and the acquisition of the latest industrial food processing technology. The major issue here is innovation in technopreneurship. In Iran, Nejad and Zarei (2015) also discovered a direct relationship between innovation strategy and the competitiveness of business. Innovation is part of both entrepreneurship and technological advancement that amounts to technopreneurship. In this case, the importance of industrial food processing technology in the Zimbabwean industry determines the competitiveness of the industry against neighbouring countries. In particular, technological innovation and business innovation also taken as part of the key success factors in the results and played a pivotal role in determining the competitiveness of the Zimbabwean industries against neighbouring countries.

Correlational results also show that there was a negative correlation between importance of technopreneurship and the government giving policy support to the food processing sector. That means there was association between the importance of technopreneurship and the government's role of giving policy support to industry. Technopreneurship is taken to be both a strategic guide and an economic policy guide for modern economies and food processing technopreneurs (Reza and Mona, 2014). Thus, in this case, it can be noted that the role of technopreneurship is at both macro and micro level. At the macro level, it is viewed as guidance to policy makers as they draw economic policies in progressive

communities. It can be adopted as an economic development policy through guiding the industrialisation process of an economy (Ajagbe et al., 2015) while at the micro level it assists entrepreneurial managers to make decisions so as to survive in the highly competitive global village, as well as meeting quantity and quality product demands and capitalising on the prevalent new business opportunities. Kwa et al. (2014) stress that underdeveloped and developing nations should realise the urgent need to recognise technopreneurship as a lifestyle among its citizens; and take it as a fulcrum of economic development through the interplay of science, technology and entrepreneurship; so as to make technological innovations valuable in the context. Therefore, the results of the study also confirm the technopreneurial orientation as a modern and important concept for economic development.

Lastly there was a negative correlation between the importance of technopreneurship and the Zimbabwean companies being of higher quality than imports. There was an association between the importance of technopreneurship and the superiority of locally produced food stuffs over imports. Off hand, a technopreneurial opportunity can be perceived from this result. A competitive edge of local companies over imports can be derived from adopting technopreneurship (Nejad and Zarei, (2015).

7.4 Factors that influence successful adoption of technopreneurship in the food processing sector

The examination of the factors influencing the adoption of technopreneurship was the major objective of the study. Based on empirical research and theoretical literature, a conceptual framework was proposed which proposed such issues as internal processes, venture capital, human factors, global factors and partnerships as influencing technopreneurship.

Reza and Mona (2014) concluded that the main factors influencing the technopreneurship process of the Iranian nano-food industry included organisational factors, environmental factors, institutional factors, technological factors and individual factors that are shown in the new conceptual model of the technopreneurship process. The factors seem to be general and not specific, that is, they seem to be similar to the traditional business environmental forces. However, the factors are interesting since they refer to the subject matter of the study that is technopreneurship though in a different specialised area. These can be contrasted to CZI (2014) factors that affected business operations in Zimbabwe, which include: access to financing; policy instability; inadequate supply of infrastructure; inefficient government bureaucracy; corruption and restrictive labour regulations. On the other hand, Ajagbe et al. (2015) concluded that barriers hindering innovation activities in the Malaysian industries were cost factors; knowledge factor; market factors; attitude of personnel towards change; regulatory factors and public policy. Another important factor was that there is no need to innovate as a result of earlier innovations.

7.4.1 Internal processes

Velikova et al. (2014) emphasised the definition of business processes as a starting point of executing a technology-oriented innovations of an industrial organisation. Organisational processes are summarised as going through the idea, idea realisation, financing and commercialisation (Velikova et al., 2014). The results indicated that of the six internal processes asked about, three of them had a significant disagreement, which are full utilisation of current processing machinery, the replacement of machinery as soon as it is old and changing to new processing technology not being a problem to the companies. Of the six, only one of the companies has a research and development department and had significant agreement.

Machinery capacity utilisation

Thus, in general, food processing technopreneurs are not fully utilising its current processing machinery. This refers technically to capacity utilisation. CZI (2014) also concluded that manufacturers were not fully utilising capacity owing to such factors as low local demand; working capital constraints; competition from imports; antiquated machinery and machine breakdowns; drawbacks from the current economic environment; high cost of doing business; shortage of raw materials and power and water shortages. Technopreneurs can be viewed as opportunity perceivers, pursuers and exploiters. Memon et al. (2015) hold that technopreneurs are technically skilled and opportunity spotters in high-value-added products and/or processes. This is a behavioural perspective of technopreneurship. Capacity can be viewed as an opportunity for innovative companies especially in light of the prevailing demand for locally made food products. That is, technopreneurship has an innovation element which includes process innovation; product innovation; technological innovation, and business innovation. Innovation can convert any challenge to an opportunity. There are challenges to capacity utilisation in the Zimbabwean manufacturing industry which includes the industrial food processing sector, and through innovation, these can be exploited as opportunities. This can be supported by Fynes et al. (2015) who concluded that absorptive capacity enhances mass customization capabilities. Mass customization is viewed as involving the satisfaction of customer demands in different fronts; that is, product quality; quantity and variety; and requires not only advanced manufacturing technologies, but also tailormade operational capabilities (Fynes, 2015).

Replacement of old processing machinery

One of the variables measured in internal processes was the company innovation through the company's tendency of replacing ageing equipment. The questions posed asked whether the company replaced the processing machinery as soon as it became old. The innovativeness of a company was measured by the company's replacement of processing machinery as soon as it is deemed obsolete (Nejad and Zarei, 2015). The absorptive capacity already looked at as the ability of an organisation to adopt new technology as a competitive advantage (Duchek, 2013). The concept of absorptive capacity was also extended by Fynes

et al. (2015) as it included different processes of absorptive capacity which include: knowledge acquisition, knowledge assimilation and knowledge application. Thus, the food processing technopreneurs may be lacking all these absorptive capacity processes that have implications on their innovativeness. Furthermore, a company's production knowledge determines the chances of the new product introduction, that is, process improvements facilitate product innovation (Machikita and Ueki, 2015).

Challenges of replacement of old processing machinery

There was a need to establish whether the companies had challenges in the replacement of obsolete processing equipment. It was reported that the companies had challenges in the ability to replace old processing technology. Such challenges can be addressed as suggested by Lungeanu et al. (2015) who moved that companies with a financial slack can respond to issues of poor innovation by diversifying technological sourcing vehicles. That is, a company with some financial slack can adopt different technology sourcing strategies in a make-or-buy decision that include: the sole approach; alliances or joint effort; and acquisition (Lungeanu et al., 2015). However the challenges of acquiring new processing technology can point to other factors that influence technopreneurship, such as government support, partnerships and global factors.

The company's internal Research and Development Department

On the other hand, the significant agreement is indicated for the company having a research and development (R&D) department. This is in line with the assertion by Memon et al. (2015) who hold that, technopreneurs emphasise innovation and invention in their business approach as they deploy a significant percentage of investment on R&D and "use a relatively high percentage of scientists and engineers in their workforce, and compete worldwide". The R&D department is expected to behave as knowledge entrepreneurs. Memon et al. (2015) look at knowledge entrepreneurs as "being capable of producing and using intellectual assets of self for the growth of new start-up or services that can later guide entrepreneurs to prosperity and wealth creation of community and provide better and superior services". Research is worthless if it ends at research, without implementation.

The development part means that the knowledge created by research has to be utilised to create knowledge. This is the essence of academic entrepreneurship (Kakava, 2013). Thus, while organisations may have R&D departments, the impact of such departments should be felt by solving business challenges through innovative means. Research should solve industrial challenges and thereby achieve developmental goals. Apart from the company's R&D department, collaboration could be sought with R&D institutions. R&D can be enhanced through industry and universities' collaboration as universities apply and acquire patents and generate science and technology revenue through licencing and commercialisation of their research output. This is also an area of government support as expressed by Wong (2015) where the Singaporean government in their initiative to develop a life science industrial cluster in Asia took a leading role and

created a technopreneurial culture. Research requires funding and normally no private organisation may sustain a viable R&D department on its own as this is funded by government efforts (Ajagbe et al., 2015).

7.4.2 Human Factors

The human factors encompassed knowledge of processing equipment, human capital development and employee patriotism. From the findings, all three of the aspects had a mean score less than three which imply agreement. Perhaps this was the case given that it pertained to workers who happened to be the respondents.

Processing technological knowledge

The analysis shows that significant agreement was indicated for plant engineers having full knowledge of the processing machinery. In this study, the main technology under consideration is manufacturing technology or industrial food processing technology in particular. As such it is assumed that the plant engineering skill is equivalent to the technological skill that was being sought by the quest. Thorsteinsson and Olafsson (2015) considered technological skills as, "psychomotor skills that are an important element of technical thinking and understanding and such skills include kinesthetic capability and everyday intellect." It is noted that engineers have the required technological skills; however it seems that the factor may not achieve much if it is not backed by other factors influencing technopreneurship. Furthermore, the engineers may have full skills and knowledge of outdated equipment. Kabukcu (2015) advocates for creativity and innovation, as well as an entrepreneurial mind required for managers in the industry. This is so because industrial food processing technopreneurs are not doing well in Zimbabwe with at least 70% of the food products on the market being imports.

Human factor development

The results indicate that the companies in the industrial food processing sector in Zimbabwe continuously train their workers. It is assumed that when workers have enough knowledge and skills for their work, they are motivated and likely to have a sense of belonging. Training with regards to the tasks to be executed and clarifications about outcome expectations was found to be an important element of creating a workforce that delivers quality to the customers (Cook and Chaganti, 2015).This is in line with the general strategy that if workers are happy that will naturally spill over to the customers hence leading to the organisation achieving its goals (Guchait et al., 2015). The issue of satisfied employees leads to the next item of workers supporting the organisation's vision.

Company employee support

Results indicated that workers in the food processing sector support their organisation's vision. Organisations can have corporate visions, but may lack shared vision. A shared vision is influenced by affective commitment, effective communication and intrinsic motivation (Smutkupt, 2015). On this note, food processing technopreneurs are expected to do well given the support they receive from the workers. Studying the "workplace concept development towards optimal work support in knowledge-intensive organisations", Keinänen (2015) concluded that to maximise potential from the workers, organisations should consider physical dimensions, social dimensions, virtual dimensions, and sustainable dimensions that influence people at their workplace. Furthermore, market orientation has a bearing on the support that employees give to their organisation. Roghie et al. (2015) examines market orientation as the positive sentiments that employees have about their job.

7.4.3 Venture capital

Venture capital, in this case, covered two aspects that included: access to venture capital loans and local and international venture capital sourcing. Findings showed that the questions had a mean score of less than three which implies agreement. That is, the employees of the companies indicated the companies had access to venture and collaborated with internal and external venture capitalists. Of course, one of the factors influencing the responses here is that in most cases employees would not believe that their organisation has no access to funds since this would mean that they should be retrenched.

Venture capital loans

The analysis shows that significant agreement is indicated for the company having access to venture capital loans. The issue of venture capital can also have support from policy-makers to encourage technopreneurs in specific areas which they deem to be critical (Klingler-Vidra, 2015). Ajagbe et al. (2015:210) state that "the establishment of various agencies to support and finance researchers at universities and research institutes capable to grow Technology Based Firms was due to the Malaysian government's recognition of Technology Entrepreneurship as an avenue to develop the economy industrially". Thus, funding can, apart from being attracted from private sources, be obtained by governmental policies designed towards supporting technopreneurship as shown by the Malaysian government. Velikova et al. (2014) investigate financing aspects of innovations only as being insufficient but at funding the whole process until commercialisation.

Relations with venture capitalists

Results show that companies in the food processing sector endeavoured to create relations with local and foreign venture capitalists. According to Wonglimpiyarat and Khaemasunun (2015), upcoming economies

can adopt the triple-helix model of innovation financing systems. The model allows the financing system to tap potential from the three arms, which are, the government, the universities and the industry. Other governments like the Singaporean government adopted a Technopreneurship Investment Fund (TIF) to promote industrial development through technopreneurship (Klingler-Vidra, 2015). Thus, the financing of technopreneurial activities require policy intervention as well. According to Mani (2004), nations like Singapore and Malaysia adopted three types of financial instruments, which are: research grants, venture capital and tax incentives.

7.4.4 Partnerships

Partnerships, in this case, were studied through finding out whether the companies had foreign partnerships or links in finance and technology, as well as research and development institutions that included universities. From the findings, it could be observed that q2.12 had a mean score of >3 which implied disagreement. The analysis shows that significant disagreement is indicated for the company having foreign partners in finance and technology. Zinyama and Nhema (2015) concluded that there is the low uptake of private-public partnerships (PPPs) in Zimbabwe and view PPPs to have the potential to raise the financial resources to fund projects on infrastructural development such as, "electricity, telecommunications, transport, water, education and the health sectors." The PPPs policy in the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET), which was the five-year economic blueprint (2013-2018), lacked a clear supporting legislative and regulative framework hence an implementation barrier. A triple helix framework can be adopted to complement potential from the private sector, government and universities (Wong 2015; Mok, 2015). Mok (2015) also supports that the Malaysian economic development was facilitated by transforming universities and driving them to partner with industry and commerce to enhance innovation and entrepreneurship for innovation and technological advancement.

The uniqueness of the Singaporean model of economic development rests in the strengthening of university enterprise cooperation to attain the goal of promoting innovation and entrepreneurship (Mok, 2015). Also,technology transfers make a lot of sense in trying to benefit from the relationship between other institutions and industry. Nurdin (2014:2366) looks at technology transfer as "the process of skill, knowledge and technologies transferring to ensure that scientific and technological development are exploited for improving new products, processes, applications, materials or services, while technopreneur (techno-entrepreneurs) use technology to come out with new or innovative products through a process of commercialization". Industry collaborating with universities can yield far-reaching results. However the unfortunate part is that in developing countries, universities and research centres take little or no part in stimulating the formation of local innovation systems that lead to industrialisation and instead, they are substituted by large companies that are multinational corporations in most cases (Ferretti and Parmentola,

2015). The modern university technopreneurial educational approach can adopt the experiential-learning approach that enhances the collaboration between universities and industry (Ho et al., 2014). That is, the experiential-learning approach involves learning by practising in the real-world setup (Ho et al., 2014).

In addition, as a global factor, international co-inventions have become prevalent in the global economy especially with the advent of communication technology that has simplified communication between geographically separated groups and individuals collaboration has become important in recent years (Tsukada and Nagaoka, 2015). Also, according to Lee and Narjoko (2015), technological spillovers can be enhanced by globalisation through foreign direct investments and international trade backed by sound policy for innovation and high productivity so as to upgrade economies from low income to high-income earners.

7.4.5 Government support

In this case, government support was analysed through such government role like infrastructural development to include a power supply, fiscal policy and economic policy. The results show that all government support questions had mean scores of <3 that implied agreement. Regarding government support in this study, the questions were structured in such a way that the issues concerned were asked as barriers and the respondents concurred that they were barriers to technopreneurship in the Zimbabwean food processing sector.

Electricity load shedding

The findings indicate that electricity load shedding hampered the industrial food processing business and furthermore electricity costs were a drawback to the industrial food processing business in Zimbabwe. These fall under infrastructural development. The results are consistent with conclusions of the annual survey by CZI (2014). CZI (2014:21) indicating the five most problematic infrastructural challenges that included: "Power cuts and shortages; Poor road infrastructure; water shortages; inefficient rail network within the country; and lastly, poor transport Infrastructure for access to ports". This could reflect that there are no government initiatives to deal with the challenges. Government initiatives can influence the success of industrial food processing and other industrial processes in the nation (Kamarudin and Sajilan, 2013; Wong, 2015).

Electricity costs

Results showed that there was significant agreement that electricity costs were a drawback to the food processing sector in Zimbabwe. The government has a monopolistic right to supply electricity to all users in Zimbabwe. As such it can peg electricity tariffs at the level they see fit. Currently, the government is broke and may commercialise electricity supplies leading to the stifling of industrial operations. The

supply of electricity in the nation has also massively reduced and the government may charge higher tariffs in order to discourage consumption of the important commodity. In Malaysia, Shaari et al. (2013) concluded that causality ran from electricity consumption to economic growth and as such, a policy to reduce gas utilization would harm economic growth in the nation.

The fiscal policy

The results also indicate that the government taxes were a drawback to the industrial food processing sector in Zimbabwe. Taxes fall under government fiscal policy. Within the fiscal policy, sectoral support may be included through exemptions on certain activities or developmental moves of organisations within the sector. To develop, Singapore had an effective industrial policy (Mok, 2015) and it has to be noted that the government is the policy-maker.

According to Chinamasa (2015), the Zimbabwean fiscal policy included tax measures imposed to enhance industry productivity and discourage imports of non-essential imports. However, the same policy has a chain of taxes as enshrined in the fiscal policy which may be viewed as burdensome such as:

- Pay as you earn
- Value added tax
- Corporate tax
- Excise duty
- Customs duty
- Other direct taxes
- Non-tax revenue

Apart from the taxes, there are also other levies and licences required for operation especially in the food production and enforced by different government departments such as the National Social Security Authority (NSSA); Aids Levy; medical certificates; health licences; operator's licence.

The economic policy

Finally, it was found that the government gave policy support to the food processing sector in Zimbabwe. This could be supported by the issue of Food Security and Nutrition being taken as one of the strategic clusters in the economic blueprint ZIMASSET (Bonga, 2014).The result could be true on policy documents but lacking implementation. Bonga (2014) indicates that power generation is among issues of prioritised infrastructural development policy issues in the ZIMASSET. This is on paper but lacks implementation support like a legal and regulatory framework. This is so, because of a lack of consistence between the other three findings with regards to electricity load shedding, electricity costs as well as

government taxes as limitations to industrial food processing in the nation. Zinyama and Nhema (2015) encored that some of the economic policy issues in the blueprint lack a clear legislative and regulative framework and thus leading to implementation drawback.

Wong (2013) evaluated technopreneurship policy in Singapore and concluded that there was enough government support which boosted technopreneurship and strengthened the whole process up to the commercialisation process. The evaluation was based on weighing the efficacy of government support on promoting technopreneurship in Singapore. Governments may have a clear technology policy like that relating to technology transfer. Technology transfer according to Nurdin (2014:2366), can take various forms like, "Foreign Direct Investment (FDI), Joint Venture (JV), Licensing Agreement (LA), Technological Advisory/Consultant (Technical Assistance) (TA), Technical Staff Training and Education (TT), Sales/Purchase Equipment or Machineries (S/P), Intellectual Property Right (IPR), and Unlocking Tacit Technical Knowledge (UTK)."This is a broad perspective that the policy-maker can consider.

To this end, it can be appreciated that the government is the captain of all economic and industrial activities. In particular, the government determines the relationship and the effectiveness of all economic activities in a nation. Kassicieh (2015) advocates for joint and harmonized efforts to develop and grow viable economies through triple-helix (government, academia and industry), the quadruple helix (adding to the triple helix the culture of the technology sources and users) and the quintuple helix (adding the societal need for economic development based on technology and innovation).

7.4.6 Global factors

Regarding global factors, the study considered: local versus foreign products; organisational global trend information of the company and competition with neighbouring countries. Thus, the forces of globalisation can be analysed regarding their influence to technopreneurship in the food processing sector in Zimbabwe.

Local versus foreign products

Analysis showed that significant agreement is indicated for the company's products being of higher quality than imported products. This can be viewed as consistent with Makanyeza (2015) who indicated that the higher the consumer ethnocentrism, the lower the consumer loyalty to imported poultry products in Zimbabwe, especially given a high level of consumer awareness. As such this gives some competitive edge to local industrial food processing technopreneurs as their products are perceived to be of higher quality than imported food products. This could also support the results that the company being able to stand up against competition from neighbouring countries.

Technological global trends

The results also show that food processing companies keep track of global trends. Global trends are part of the globalisation process. The global trend in technological development is basically through R&D and technology sourcing between developing and developed countries under the concept of international technology sourcing (Nepelski and De Prato, 2015). As such, while organisations keep track of global trends in industrial food processing technology, there may be a need to consider international technology sourcing with policy support from the government. Without good international relations challenges, technology sourcing and technology exchange programmes may not work. Government policies should be compatible with global trends.

The current trend in the food sector is the advent of nanotechnology in foods (Momin and Joshi, 2015; Var and SağLam, 2015; Keshwani et al., 2015; Neves et al., 2015; Amenta et al., 2015). According to Momin and Joshi (2015:3), nanotechnology in industrial food processing has several applications which include: "improved taste, flavour, colour, texture and consistency of foodstuffs, better absorption, bioavailability of nutraceuticals and health supplements, food antimicrobials development, innovative food packaging materials with enhanced mechanical barrier and antimicrobial properties, nanosensors for traceability and monitoring food condition during transport and storage, as well as encapsulation of food components or additives". Another global trend is the development of industrial clusters in order to enhance technopreneurship (Mohan, 2014). Such clusters include: Silicon Valley (USA); Silicon Island (Taiwan), Multimedia Super Corridor (Malaysia), Silicon Plateau (Bangalore), Silicon Hills (Austin Texas), Silicon Alley (New York), Silicon Fen (Cambridge, U.K).

Yetisen et al. (2015) hold that high-tech businesses of late have become the driving forces behind knowledge-based economies' success stories in the world. As such, companies are to adopt a technopreneurial corporate strategy if they are to be competitive in the global market. Lastly, Motohashi (2015) asserted that technological innovation does matter for manufacturing competitiveness.

7.5 Critical success factors that influence the adoption of technopreneurship in the food processing sector

In this case, critical success factors were not limited to a few factors and were done so as to give respondents a wider range of choice. It can be noted that the 19 critical success factors used in this study scored a mean of more than three. That means that all the factors were considered as critical. One would perhaps want to note the difference between the highest and the lowest score that is 4.69 for product quality and 4.04 for partnerships, which gives us 0.65. It seems all factors are almost equally critical and more factors could be added for evaluation.

From the results, it was noted that all the 19 factors were taken as critical success factors. The factors were ordered from most important to least important and the top were found to be: quality of products; skills development; responsiveness to customer needs; teamwork; technological innovation; minimisation of costs; product innovation; process innovation; human factors and government support. Kamarudin and Sajilan (2013:232) concluded that the critical success factors to animation technopreneurship in Malaysia are: "access to financial resources, talent pool, government's initiatives; promotion and marketing; networks and collaboration; IP; content quality; technology; diversification of products; entrepreneurial skills; and business location."

Table 7.1: A comparison of food processing sector findings and Malaysian animation sector

	Critical Success Factors of Technopreneurship in the Zimbabwean industrial food processing sector	**Critical Success Factors of Technopreneurship in the Malaysian animation sector** **(**Kamarudin and Sajilan, 2013)
1	Quality of products	Access to financial resources
2	Skills development	Talent pool
3	Responsiveness to customer needs	Government's initiatives
4	Teamwork	Promotion and marketing
5	Technological Innovation	Networks and collaboration
6	Minimisation of costs	IP
7	Product Innovation	Content quality
8	Process Innovation	Technology
9	Human Factors	Diversification of products
10	Government Support	Entrepreneurial skills
11	Participation of all workers	Business location
12	Daily/Monthly Production	
13	Business Innovation	
14	Involvement of all workers	
15	Internal processes	
16	Dynamism to suit situations	
17	Global factors	
18	Venture capital	
19	Partnerships	

Source: Own compilation from results and literature

By comparing the two results, it can be noted that the issue of government support and technology appears to be valued in both situations. Thus, modern economies should adopt a technopreneurial policy with the government as the central player through its initiatives of policy formulation and implementation. It can be summed up by asserting that all other critical success factors are influenced/determined by the behaviour and attitude of the government towards political, economic and industrial issues.

Harlanu and Nugroho (2015) regard a technopreneur as a person who believes that technology increases efficiency, productivity, product quality, broaden the market and helps to market the developed product widely. This view is also supported by Çalışkan (2015) who holds that technology reduces costs and enhances productivity gains, as well as contributing to the cultural and political development of societies. Studying the concept of knowledge-based entrepreneurship ecosystems (KBEEs) in Iran; Entezari (2015) postulates that the process of designing KBEEs is influenced by both actors and factors.The actors include "academic entrepreneurs, entrepreneurial universities, science and technology parks, knowledge-based industrial parks, financial institutions and government"; and the factors included: "entrepreneurship opportunity, entrepreneurial capacity technological learning, entrepreneurial culture, innovation capital, human capital, social capital, knowledge production, and infrastructure and infostructure and University - company interactions" (Entezari, 2015:1206). In the case of this study, the actors and factors can be taken as critical success factors or factors that influence technopreneurship.

7.6 Feasibility of technopreneurship in the food processing sector

The objective of feasibility focused on how possible it may be to implement the concept of technopreneurship in the Zimbabwean food processing sector. Issues of feasibility included: whether there was enough demand for local products; the companies having capacity to satisfy the demand; the companies possessing enough industrial food processing technology; the companies being able to acquire new processing technology; the company having enough entrepreneurial skills; and lastly the ability to compete with existing food products on the market. It was observed that all the feasibility of technopreneurship questions in the food processing sector had mean scores of >3, which implies positive responses to all the questions. So, according to the respondents, it is feasible to implement technopreneurial concepts to the food processing sector in Zimbabwe.

Demand for locally made products

Results indicated that there was enough demand for processed food products in Zimbabwe. This is in contrast with CZI (2014) that indicated that there is low domestic demand in the nation. Perhaps the difference is because of the target sample. The CZI (2014) survey focused, on the whole, manufacturing industry while this study focused on the industrial food processing sector. Because of Zimbabwean consumer ethnocentrism (Makanyeza 2015), questions may be raised regarding why we may say there is

low domestic demand. This could require analysis product by product. Thus, in this case, the results are that Zimbabwean consumers prefer locally manufactured food products to imports, owing to trust they put in the local food stuff. However Mlambo and Marufu (2015) concluded that it was difficult to establish consumer ethnocentrism in Zimbabwe given that at least 70% of the retail products on the market are imports and therefore, consumers are left with no choice.

Capacity to satisfy demand

It was found that the companies had the capacity to satisfy the demand. Capacity, in this case, refers to the production capacity, as well as the competency to meet the local demand for locally produced food products. The issue of capacity was discussed under global factors as the researcher examined the capacity of the company to compete with neighbouring countries like South Africa and Zambia, who are the leading suppliers of food products in Zimbabwe. However, the issue of satisfying demand may be viewed much regarding quality and quantity demanded. Perhaps the issue of quality can be in order since the Zimbabwean market can be viewed as ethnocentric. On the other hand, the issue of quantity is an issue that requires discussion here since it concerns the issue capacity utilisation and efficiency.

To satisfy the food market regarding quantity demanded is not consistent with other empirical evidence like CZI (2014). CZI (2014) indicated that manufacturing companies were operating far below the capacity of an average of 36.3% capacity utilisation. Also, the ZIMSTAT (2015) reports that most companies in the manufacturing sector operated well below capacity at about 36%. Furthermore, Chinamasa (2015) acknowledges that there was still under-utilisation of capacity. This can be viewed as that capacity is there but it is not being utilised because of different Zimbabwean economic challenges such as infrastructural problems (power and water shortages) and policy inconsistencies as presented by CZI (2014). If capacity is there but not fully utilised, it amounts to a lack of capacity to operate. It can be pointed out that companies are incapacitated by the prevailing economic and political challenges (Mhlanga, 2015).

Industrial food processing technology

There was a positive response to the question that the company had enough technology for food processing. Perhaps the meaning attached to industrial food processing technology may not be wide enough for the respondents. According to Poti et al. (2015), industrial food processing can be seen as all activities that transform all natural or agricultural food produce from the natural state. Wagner et al. (2015) view technology as a set of tools used to exploit the natural state to enhance human life. The term ‘set of tools’ can be misunderstood and narrow the scope of technology. Rebentisch and Ferretti (1995) has a wider view of technology that encompasses not only a set of tools but also procedures, laws, strategies and so on, designed to solve day-to-day human problems. That means, according to the respondents the companies have all that it takes regarding machinery, innovation skills and knowledge to the production

and distribution of food products. This may be correct, but, it is not consistent with the result that companies had difficulties in replacing existing equipment. Perhaps the fact emanates from the fact that industrial food processing technology does not only cover production equipment but also touches production procedures and formulae. Rodriguez-Gonzalez et al. (2015) acknowledge that the food industry is continuously developing solutions to: enhance food manufacturing; improve efficiency in energy use; satisfy consumer demands for shelf-life; natural taste and composition, and preserved healthy micronutrients. Thus, latest food technologies endeavour to meet engineering; scientific and entrepreneurial requirements.

Acquisition of new processing technology

Respondents indicated that companies had the capacity to acquire new industrial food processing technology. The result is also not consistent with results of internal processes that asked whether the company has problems in changing to new processing technology. However, Haq and Boddu (2015) indicate that global competition compels organisations to be more responsive and efficient. Latest technologies have enhanced qualities of quality and efficiency enhancement. Hu (2015) asserts that success stories of Japan, Taiwan and Korea are based on the graduation from imitation to innovation.

The current trend in technological development is towards nanotechnology even in the food industry (Kuan et al., 2012; Momin and Joshi, 2015; Var and SağLam, 2015; Keshwani et al., 2015; Neves et al., 2015; Amenta et al., 2015). One could wonder why they still have old and outdated processing equipment. Perhaps again, capacity, in this case, was taken to touch several issues to include financially, human capital and so on. It has to be noted that Dosi et al. (2015) concluded that technological variables such as patents and investments pose the highest costs to organisations than other organisational cost drivers like labour costs. Thus, the capacity that industrial food processing organisations have to acquire new technology is subject to qualification. In any case, Motohashi (2015) asserted that technological innovation does matter for manufacturing competitiveness. Hence, a food processing company that does not value technological innovation may not withstand competition in the global village.

Entrepreneurial skills

It was indicated that companies in the food processing sector possessed enough entrepreneurial skills. This was one of the key questions that measured one of the pillars of technopreneurship. However, the result is subject to debate and perhaps further assessment. As an entrepreneur, one would want to identify the evidence of enough entrepreneurs in the food processing sector. Usman and Tasmin (2015) explain entrepreneurial skills as embedding competencies in such areas as creativity, analytic, motivation, networking, adaptive and financial prudence. The entrepreneurial skills, in this case, are being viewed from a trait as well as capabilities or competencies approach. Thus certain competencies should be present

for someone to have enough entrepreneurial skills. The entrepreneurial skills are developed and enhanced by entrepreneurship knowledge and entrepreneurial attitude (Usman and Tasmin, 2015).

For the companies to be said to have enough entrepreneurial skill, this should be evidenced by new production projects being added to the existing list or replacing some. Chinamasa (2015) indicated that in 2014 the manufacturing sector was characterised by underutilisation of capacity, closure of companies and introduction of few new companies. In the industrial food processing sector, few new companies and acquisitions (take-overs) led by Chinese investors could be witnessed in cooking oil production. However, the rate of reduction in capacity utilisation and company closures is higher than the rate at which new companies were being opened resulting in overall industrial shrinkage. Also, companies should be observed to be opportunity conscious rather than threat conscious. Entrepreneurs, in this case, technopreneurs should be innovators regarding technovation in food processing. They are supposed to adopt emerging technologies. Rotolo et al. (2015) discern emerging technologies as marked by five features, namely: radical novelty; prominent impact; coherence; fast growth, and uncertainty and ambiguity. Entrepreneurial skills give managers the acumen to relay technological and other opportunities, pursue the opportunities and exploit them at some risk.

Competition against existing food products

Lastly, there was a positive response to companies having the ability to compete with existing food products on the market. Harlanu and Nugroho (2015) argue that competitive advantage is not only based on the abundance of natural endowments but on the ability to convert the natural endowments to various purposes, which is the essence of technological and entrepreneurial innovation and competencies. Perrea et al. (2015) acknowledge that global technological progress prompts the rise to new and advanced food manufacturing and processing technologies. This means competition in the globalised market is mainly based on technological and entrepreneurial capabilities. Abilities, in this case, touch several factors such as technological skills, strategy, marketing, supply chain management and so on.

Comparative advantage may lead to Zimbabwean companies losing the competition in the production of foodstuff given the business environment. The factors affecting business operations in Zimbabwe as outlined by CZI (2014) can lead to food processing companies failing to compete with neighbouring countries. Industrial operations in Zimbabwe are held back by such factors as a shortage of power and water as well as ageing production equipment. Perhaps the only opportunity for Zimbabwean industrial food processing technopreneurs is the ethnocentrism of the Zimbabwean food market. Furthermore, Motohashi (2015) pointed out that technological innovation is of the essence for manufacturing competitiveness, especially in the globalised economies where competition is stiff.

7.7 The relationship between factors that influence technopreneurship and the importance of technopreneurship in the company

To answer the main objective of the study, that is, which factors influence technopreneurship, each item in the factors influencing technopreneurship; all questions in question 2 (2.1 to 2. 20) were tested to see how it correlated with the three items of section 1, which is the role of technopreneurship. That is, to see for which factors there is a significant correlation between an agreement that a factor is used in the company and importance of technopreneurship/ industrial food processing technology/ entrepreneurship orientation in the company. For this purpose, Pearson's correlation analysis was applied. This is used since the Likert scale of measurement of the variables was taken as nominal and the data as categorical.

Industrial food processing technology and latest industrial food processing technology

For internal processes, there was a significant association between "industrial food processing technology" and "the company having the latest industrial food processing technology". As such, this could be indicated that the importance of food technology has a bearing on the company acquiring new industrial food processing technology. Naturally it should follow that the industrial food processing companies keep abreast of technological developments by having the latest technology. However, this could be answered by the fact that it was observed that companies had difficulties in changing from existing industrial food processing technologies to new processing technology.

To support the association Machikita and Ueki (2015:171) explained that:

"...we ask what drives the innovative capability that comes from the firm-level scores in process improvements. We find that inter-firm technology transfers from quality-oriented buyers and foreign knowledge in the managerial class can provide a good explanation of innovative capability well. More specifically, we find that CEO and factory manager MNE experience plays an important role in increasing innovative capability. In addition to the impact of CEOs and factory managers, worker-embodied foreign knowledge functions well to shape innovative capability as long as foreign workers stay in the managerial class. A capital tie-up with an MNE has a positive and significant impact on innovative capability only for MNE respondents."

Thus, the innovativeness of an organisation can depend a great deal on the attitude of the organisational leader. If the organisational leader is a laggard, it follows that the organisation may not value the acquisition of new or latest technology leading to the organisation not being competitive.

Entrepreneurial orientation and latest industrial food processing technology

It was also noted that there was a significant negative correlation between, "entrepreneurial orientation" and "the company having the latest industrial food processing technology". In principle, there may not be

any entrepreneurship without innovation. Further, to that, there may not be innovation without adopting new technology. Perhaps, the engineers who were held to have enough knowledge and skills of the companies' industrial food processing machinery have the knowledge and skills of old and outdated equipment. This does not function well for technopreneurship. Technological advancement was found to be a crucial endogenous variable in aggregate production function and it was concluded that technological progress and innovation in Turkey had a significant effect on economic growth (Adak, 2015). The essence of innovation viewed as creative destruction is on "discarding the old and familiar for the new and better" (Markatoua and Vetsikasb, 2015:123). Companies should monitor the life cycle of their technologies and mercilessly replace them as soon as the world trends have emerging technologies.

Entrepreneurship orientation and employee organisational support

For human factors, there was a significant negative correlation between, "entrepreneurship orientation" and "workers supporting the organisation's vision". This can be observed as an anomaly. It is assumed that the more the organisation become entrepreneurial, the more support it should get from the workers. However to some extent, this could be the case given the fact that employee support to an organisation is a function of several factors that include morale, motivation and patriotism. According to Bircana and Gençler (2015:1348), "the spread of innovation-based human resources will accelerate by the emergence of new business areas, knowledge, skills, and expansion of high value-added production". There is need of a human resources paradigm shift from the traditional knowledge and skills requirements to a technopreneurial perspective that suit the current industrial demands in the global village.

Government policy support and role of technopreneurship

Under government support, there was a significant association between, "importance of technopreneurship" and "the government giving policy support to the food processing sector". This can be viewed as interesting. It could be expected that there be a positive correlation between the two aspects, that is, if technopreneurship would be a success in the given situation. The role of technopreneurship was viewed as the policy maker's guide, so if the policy is not in harmony with technopreneurship it may not be viewed as a well-crafted policy.

Global factors and role of technopreneurship

As for global factors, there was a negative correlation between, "importance of technopreneurship" and "the company's products being of a higher quality than imported products." In this case also, it could be assumed that quality of products should be associated with technopreneurship since technology may be assumed to enhance product quality (Harlanu and Nugroho, 2015). So if it were found to be negatively correlated to the importance of technopreneurship, it may be said not to be genuine quality. However, the quality of local food products in comparison to imports is a function of several factors.

7.8 Relationship between area of specialisation and feasibility of technopreneurship

The relationship of the area of specialisation and feasibility of technopreneurship is important to determine the differences in the technopreneurial drive among the employees with different educational backgrounds.

Area of specialisation and ability to satisfy demand

From the correlation analysis, it was seen that there was a significant relationship between specialisation and the company's capacity to satisfy the demand for processed food products in Zimbabwe (q4.2; $p<.05$). More than expected: 'Eng only' responded 'not at all'; 'business only' responded 'neutral'; 'eng and bus' responded 'no not really' and 'other' responded 'yes, to some extent'.

From the previous discussion, the capacity to satisfy demand could be interpreted from the perspective of technological capacity, financial capacity or other competencies that enable the company to meet the demand. García-Barriocanal et al. (2012) indicate that organisational competencies could be modelled by concrete human capacities under certain work conditions. Chong (2013) discusses the importance of managerial competencies as equally essential for all organisations. Thus, the responses could be based on the respondents' assessment of managerial competence of the organisations. On the other hand, the responses could have been based on entrepreneurial attitude orientation of the respondents. Abdul-Mohsin et al. (2015) regard entrepreneurial attitude orientation as an evaluation of the chances of success or failure of entrepreneurial activity. It seems people from different departments have different assessments or attitude towards their organisational activities. Engineers thought the organisation lacks capacity not perhaps from the point of view that they lacked technological skill but from the perspective that the organisation lacks the required modern technology. Engineers had the most negative attitude followed by those with both engineering and business people towards the organisation's capacity while business only neutral.

Area of specialisation and capacity to acquire new technology

There was a significant relationship between specialisation and the company's ability to acquire processing technology (q4.4; $p< 0.05$). More than expected: 'Eng only' responded 'not at all'; 'business only' responded 'yes, to some extent' or 'neutral'.

Acquisition of new technology is a function of several factors that include: the organisation's financial position and the company's innovative personality. Engineering staff seemed to be sceptical about the companies' ability to acquire new industrial food processing technology while business staff was optimistic. This is a matter of entrepreneurial attitude.

This takes the focus again back to innovativeness and absorptive capacity. Engineers once more seem to be pessimistic about the companies' capacity to acquire new industrial food processing technology while business people are to some extent optimistic. The issue of technopreneurial personality seems to be playing a big role in this case. Ahmetoglu (2015) indicated nine major entrepreneurial personality traits that included:

- Trait Emotional Intelligence
- Core Self-Evaluations
- Locus of Control
- Primary and Secondary Psychopath
- Machiavellianism
- Vocational Interests
- General Mental Ability
- Divergent Thinking
- Relevant demographic variables

Espíritu-Olmos and Sastre-Castillo (2015) concluded that personality traits influence entrepreneurial intentions more than work values. Thus, the entrepreneurial drive is determined by personality traits.

7.9 Summary

The discussion of research results involves a lot of deductions, inductions and abductions. In this study, it involved comparing and contrasting the findings with other empirical and theoretical findings locally, regionally, internationally and globally. The researcher's deductions and views were also dominating the discussion based on acquired knowledge and principles. However more could be discussed and different dimensions could be taken given the findings.

All the results of the research objectives of this study were discussed and more insight could be obtained as the results were compared to literature. Technopreneurship was discussed as playing a pivotal role in the industrial food processing sector in company strategic and policy guidance. The association between the role of technopreneurship and such elements as an area of specialisation and feasibility of technopreneurship were also discussed. The impact and implications of the factors influencing technopreneurship, that is, human factors, global factors, venture capital, internal processes and government support were discussed. The pervasiveness of government support was noted from the results and compared with literature. Key success factors were discussed and compared with other research results in the theoretical and empirical literature. Feasibility of technopreneurship was discussed and their

implication to technopreneurial attitude and behaviour was noted. Nevertheless, for the purpose of the study, the chapter has enough discussion to create grounds for conclusions and recommendations. The next chapter covers the research study's conclusions and recommendations that represent the major contributions of the study.

CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

The deductive reasoning begins with theory and gathers facts to test the theory. In this study, there was no specific theory but some theoretical and empirical findings regarding factors influencing technopreneurship in different industries. At this point, facts were gathered, analysed and discussed accordingly. That means conclusions can now be made based on the discussion and recommendations based on conclusions and acquired knowledge and analysed theoretical and empirical literature.

This chapter aims at concluding the thesis through revealing mainly the research conclusions and recommendations for different audiences. It starts by restating the problem of the study and aim of the study. The conclusions per each objective are given followed by recommendations for policy makers, curriculum developers and industrialists.

8.2 Restating the research problem

The study focused on the factors influencing the successful adoption of technopreneurship in the food processing sector in Zimbabwe. It was against the background that there is low industrial activity in the economy while modern concepts like technopreneurship can revive economic and industrial activity. In particular, the fact that the country is an agriculturally based economy would mean a great deal of value addition activity to produce food products on the market. However, the retail market was observed to have about 70% imported products. Technopreneurship was taken as a policy guide to developing most upcoming economies in the knowledge-based economies. It has been an issue of concern of developing countries not industrialising or developing in the manufacturing industry. A point in this study was why a bread basket like Zimbabwe would import 70% of its food products if they can produce locally.

To focus the research the objectives of the study were:

- To examine factors that influence the adoption of technopreneurship in the food processing sector in Zimbabwe.
- To assess the importance given to technopreneurship by the food processing sector in Zimbabwe;
- To examine the feasibility of technopreneurship in the food processing sector in Zimbabwe;
- To test the relationship between the factors influencing the adoption of technopreneurship.

8.3 Limitations

The major limitations encountered during the study were:

- Delays in the ethical clearance process which lead to respondents resisting the questionnaire that had sought for permission for circulating in 2014 while data collection commenced in 2015. This reduced the targeted sample size by a quarter.
- The industrial situation in Zimbabwe was not conducive for research since it was so turbulent and hostile. Companies were closing; some were downsizing leading to massive job losses. Retrenchment was a threat to most of the employees who were the target respondents who were not motivated and depressed.
- It was difficult to access employees with the questionnaire in most companies who were suspicious about the research and at times, the gatekeepers would not cooperate.
- Although a full-time researcher, the researcher could not get cooperation from the employer who could not agree to reduce workload and approve study leave as the need arose.

To deal with the limitations the researcher adopted different measures so as to reduce the effect of the limitations which included:

- Use of multiple data analysis techniques which included Wilcoxon's signed ranks test that eliminated response bias on questions that pertained to a particular organisation.
- Balancing between ethical research standards and the qualitative as well as quantitative sample size considerations.
- The use of leads and snowballing to reach potential respondents to the questionnaire.

8.4 Conclusions

The research conclusions are made on each objective so as to round off the study. Thus, each objective is the subheading for each set of conclusions. From the findings the following conclusions were reached:

8.5 Conclusion 1: The role of technopreneurship

Technopreneurship and its facets were rated very important in the food processing sector. The two facets were industrial food processing technology and entrepreneurship. The role of technopreneurship was concluded to be at two levels, that is, the macro level – for policy makers and the micro level – for industrialists.

At the macro level, it was concluded that the modern economies are basically knowledge based and technopreneurship can guide policy makers to make government policy interventions and initiatives to

assist technopreneurs in their economies. Blanco (2007) echoed that technopreneurship is regarded as one of best approaches to economic value creation, growth and development in European economies as it explores and exploits technology-based solutions. It was observed that without proper government policy intervention and initiatives, technopreneurship may add no value to developing economies like Zimbabwe. Such lessons have been learnt from the success stories of the Asian countries. The implication of these conclusions is that there is a need for a paradigm shift on the part of policymakers who have the duty of putting policies in place and ensuring that they are implemented. The government spearhead research and facilitate the required relationship among players to include industry research and developmental institutions.

At the micro level, technopreneurship was taken to be a strategic guide to modern industrial food processing technopreneurs. Thus organisational strategy should be technopreneurial, if environmental dynamics can be exploited. Organisations have to harness new technological breakthroughs in the industrial food processing area so as to compete in the global village. Thus, the technopreneurial behavioural pattern can lead industrial food processing technopreneurs to successful production.

8.6 Conclusion 2: Factors influencing technopreneurship

The factors influencing technopreneurship in the food processing sector of Zimbabwe were concluded to be in six categories. That is internal processes, human factors, venture capital, partnerships, government support and global factors. From the six factors, the most pervasive was concluded to be government support. Government support that included policy formulation and implementation and government initiatives were concluded to influence technopreneurship as well as the other five factors, which include: internal processes; human factors; venture capital; partnerships and global factors.

8.7 Conclusion 3: Critical success factors of technopreneurship

From the findings, it can be concluded that the success of technopreneurship in the food processingsector is determined by a multiplicity of factors. All the 19 factors thatwere put to test were found to be a factor that if not in place, leads to failure in technopreneurship. The factors were the quality of products, skills development, responsiveness to customer needs, teamwork, technological innovation, minimisation of costs, product innovation, process innovation, human factors, government support, participation of all workers, daily/monthly production, business innovation, involvement of all workers, internal processes, dynamism to suit situations, global factors, venture capital and partnerships.

8.8 Conclusion 4: Feasibility of technopreneurship

From the findings, it was concluded that technopreneurship in the food processing sector in Zimbabwe is feasible. Results indicated that there was enough demand for processed food products in Zimbabwe; the

companies had the capacity to satisfy the demand; the companies had enough technology for food processing; the companies had the capacity to acquire new food processingtechnology; the companies in the food processingsector possessed enough entrepreneurial skills and lastly the companies had the ability to compete with existing food products on the market.

8.9 Recommendations

Recommendations, in this case, are based on the conclusions, empirical and theoretical literature and knowledge acquired during the period of the study. The recommendations are classifiedas contribution to new knowledge; recommendations to policy makers, recommendations to industrialists; recommendations to curriculum developers and R&D institutions and recommendations for further research. Given the conclusions above, the researcher had the following recommendations to make:

8.10 Recommendation 1: New knowledge

The major contribution to new knowledge was the technopreneurship system. Nacu and Avasilcăi (2014) stipulate that technopreneurship can be treated as policy, as a system and as individual attitude. From the study, the researcher looks at technopreneurship as the system that explores and exploits business opportunities through technological prowess and entrepreneurial knowledge and skills under any conditions. Technopreneurship operates in any environment that is technopreneurial-opportunity-based. It is influenced by a multiplicity of factors that can be presented in a model like **Figure 8.1**.

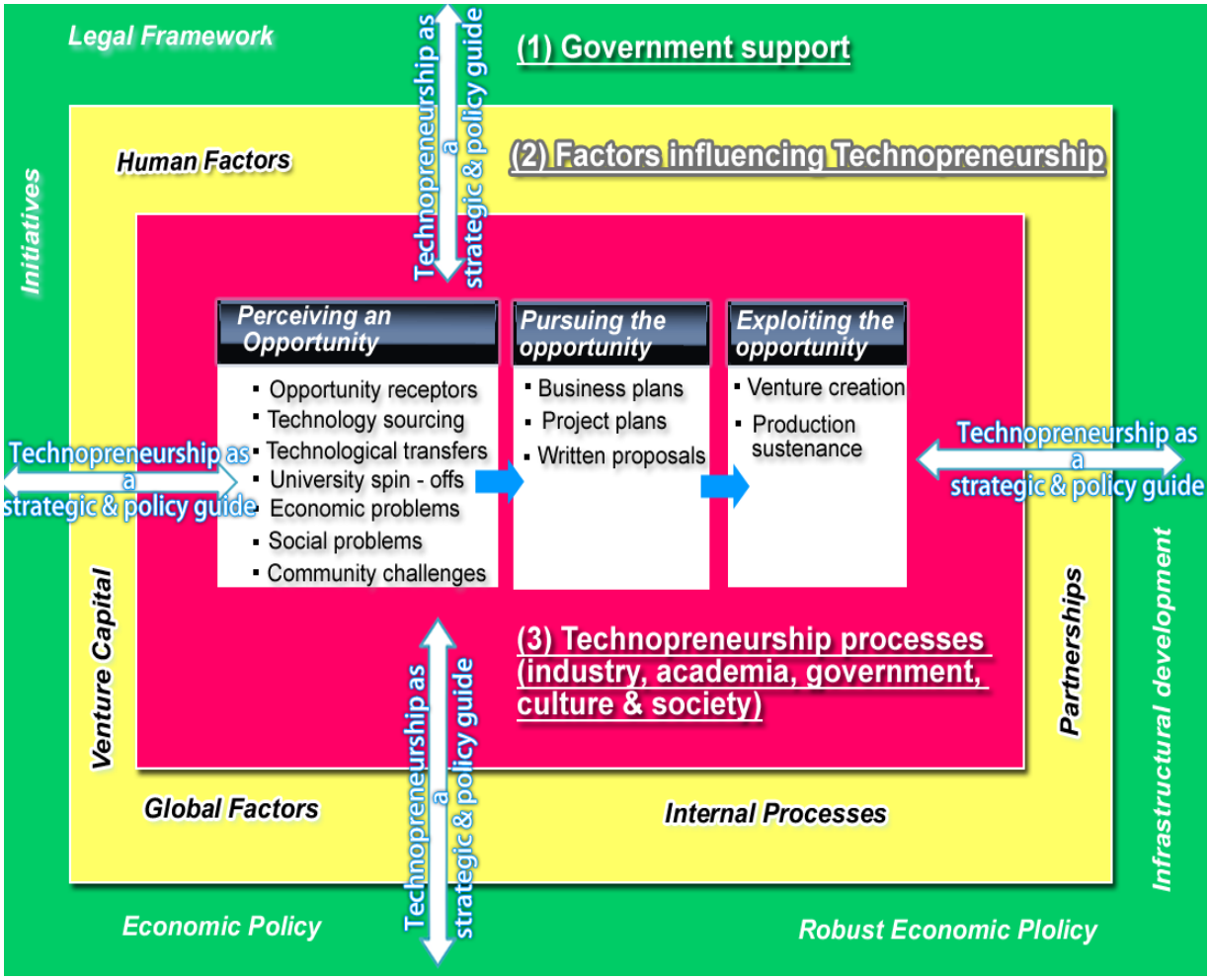

Figure 8.1: The technopreneurship system

Source: Own compilation from the results

The model in **Figure 8.1** presents factors influencing technopreneurship from a systematic perspective. The model can be explained from inside categorised into three layers that are the technopreneurship process; factors influencing technopreneurship and government support.

(1) Government support

It was established that government support is the most pervasive factor influencing technopreneurship. The behaviour of the government of any economy was concluded to be the determining factor of other factors. Thus, it has been placed as the universal force behind all technopreneurial activities. The government support has been seen to include: the economic policy; robust economic policy implementation; legal frameworks; government initiatives and infrastructural development as determined by the ideology of the ruling party determine all the factors and actors influencing technopreneurship.

It is at present held that the government is responsible for creating a conducive atmosphere for all economic and socio-cultural activities in any nation. The success or failure of an economic system is

anchoredin the economic managers and administrators. Thus,in this case, the ZANU PF administration with its ideologies is largely responsible for any success or failure of the Zimbabwean technopreneurial operations in the food processing sector and the economy at large. The government's ability to manage interior and exterior relationships will determine the impact of:

- *Internal processes* – internal processes are influenced by the government through government regulations regardinglicences, safety regulations, quality standards and other regulatory measures on operations and products.
- *Global factors* – global factors that include international relations are spearheaded and regulated by the government through its foreign affairs department. Foreign policies will determine global cooperation and alliances and the ability to execute foreign direct investments (FDIs), technological sourcing and other strategies.
- *Partnerships* – While the government is one of the partners in triple or quadruple helices, it has to be appreciated that it is the captain of the whole system and determines its relationships with all partners that are industry, academia and socio-cultural systems. Universities that are the most common run their affairs based on the given mandate and educational systems. Industries are given industrial policies to guide their conduct. The socio-cultural systems are developed and influenced by political systems through the ideologies of the ruling party.
- *Venture capital* – The government policies determine investor confidence and other funding programmes. Government organises funding support and criteria for different organisations and projects. They determine the distribution of the government revenue through monetary policy, subsidies and taxation as they decide on what can be taken as strategic or not to the economy.
- *Human factor* – Human factor development also is one of the policy issues as the government plans on the skills requirements of the economy. Educational training in schools, colleges and universities is directly controlled by the government especially in an autocratic system of Zimbabwe.

(2) Factors influencing technopreneurship

The factors influencing technopreneurship have been included as internal processes; venture capital; human factors; partnerships and global factors. It was noted that the factors influence technopreneurship as well as influencing each other and all being influenced by government behaviour or support. Thus, the middle position implies that the factors influence technopreneurship but these are covered by government support that is the main determinant of how each of the factors influencing technopreneurship function.

(3) The technopreneurship process

The inside area covers technopreneurship viewed as a process with three basic phases that include perceiving an opportunity; pursuing the opportunity and exploiting the opportunity. The actors involved

in the process include industry; government; academics, social and cultural set-ups; that is, from a quadruple helix perspective.

Perceiving the opportunity

Firstly, a technopreneurial opportunity can be perceived by individuals and groups who have opportunity receptors or who can identify and define a technopreneurial opportunity clearly. Opportunities arise from unlimited sources that include all perspectives of technopreneurship such as innovation theories, technoparks, academic entrepreneurship, technological spinoffs and industrial clusters. The other source opportunities are economic problems, community challenges and social problems that may give rise to sociopreneurship, environmental entrepreneurship, green entrepreneurship or ecopreneurship.

Pursuing the opportunity

Next in the technopreneurial process is the drive to pursue an opportunity. Thus, perception brings awareness and insight that leads to a motive which when it becomes strong enough to push someone to act or move towards something becomes a drive. That is, technopreneurs are distinguished from non-technopreneurs by their tendency to act upon an opportunity. The actions involve developing an idea into a business plan, project plan or written business proposals. Such plans indicate the readiness of the technopreneur and will attract support from all other stakeholders in the technopreneurial process. Thus, from this phase resources are mobilised and all desired support is gained.

Exploiting the opportunity

Lastly, the resources and support that has been gained by pursuing the technopreneurial opportunity are arranged into a technological venture. Successful technological venture creation is determined by the technopreneurial traits, knowledge and skills of the visionary or technopreneur as well as the strength of the support from the actors in the quadruple helix set up.

Also to be noted on the diagram is the double headed arrows that are labelled technopreneurship as a strategic and policy guide. These imply that all actors in the technopreneurship process and system are supposed to be led by the technopreneurial philosophy. A technopreneurial attitude modifies the behaviour of governments, industries, academics and socio-cultural systems.

8.11 Recommendation 2: For policy-makers

The policy maker here refers to the government and all its elements which include the executive, judiciary and the parliament. Other government arms include all ministries and institutions that assist with policy formulation and implementation. Thus, the policy maker is the authority that is responsible for economic governance.

Policy Support

It was recommended that technopreneurship be taken as the key to the economic development framework. De Beer et al. (2014:32), "The review suggests that the time is ripe for African policy-makers to seek more holistic approaches to facilitating innovation and, in turn, to fostering socio-economic development in African nations".

While the nation has ZIMASSET as the so-called economic blueprint, there is a need for the government to have technopreneurial initiatives. Any paradigm shift in an economic system begins with a change in the mindset of the economic leaders. Success stories of Asian Tigers are based on policy makers being sincere and designing an economic policy consistent with modern globalisation forces around which they build a culture. Examples include Singapore (Wong 2015), Indonesia (Harlanua and Nugroho, 2015) and Malaysia (Ayoib and Nosakhare. 2015; Ayoib and Nosakhare Peter, 2015) who took technopreneurship as a policy guide for an economic development model and developed a technopreneurial culture around the policy. Sub-Saharan Africa is to have a paradigm shift and drop traditional and ancient economic developmental models and cultures which are based on colonial backgrounds and no longer fit into a modern global system. Current political leadership should be based on the ability to manage relationships locally, regionally, internationally and globally and not based on pride, revenge, selfish interests and the inability to prioritise issues.

ZIMASSET is criticised by analysts who view the economic programme as having a lot of inconsistencies and controversial issues like the Indigenisation and Economic Empowerment Act (IEEA) [*Chapter 14:33*] which is not in harmony with the promotion of foreign direct investment.

Regulatory framework

The government as the captain of the economic system should be able to offer a legal framework and regulatory systems that facilitate the implementation of the economic programme. When an economic programme has been put in place, the government should lead by example through the upholding of the rule of law to ensure successful implementation of the programme. Stakeholders like the industry, academia and society would not take the government seriously if they witness such issues like corruption and uncontrollable government expenditure without any prosecutions. The legal frameworks should provide for prosecution of any perpetrators of 'economic crimes' even if it is the head of state without fear or favour. African economies fail because leaders are hero-worshipped even if they are corrupt and dictators to the detriment of the whole system. Thus, no one should be above the law.

Quadruple-helix framework

For an economy to succeed there is a need for all players to be active and maximise their potential. Every economic system hascooperation of all stakeholders or economic players that include the government, industry, academia and socio-cultural systems. It is again the government that facilitates the harmonisation and interplay of all stakeholders and members in the quadruple framework (Kassicieh, 2015). Any government that has no cooperation of such members may not succeed in developing the economy. Here it is a matter of the government's integrity and ability to manage relationships.

Government initiatives

The government has to make strategic initiatives that include: promoting foreign direct investment; technoparks; venture incubation centres; value addition; and industrial clusters. The government has to spearhead all developmental programmes and seek cooperation from other players like industry and the academia. Without the government initialising all these, otherwise, nothing may be done since there would be a lack of coordination.

8.12 Recommendation 3: For industrialists

The industrialists here refer to all the primary, secondary and tertiary industrialists. The research results can be generalised as such. However, the manufacturing (secondary) industry is the one often called the industry. In this case, industrialists pertain to industrial food processing technopreneurs although the principles can apply to all industries. Technopreneurship is universal.

The first point is that organisational leadership transformed over years. Initially, economics was leading, followed by management, followed by strategic management; currently, entrepreneurship is the organisational leadership acumen that is required to spearhead organisation dynamics. In particular, here it is advocated that technopreneurship be the aptitude required to lead industries and organisations. It is recommended that management in the food processing sector be technopreneurial in their skills, knowledge and behaviour. Also, take technopreneurship as the strategic and policy guide. Industrial food processing technopreneurs are encouraged to adopt the latest food technologies like the nano-foods and nanotechnology. This is one of the characteristics of innovators so as to capitalise on the prevalent opportunities and enhance food production and packaging. Technology has advantages of reducing costs and to enhance productivity gains as well as contributing to the cultural and political development of societies (Çalışkan, 2015).

Industrialists should consider effectuation and their technopreneurial orientation. Especially the organisational Chief Executive Officers (CEOs) should have the technopreneurial acumen. Organisations in Zimbabwe should leave the appointment of CEOs who have traditional qualifications and skills like

chartered accountancy. Such CEOs are not innovative since they are not trained to be innovative, but to follow myopic accounting standards. CEOs who have entrepreneurial or specifically technopreneurial thrusts can handle situations in the Zimbabwean industry without much difficulty.

8.13 Recommendation 4: For universities

Private Public Partnerships and Universities

Universities are to be involved in private-public partnerships to contribute to industrial development. In principle, the modern concept of experiential-learningprogrammes should guide university curriculum development and education. When universities partner with industry, the synergistic effect will be realied, that is financially and technologically and universities will have an opportunity to contribute to industrial development.

Academic entrepreneurship and university spin-offs

Academic entrepreneurship should guide universities as they allocate the available resources towards research. All university research should end up in venture incubation or license of the patents to industrialists. The current situation is that the Zimbabwean government has since failed to fund fully universities so universities should open own income generating projects. That means universities are to be entrepreneurial in their approach. The criteria ofrating / ranking of universities should change as such.

University Rankings

The criteria ofrating / ranking of universities should change. Universities should not be ranked using publications only but the registered patents and incubations emanating therefrom. Thus, there should be an Entrepreneur and Innovative University Index (İskendera and Batı, 2015). It follows that universities should compete on a technopreneurial basis rather than other traditional variables that are failing to have a meaningful contribution to economic growth and development.

Academic promotions

Therefore, it automatically applies to academic promotions, in all fields the academic should be rated / ranked based on contributions to patenting and venture creation.

8.14 Future research

The following recommendations are made for further research on:

- The business attitudes of local industrial food processing technopreneurs (industrialists) can be explored more based on the current Zimbabwean political and economic crisis. A question can be asked: "To what extent do the industrialists envisage any technopreneurial opportunities?"
- The diffusion and adoption of technopreneurship as a strategic guide to industrial food processing technopreneurs is also an issue that requires further study.
- The availability of technopreneurial knowledge and skills in Zimbabwe and Africa specifically require further research.

8.15 Summary

The thesis pertains to the study of factors influencing technopreneurship in the food processing sector in Zimbabwe. The topic was introduced in chapter one; chapter two presented the situation of the location of the study; chapter three analysed the subject content and its global application and information; while chapter four described the perspectives of the subject area. The methodology and methods were presented in chapter five; with research findings outlined in chapter six and discussed in chapter seven.

This chapter began by a recap of the whole thesis and the limitations of the study. Conclusions were reached at and presented based on analyses and discussions. Lastly, recommendations were made for all stakeholders of the study. The next sections present the appendices to cover other pertinent information that include data tables, the questionnaire and list of references.

The study managed to fulfil all the research objectives thatwere formulated as to: establish the role of technopreneurship in the food processingsector of Zimbabwe; determine factors influencing technopreneurship in the food processingsector of Zimbabwe; determine key success factors of technopreneurship in the food processingsector of Zimbabwe and determine the feasibility of technopreneurship in the Zimbabwean food processingsector. The original contribution of the study was mainly in the implementation of technopreneurship in a developing country like Zimbabwe so as enhance organisational performance thereby developing the economy. How technopreneurship could be applied in practice; how it works and the influencing factors and an accompanying model to understand the situational forces in such a developing nation were part of the contribution of this study. The study proves to be important not just to fulfil Ph.D. study requirements but it attends to a pertinent developmental issue in developing economies and organisational operational challenges. This study has a direct contribution to organisational competitiveness, economic development and value addition to academic knowledge further research.

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APPENDIX 1: The Questionnaire

UNIVERSITY OF KWAZULU-NATAL

School of Management, IT and Governance

Dear Respondent,

PhD Research Project

Researcher: Nicholas Z. Kakava +263772887043

Supervisor: Dr. Ziska Fields +27 31 260 8103

Research Office: Ms P Ximba 031-2603587

I, Nicholas Zivengwa Kakava, am a PhD student in the School of Management, IT and Governance, at the University of KwaZulu-Natal. You are invited to participate in a research project entitled: **"***Factors Influencing Technopreneurship in the Food Processing Sector in Zimbabwe."* The aim of this study is to establish factors which influence technopreneurship in the food processing sector.

Through your participation I hope to understand issues to do with technopreneurship in your organization. The result of this survey is intended to contribute to the growth and development of the food processing sector in Zimbabwe.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this research project. Confidentiality and anonymity of records identifying you as a participant will be maintained by the School of Management, IT and Governance, at the University of KwaZulu-Natal.

If you have any questions or concerns about participating in this study, please contact me or my supervisor at the numbers listed above.

It should take you less than 15 minutes to complete the questionnaire. I hope you will take the time to complete the questionnaire.

Sincerely

Investigator's signature_____ Date_____

This page is to be retained by participant

UNIVERSITY OF KWAZULU-NATAL

School of Management, IT and Governance

PhD Research Project

Researcher: Nicholas Z. Kakava +263772887043

Supervisor: Dr. Ziska Fields +27 31 260 8103

Research Office: Ms P Ximba 031-2603587

CONSENT

I_____(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

_____ _____

Signature of Participant Date

This page is to be retained by researcher

Questionnaire

Please complete this questionnaire by ticking in the appropriate box or writing on given spaces. This should take you less than 15 minutes.

Terminology: *"**Technopreneurship** refers to a business approach that employs both technological and entrepreneurial skills to revive existing projects or start new ones".*

1. The role of Technopreneurship in the food processing sector.

Indicate how important the following aspects are to your company:

	Aspect	**Not at all Important**	**Not that Important**	**Undecided**	**Important**	**Very Important**
1.1	Food processing technology					
1.2	Entrepreneurship orientation					
1.3	Technopreneurship					

2. Factors that influence technopreneurship in the food processing sector.

Indicate your agreement with the following statements **with regard to your company**:

	Statement	**Strongly Agree**	**Agree**	**Not sure**	**Disagree**	**Strongly Disagree**
	Internal Processes					
2.1	The company has the latest food processing technology.					
2.2	The processing machinery is currently fully utilised.					
2.3	Machinery is replaced as soon as it is old.					
2.4	The company continuously updates itself with the latest processing technology.					
2.5	Changing to new processing technology is not a problem for the company.					
2.6	The company has a research and development (R&D) department.					

	Human Factor					
2.7	Plant engineers have full knowledge of the processing machinery.					
2.8	The company continuously trains its workers					
	Statement	**Strongly Agree**	**Agree**	**Not sure**	**Disagree**	**Strongly Disagree**
2.9	The workers support the organisation's vision.					
	Venture Capital					
2.10	The company has access to venture capital loans.					
2.11	The company endeavours to create relations with local and foreign venture capitalists.					
	Partnerships					
2.12	The company has foreign partners in finance & technology.					
2.13	The company has links with R&D institutions, e.g. universities in Zimbabwe.					
	Government Support					
2.14	Electricity load shading hampers the food processing business in Zimbabwe.					
2.15	Electricity costs are a drawback to the food processing business in Zimbabwe.					
2.16	Government taxes are a drawback to the food processing in Zimbabwe.					
2.17	The government gives policy support to the food processing sector in Zimbabwe					

	Global Factors					
2.18	The company's products are of a higher quality than imported products.					
2.19	The company keeps track of global trends in the food processing sector.					
2.20	The company can stand up against competition from neighbouring countries.					

3. Critical success factors that influence technopreneurship in the food processing sector.

Indicate how important you believe the following factors are to the successful adoption of technopreneurship in the food processing industry

	Aspect	**Not at all Important**	**Not really Important**	**Neutral**	**Important**	**Extremely Important**
3.1	Internal processes					
3.2	Human Factor					
3.3	Venture Capital					
3.4	Partnerships					
3.5	Government Support					
3.6	Global factors					
3.7	Process Innovation					
3.8	Product Innovation					
3.9	Technological Innovation					
3.10	Business Innovation					
3.11	Daily/Monthly Production					
3.12	Quality of products					
3.13	Minimisation of costs					
3.14	Involvement of all workers					
3.15	Participation of all workers					

3.16	Team work					
3.17	Responsiveness to customer needs					
3.18	Skills development					
3.19	Dynamism to suit situations.					

4. Feasibility of Technopreneurship in the food processing sector

Indicate your opinion on the following items with particular regard to your company.

	Aspect	**Definitely yes**	**Yes, to some extent.**	**Neutral**	**No, not really**	**No, not at all**
4.1	Is there enough demand for processed food products in Zimbabwe?					
4.2	Does the company have the capacity to satisfy the demand?					
4.3	Does the company possess enough technology for food processing?					
4.4	Does the company have the capacity to acquire new processing technology?					
4.5	Does the company possess enough entrepreneurial skills?					
4.6	Can the company compete with existing food products on the market?					

5. Demographic information

Select ONE option for each of the following questions

5.1	**Your specialisation**	Engineering only	Business only	Both Engineering & Business	Other (Please Specify)

5.2.	**Your position**	

5.3.	**Your department**	

5.4.	**Gender**	Male		Female	

5.5.	**Please indicate your highest level of education**	O-level	Certificate	Diploma	Degree	Honours	Masters	PhD

THANK YOU

THE END

APPENDIX 2: DATA ANALYSIS TABLES AND GRAPHS

Demographic Data

Table A2.1: A frequency distribution table showing respondents' areas of specialisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Engineering only**	30	20.4	20.8	20.8
	Business only	69	46.9	47.9	68.8
	Engineering and business	26	17.7	18.1	86.8
	Other	19	12.9	13.2	100.0
	Total	144	98.0	100.0	
Missing	**System**	3	2.0		
Total		147	100.0		

Table A2.2: A frequency distribution table showing respondents' gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Male**	99	67.3	68.3	68.3
	Female	46	31.3	31.7	100.0
	Total	145	98.6	100.0	
Missing	**System**	2	1.4		
Total		147	100.0		

Table A2.3: A frequency distribution table showing respondents' educational attainment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**O-levels**	7	4.8	5.0	5.0
	Certificate	9	6.1	6.4	11.4
	Diploma	41	27.9	29.3	40.7
	Degree	47	32.0	33.6	74.3
	Honours	23	15.6	16.4	90.7
	Masters	13	8.8	9.3	100.0
	Total	140	95.2	100.0	
Missing	**System**	7	4.8		
Total		147	100.0		

Table A2.4: A frequency distribution table showing respondents' position in the organisation.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Top management**	8	5.4	5.6	5.6
	Middle management	54	36.7	37.8	43.4
	First line management	57	38.8	39.9	83.2
	Non managerial	24	16.3	16.8	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.5: A frequency distribution table showing respondents' organisational department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Administrative**	68	46.3	47.2	47.2
	Engineering	55	37.4	38.2	85.4
	Support services	21	14.3	14.6	100.0
	Total	144	98.0	100.0	
Missing	**System**	3	2.0		
Total		147	100.0		

The importance of Technopreneurship in the food processing sector.

Table A2.6: A frequency distribution table showing respondents' importance rating of Food processing technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not that important**	4	2.7	2.7	2.7
	Important	52	35.4	35.4	38.1
	Very important	91	61.9	61.9	100.0
	Total	147	100.0	100.0	

Table A2.7: A frequency distribution table showing respondents' importance rating of entrepreneurship orientation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not at all important**	6	4.1	4.3	4.3
	Not that important	10	6.8	7.1	11.3
	Undecided	17	11.6	12.1	23.4
	Important	61	41.5	43.3	66.7
	Very important	47	32.0	33.3	100.0
	Total	141	95.9	100.0	
Missing	**System**	6	4.1		
Total		147	100.0		

Table A2.8: A frequency distribution table showing respondents' importance rating of technopreneurship

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not at all important**	4	2.7	2.8	2.8
	Not that important	10	6.8	7.1	9.9
	Undecided	12	8.2	8.5	18.4
	Important	61	41.5	43.3	61.7
	Very important	54	36.7	38.3	100.0
	Total	141	95.9	100.0	
Missing	**System**	6	4.1		
Total		147	100.0		

Table A2.9: A table showing one-sample statistics for q1.1, q1.2 and q1.3

	N	Mean	Std. Deviation	Std. Error Mean
q1.1	9	4.5833	.21148	.07049
q1.2	9	3.9533	.29125	.09708
q1.3	9	4.0444	.21501	.07167

Table A2.10: A table showing test statistics for q1.1, 1.2 and 1.3

	threes - q1.1	threes - q1.2	threes - q1.3
Z	-2.666[a]	-2.666[a]	-2.670[a]
Asymp. Sig. (2-tailed)	.008	.008	.008

Factors that influence technopreneurship in the food processing sector.

INTERNAL PROCESSES

Table A2.11. A frequency distribution table showing results for question 2.1.

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	**Strongly agree**	20	13.6	14.0	14.0
	Agree	54	36.7	37.8	51.7
	Not sure	6	4.1	4.2	55.9
	Disagree	51	34.7	35.7	91.6
	Strongly disagree	12	8.2	8.4	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.12. A frequency distribution table showing results of question 2.2.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	6	4.1	4.1	4.1
	Agree	39	26.5	26.5	30.6
	Not sure	17	11.6	11.6	42.2
	Disagree	69	46.9	46.9	89.1
	Strongly disagree	16	10.9	10.9	100.0
	Total	147	100.0	100.0	

Table A2.13. A frequency distribution table showing results for question 2.3.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	4	2.7	2.7	2.7
	Agree	25	17.0	17.0	19.7
	Not sure	16	10.9	10.9	30.6
	Disagree	69	46.9	46.9	77.6
	Strongly disagree	33	22.4	22.4	100.0
	Total	147	100.0	100.0	

Table A2.14. A frequency distribution table showing results of q2.4.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	7	4.8	4.8	4.8
	Agree	46	31.3	31.3	36.1
	Not sure	17	11.6	11.6	47.6
	Disagree	69	46.9	46.9	94.6
	Strongly disagree	8	5.4	5.4	100.0
	Total	147	100.0	100.0	

Table A2.15. A frequency distribution table showing results for q2.5.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	15	10.2	10.2	10.2
	Agree	27	18.4	18.4	28.6
	Not sure	17	11.6	11.6	40.1
	Disagree	64	43.5	43.5	83.7
	Strongly disagree	24	16.3	16.3	100.0
	Total	147	100.0	100.0	

Table A2.16. A frequency distribution table showing results for q2.6.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	20	13.6	13.6	13.6
	Agree	63	42.9	42.9	56.5
	Not sure	25	17.0	17.0	73.5
	Disagree	19	12.9	12.9	86.4
	Strongly disagree	20	13.6	13.6	100.0
	Total	147	100.0	100.0	

Table A2.17. A table showing one sample statistics for questions 2.1, 2.2, 2.3, 2.4, 2.5 and 2.6

	N	Mean	Std. Deviation	Std. Error Mean
q2.1 The company has the latest food processing technology.	143	2.87	1.274	.107
q2.2 The processing machinery is currently fully utilised.	147	3.34	1.107	.091
q2.3 Machinery is replaced as soon as it is old.	147	3.69	1.083	.089
q2.4 The company continuously updates itself with the latest processing technology.	147	3.17	1.081	.089
q2.5 Changing to new processing technology is not a problem for the company.	147	3.37	1.245	.103
q2.6 The company has a research and development (R&D) department.	147	2.70	1.252	.103

Table A2.18: A table showing one sample test results for questions 2.1, 2.2, 2.3, 2.4, 2.5 and 2.6

					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q2.1 The company has the latest food processing technology.	-1.247	142	.214	-.133	-.34	.08
q2.2 The processing machinery is currently fully utilised.	3.725	146	.000	.340	.16	.52
q2.3 Machinery is replaced as soon as it is old.	7.768	146	.000	.694	.52	.87
q2.4 The company continuously updates itself with the latest processing technology.	1.907	146	.059	.170	.00	.35
q2.5 Changing to new processing technology is not a problem for the company.	3.643	146	.000	.374	.17	.58
q2.6 The company has a research and development (R&D) department.	-2.899	146	.004	-.299	-.50	-.10

HUMAN FACTOR

Table A2.19. A frequency distribution table showing results for q2.7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	28	19.0	19.0	19.0
	Agree	95	64.6	64.6	83.7
	Not sure	14	9.5	9.5	93.2
	Disagree	8	5.4	5.4	98.6
	Strongly disagree	2	1.4	1.4	100.0
	Total	147	100.0	100.0	

Table A2.20. A frequency distribution table showing results for q2.8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	25	17.0	17.0	17.0
	Agree	53	36.1	36.1	53.1
	Not sure	18	12.2	12.2	65.3
	Disagree	43	29.3	29.3	94.6
	Strongly disagree	8	5.4	5.4	100.0
	Total	147	100.0	100.0	

Table A2.21. A frequency distribution table showing results for q2.6**.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	28	19.0	19.0	19.0
	Agree	85	57.8	57.8	76.9
	Not sure	16	10.9	10.9	87.8
	Disagree	14	9.5	9.5	97.3
	Strongly disagree	4	2.7	2.7	100.0
	Total	147	100.0	100.0	

Table A2.22: Showing one-sample statistics for questions 2.7, 2.8, 2.9 and 2.9

	N	Mean	Std. Deviation	Std. Error Mean
q2.7 Plant engineers have full knowledge of the processing machinery.	147	2.05	.792	.065
q2.8 The company continuously trains its workers	147	2.70	1.213	.100
q2.9 The workers support the organisation's vision.	147	2.19	.946	.078

Table A2.23: A table showing one-sample test results for questions 2.7, 2.8 and 2.9

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q2.7 Plant engineers have full knowledge of the processing machinery.	-14.477	146	.000	-.946	-1.07	-.82
q2.8 The company continuously trains its workers	-2.992	146	.003	-.299	-.50	-.10
q2.9 The workers support the organisation's vision.	-10.375	146	.000	-.810	-.96	-.66

VENTURE CAPITAL

Table A2.24. A frequency distribution table showing results for q2.10.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	10	6.8	6.8	6.8
	Agree	54	36.7	36.7	43.5
	Not sure	50	34.0	34.0	77.6
	Disagree	19	12.9	12.9	90.5
	Strongly disagree	14	9.5	9.5	100.0
	Total	147	100.0	100.0	

Table A2.25. A frequency distribution table showing results for q2.11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	5	3.4	3.4	3.4
	Agree	74	50.3	51.0	54.5
	Not sure	33	22.4	22.8	77.2
	Disagree	19	12.9	13.1	90.3
	Strongly disagree	14	9.5	9.7	100.0
	Total	145	98.6	100.0	
Missing	**System**	2	1.4		
Total		147	100.0		

Table A2.26: A table showing one-sample statistics for questions 2.10 and 2.11.

	N	Mean	Std. Deviation	Std. Error Mean
q2.10 The company has access to venture capital loans.	147	2.82	1.060	.087
q2.11 The company endeavours to create relations with local and foreign venture capitalists.	145	2.74	1.053	.087

Table A2.27: A table showing one-sample test results for questions 2.10 and 1.11.

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q2.10 The company has access to venture capital loans.	-2.101	146	.037	-.184	-.36	-.01
q2.11 The company endeavours to create relations with local and foreign venture capitalists.	-2.919	144	.004	-.255	-.43	-.08

PARTNERSHIPS

Table A2.28. A frequency distribution table showing results for q2.12**.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	8	5.4	5.4	5.4
	Agree	30	20.4	20.4	25.9
	Not sure	49	33.3	33.3	59.2
	Disagree	38	25.9	25.9	85.0
	Strongly disagree	22	15.0	15.0	100.0
	Total	147	100.0	100.0	

Table A2.29. A frequency distribution table showing results for q2.13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	4	2.7	2.7	2.7
	Agree	53	36.1	36.1	38.8
	Not sure	47	32.0	32.0	70.7
	Disagree	35	23.8	23.8	94.6
	Strongly disagree	8	5.4	5.4	100.0
	Total	147	100.0	100.0	

Table A2.30: A table showing one-sample statistics questions 2.12 and 2.13

	N	Mean	Std. Deviation	Std. Error Mean
q2.12 The company has foreign partners in finance & technology.	147	3.24	1.108	.091
q2.13 The company has links with R&D institutions, e.g. universities in Zimbabwe.	147	2.93	.963	.079

Table A2.31: A table showing one-sample test results for questions 2.12 and 2.13

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q2.12 The company has foreign partners in finance & technology.	2.680	146	.008	.245	.06	.43
q2.13 The company has links with R&D institutions, e.g. universities in Zimbabwe.	-.857	146	.393	-.068	-.22	.09

GOVERNMENT SUPPORT

Table A2.32. A frequency distribution table showing results for q2.14

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	72	49.0	49.0	49.0
	Agree	65	44.2	44.2	93.2
	Not sure	1	.7	.7	93.9
	Disagree	3	2.0	2.0	95.9
	Strongly disagree	6	4.1	4.1	100.0
	Total	147	100.0	100.0	

Table A2.33: A frequency distribution table showing results for q2.15

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	54	36.7	36.7	36.7
	Agree	60	40.8	40.8	77.6
	Not sure	16	10.9	10.9	88.4
	Disagree	13	8.8	8.8	97.3
	Strongly disagree	4	2.7	2.7	100.0
	Total	147	100.0	100.0	

Table A2.34. A frequency distribution table showing results for q2.16

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	39	26.5	27.3	27.3
	Agree	59	40.1	41.3	68.5
	Not sure	21	14.3	14.7	83.2
	Disagree	20	13.6	14.0	97.2
	Strongly disagree	4	2.7	2.8	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.35. A frequency distribution table showing results for q2.17

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	8	5.4	5.4	5.4
	Agree	75	51.0	51.0	56.5
	Not sure	39	26.5	26.5	83.0
	Disagree	19	12.9	12.9	95.9
	Strongly disagree	6	4.1	4.1	100.0
	Total	147	100.0	100.0	

Table A2.36: A table showing one-sample statistics for questions 2.14, 2.16 and 2.17

	N	Mean	Std. Deviation	Std. Error Mean
q2.14 Electricity load shading hampers the food processing business in Zimbabwe.	147	1.68	.921	.076
q2.15 Electricity costs are a drawback to the food processing business in Zimbabwe.	147	2.00	1.040	.086
q2.16 Government taxes are a drawback to the food processing in Zimbabwe.	143	2.24	1.087	.091
q2.17 The government gives policy support to the food processing sector in Zimbabwe	147	2.59	.927	.076

Table A2.37: A table showing one-sample test results for questions 2.14, 2.16 and 2.17

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q2.14 Electricity load shading hampers the food processing business in Zimbabwe.	-17.364	146	.000	-1.320	-1.47	-1.17
q2.15 Electricity costs are a drawback to the food processing business in Zimbabwe.	-11.655	146	.000	-1.000	-1.17	-.83
q2.16 Government taxes are a drawback to the food processing in Zimbabwe.	-8.382	142	.000	-.762	-.94	-.58
q2.17 The government gives policy support to the food processing sector in Zimbabwe	-5.337	146	.000	-.408	-.56	-.26

GLOBAL FACTORS

Table A2.38. A frequency distribution table showing results for q2.18.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	45	30.6	30.6	30.6
	Agree	55	37.4	37.4	68.0
	Not sure	25	17.0	17.0	85.0
	Disagree	18	12.2	12.2	97.3
	Strongly disagree	4	2.7	2.7	100.0
	Total	147	100.0	100.0	

Table A2.39. A frequency distribution table showing results for q2.19**.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	21	14.3	14.3	14.3
	Agree	74	50.3	50.3	64.6
	Not sure	22	15.0	15.0	79.6
	Disagree	18	12.2	12.2	91.8
	Strongly disagree	12	8.2	8.2	100.0
	Total	147	100.0	100.0	

Table A2.40. A frequency distribution table showing results for q2.20

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Strongly agree**	27	18.4	18.4	18.4
	Agree	60	40.8	40.8	59.2
	Not sure	15	10.2	10.2	69.4
	Disagree	24	16.3	16.3	85.7
	Strongly disagree	21	14.3	14.3	100.0
	Total	147	100.0	100.0	

Table A2.41: A table showing one-sample statistics for questions 2.18, 2.19 and 2.20

	N	Mean	Std. Deviation	Std. Error Mean
q2.18 The company's products are of a higher quality than imported products.	147	2.19	1.087	.090
q2.19 The company keeps track of global trends in the food processing sector.	147	2.50	1.131	.093
q2.20 The company can stand up against competition from neighbouring countries.	147	2.67	1.335	.110

Table 2.42: A table showing one-sample test for questions 2.18, 2.19 and 2.20.

	Test Value = 3					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q2.18 The company's products are of a higher quality than imported products.	-9.025	146	.000	-.810	-.99	-.63
q2.19 The company keeps track of global trends in the food processing sector.	-5.397	146	.000	-.503	-.69	-.32
q2.20 The company can stand up against competition from neighbouring countries.	-2.965	146	.004	-.327	-.54	-.11

Critical success factors that influence technopreneurship in the food processing sector.

Table A2.43. A frequency distribution table showing results for q3.1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	2	1.4	1.4	1.4
	Neutral	2	1.4	1.4	2.8
	Important	75	51.0	52.4	55.2
	Extremely important	64	43.5	44.8	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.44. A frequency distribution table showing results for q3.2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	2	1.4	1.4	1.4
	Neutral	4	2.7	2.8	4.3
	Important	57	38.8	40.4	44.7
	Extremely important	78	53.1	55.3	100.0
	Total	141	95.9	100.0	
Missing	**System**	6	4.1		
Total		147	100.0		

Table A2.45. A frequency distribution table showing results for q3.3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	4	2.7	2.9	2.9
	Neutral	13	8.8	9.5	12.4
	Important	59	40.1	43.1	55.5
	Extremely important	61	41.5	44.5	100.0
	Total	137	93.2	100.0	
Missing	**System**	10	6.8		
Total		147	100.0		

Table A2.46. A frequency distribution table showing results for q3.4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	6	4.1	4.3	4.3
	Neutral	20	13.6	14.2	18.4
	Important	77	52.4	54.6	73.0
	Extremely important	38	25.9	27.0	100.0
	Total	141	95.9	100.0	
Missing	**System**	6	4.1		
Total		147	100.0		

Table A2.47. A frequency distribution table showing results for q3.5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	4	2.7	2.8	2.8
	Important	64	43.5	45.4	48.2
	Extremely important	73	49.7	51.8	100.0
	Total	141	95.9	100.0	
Missing	**System**	6	4.1		
Total		147	100.0		

Table A2.48. A frequency distribution table showing results for q3.6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	2	1.4	1.4	1.4
	Neutral	6	4.1	4.3	5.7
	Important	76	51.7	53.9	59.6
	Extremely important	57	38.8	40.4	100.0
	Total	141	95.9	100.0	
Missing	**System**	6	4.1		
Total		147	100.0		

Table A2.49. A frequency distribution table showing results for q3.7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	2	1.4	1.4	1.4
	Important	68	46.3	47.6	49.0
	Extremely important	73	49.7	51.0	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.50: A frequency distribution table showing results for q3.8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Important**	56	38.1	40.3	40.3
	Extremely important	83	56.5	59.7	100.0
	Total	139	94.6	100.0	
Missing	**System**	8	5.4		
Total		147	100.0		

Table A2.51. A frequency distribution table showing results for q3.9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	4	2.7	2.8	2.8
	Important	45	30.6	31.5	34.3
	Extremely important	94	63.9	65.7	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.52: A frequency distribution table showing results for q3.10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	12	8.2	8.4	8.4
	Important	59	40.1	41.3	49.7
	Extremely important	72	49.0	50.3	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.53: A frequency distribution table showing results for q3.11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	8	5.4	5.7	5.7
	Important	65	44.2	46.4	52.1
	Extremely important	67	45.6	47.9	100.0
	Total	140	95.2	100.0	
Missing	**System**	7	4.8		
Total		147	100.0		

Table A2.54: A frequency distribution table showing results for q3.12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	2	1.4	1.4	1.4
	Important	41	27.9	28.7	30.1
	Extremely important	100	68.0	69.9	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.55: A frequency distribution table showing results for q3.13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	4	2.7	2.8	2.8
	Neutral	4	2.7	2.8	5.7
	Important	34	23.1	24.1	29.8
	Extremely important	99	67.3	70.2	100.0
	Total	141	95.9	100.0	
Missing	**System**	6	4.1		
Total		147	100.0		

Table A2.56: A frequency distribution table showing results for q3.14

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	2	1.4	1.4	1.4
	Neutral	10	6.8	7.0	8.4
	Important	57	38.8	39.9	48.3
	Extremely important	74	50.3	51.7	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.57: A frequency distribution table showing results for q3.15

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	14	9.5	9.8	9.8
	Important	47	32.0	32.9	42.7
	Extremely important	82	55.8	57.3	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.58: A frequency distribution table showing results for q3.16**.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	6	4.1	4.2	4.2
	Important	38	25.9	26.6	30.8
	Extremely important	99	67.3	69.2	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.59: A frequency distribution table showing results for q3.17.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not really important**	2	1.4	1.4	1.4
	Neutral	4	2.7	2.8	4.2
	Important	35	23.8	24.5	28.7
	Extremely important	102	69.4	71.3	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.60: A frequency distribution table showing results for q3.18.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Neutral**	2	1.4	1.4	1.4
	Important	44	29.9	30.8	32.2
	Extremely important	97	66.0	67.8	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.61: A frequency distribution table showing results for q3.19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Not at all important**	2	1.4	1.4	1.4
	Not really important	2	1.4	1.4	2.8
	Neutral	18	12.2	12.6	15.4
	Important	35	23.8	24.5	39.9
	Extremely important	86	58.5	60.1	100.0
	Total	143	97.3	100.0	
Missing	**System**	4	2.7		
Total		147	100.0		

Table A2.62: A table showing one-sample statistics for questions 3.1 to 3.19.

	N	Mean	Std. Deviation	Std. Error Mean
q3.1 Internal processes	143	4.41	.596	.050
q3.2 Human Factor	141	4.50	.628	.053
q3.3 Venture Capital	137	4.29	.759	.065
q3.4 Partnerships	141	4.04	.764	.064
q3.5 Government Support	141	4.49	.556	.047
q3.6 Global factors	141	4.33	.629	.053
q3.7 Process Innovation	143	4.50	.529	.044
q3.8 Product Innovation	139	4.60	.492	.042
q3.9 Technological Innovation	143	4.63	.540	.045
q3.10 Business Innovation	143	4.42	.644	.054
q3.11 Daily/Monthly Production	140	4.42	.601	.051
q3.12 Quality of products	143	4.69	.495	.041
q3.13 Minimisation of costs	141	4.62	.683	.058
q3.14 Involvement of all workers	143	4.42	.686	.057
q3.15 Participation of all workers	143	4.48	.670	.056
q3.16 Team work	143	4.65	.560	.047
q3.17 Responsiveness to customer needs	143	4.66	.606	.051
q3.18 Skills development	143	4.66	.503	.042
q3.19 Dynamism to suit situations.	143	4.41	.866	.072

Table A2.63: A table showing mean scores of critical success factors ordered from most important to least important.

Critical success factor	**Mean score**
q3.12 Quality of products	4.69
q3.18 Skills development	4.66
q3.17 Responsiveness to customer needs	4.66
q3.16 Team work	4.65
q3.9 Technological Innovation	4.63
q3.13 Minimisation of costs	4.62
q3.8 Product Innovation	4.60
q3.7 Process Innovation	4.50
q3.2 Human Factor	4.50
q3.5 Government Support	4.49
q3.15 Participation of all workers	4.48
q3.11 Daily/Monthly Production	4.42
q3.10 Business Innovation	4.42
q3.14 Involvement of all workers	4.42
q3.1 Internal processes	4.41
q3.19 Dynamism to suit situations.	4.41
q3.6 Global factors	4.33
q3.3 Venture Capital	4.29
q3.4 Partnerships	4.04

Table A2.64: A table showing one-sample test results for results of questions 3.1 to 3.19

	Test Value = 3					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q3.1 Internal processes	28.192	142	.000	1.406	1.31	1.50
q3.2 Human Factor	28.286	140	.000	1.496	1.39	1.60
q3.3 Venture Capital	19.927	136	.000	1.292	1.16	1.42
q3.4 Partnerships	16.201	140	.000	1.043	.92	1.17
q3.5 Government Support	31.824	140	.000	1.489	1.40	1.58
q3.6 Global factors	25.184	140	.000	1.333	1.23	1.44
q3.7 Process Innovation	33.824	142	.000	1.497	1.41	1.58
q3.8 Product Innovation	38.252	138	.000	1.597	1.51	1.68
q3.9 Technological Innovation	36.104	142	.000	1.629	1.54	1.72
q3.10 Business Innovation	26.375	142	.000	1.420	1.31	1.53
q3.11 Daily/Monthly Production	28.004	139	.000	1.421	1.32	1.52
q3.12 Quality of products	40.687	142	.000	1.685	1.60	1.77
q3.13 Minimisation of costs	28.111	140	.000	1.617	1.50	1.73
q3.14 Involvement of all workers	24.746	142	.000	1.420	1.31	1.53
q3.15 Participation of all workers	26.352	142	.000	1.476	1.36	1.59
q3.16 Team work	35.247	142	.000	1.650	1.56	1.74
q3.17 Responsiveness to customer needs	32.685	142	.000	1.657	1.56	1.76
q3.18 Skills development	39.589	142	.000	1.664	1.58	1.75
q3.19 Dynamism to suit situations.	19.411	142	.000	1.406	1.26	1.55

Feasibility of Technopreneurship in the food processing sector

Table A2.65: A frequency distribution table showing results for 4.1.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Definitely yes**	115	78.2	79.9	79.9
	Yes, to some extent	24	16.3	16.7	96.5
	Neutral	4	2.7	2.8	99.3
	No not really	1	.7	.7	100.0
	Total	144	98.0	100.0	
Missing	**System**	3	2.0		
Total		147	100.0		

Table A2.66: A frequency distribution table showing results for q4.2.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Definitely yes**	57	38.8	39.6	39.6
	Yes, to some extent	48	32.7	33.3	72.9
	Neutral	5	3.4	3.5	76.4
	No not really	22	15.0	15.3	91.7
	No, not at all	12	8.2	8.3	100.0
	Total	144	98.0	100.0	
Missing	**System**	3	2.0		
Total		147	100.0		

Table A2.67: A frequency distribution table showing results for q4.3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Definitely yes**	33	22.4	22.4	22.4
	Yes, to some extent	61	41.5	41.5	63.9
	Neutral	9	6.1	6.1	70.1
	No not really	38	25.9	25.9	95.9
	No, not at all	6	4.1	4.1	100.0
	Total	147	100.0	100.0	

Table A2.68: A frequency distribution table showing results for q4.4.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Definitely yes**	54	36.7	36.7	36.7
	Yes, to some extent	25	17.0	17.0	53.7
	Neutral	13	8.8	8.8	62.6
	No not really	39	26.5	26.5	89.1
	No, not at all	16	10.9	10.9	100.0
	Total	147	100.0	100.0	

Table A2.69: A frequency distribution table showing results for q4.5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Definitely yes**	32	21.8	21.8	21.8
	Yes, to some extent	51	34.7	34.7	56.5
	Neutral	38	25.9	25.9	82.3
	No not really	20	13.6	13.6	95.9
	No, not at all	6	4.1	4.1	100.0
	Total	147	100.0	100.0	

Table A2.70: A frequency distribution table showing results for q4.6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Definitely yes**	68	46.3	46.9	46.9
	Yes, to some extent	54	36.7	37.2	84.1
	Neutral	1	.7	.7	84.8
	No not really	10	6.8	6.9	91.7
	No, not at all	12	8.2	8.3	100.0
	Total	145	98.6	100.0	
Missing	**System**	2	1.4		
Total		147	100.0		

Table A2.71: A table showing one-sample statistics for questions 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6.

	N	Mean	Std. Deviation	Std. Error Mean
q4.1 Is there enough demand for processed food products in Zimbabwe?	144	1.24	.532	.044
q4.2 Does the company have the capacity to satisfy the demand?	144	2.19	1.329	.111
q4.3 Does the company possess enough technology for food processing?	147	2.48	1.213	.100
q4.4 Does the company have the capacity to acquire new processing technology?	147	2.58	1.475	.122
q4.5 Does the company possess enough entrepreneurial skills?	147	2.44	1.098	.091
q4.6 Can the company compete with existing food products on the market?	145	1.92	1.225	.102

Table A2.72: A table showing one-sample test results for questions 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6

	Test Value = 3					
	95% Confidence Interval of the Difference					
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
q4.1 Is there enough demand for processed food products in Zimbabwe?	-39.620	143	.000	-1.757	-1.84	-1.67
q4.2 Does the company have the capacity to satisfy the demand?	-7.274	143	.000	-.806	-1.02	-.59
q4.3 Does the company possess enough technology for food processing?	-5.238	146	.000	-.524	-.72	-.33
q4.4 Does the company have the capacity to acquire new processing technology?	-3.466	146	.001	-.422	-.66	-.18
q4.5 Does the company possess enough entrepreneurial skills?	-6.233	146	.000	-.565	-.74	-.39
q4.6 Can the company compete with existing food products on the market?	-10.574	144	.000	-1.076	-1.28	-.87

ETHICAL CLEARANCE LETTER

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

10 June 2016

Mr Nicholas Zivengwa Kakava (213574125)
School of Management, IT & Governance
Pietermaritzburg Campus

Dear Mr Kakava,

Protocol reference number: HSS/1456/014D
New project title: Factors influencing the successful adoption of Technopreneurship in the Food Processing Sector in Zimbabwe

Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 03 June 2016 has now been approved as follows:

- Change in Title

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for period of 3 years from the date of original issue. Thereafter Recertification must be applied for on an annual basis.

Best wishes for the successful completion of your research protocol.

Yours faithfully

Naidoo

Dr Shamila Naidoo (Deputy Chair)

/ms

CC Supervisor: Dr Ziska Fields
Cc Academic Leader Research: Professor Brian McArthur
Cc School Administrator: Ms Debbie Cunynghame

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