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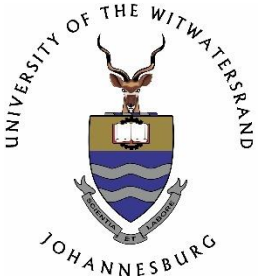
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The causes of food waste in a quick service restaurant supply chain: A South African exploratory case study

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Abstract

The total cost of food waste across the value chain in South Africa is estimated at R61.5billion per annum, equivalent to 2.1% of gross domestic product (Nahman and de Lange, 2013). Consequently, a third of food produced for human consumption is lost or wasted globally, equivalent to about 1.3 billion tonnes per year (Food and Agriculture Organisation, 2011). Food waste is composed of raw or cooked food materials and includes food waste before, during and after meal preparation in the household, as well as food losses in the manufacturing, distribution, retail and food services activities (European Commission, 2010). Oelofse and Nahman (2013) noted that attempts to quantify the actual amount of food waste globally are constrained by limited data, particularly from developing countries. The gaps in the existing literature for data on food waste, particularly in the quick service restaurant sector, created an interest to unravel the causes of food waste in the South African supply chain. The purpose of this study is to explore the influence of processes associated with supply chain activities on food waste in the quick service restaurant supply chain in South Africa. The present research undertakes a qualitative exploratory case study design. The company under study in the current research is a quick service restaurant brand owner with operations ranging from manufacturing, warehousing, distribution and franchised quick service restaurant outlets. The company has been chosen for the reason that it owns the highest number of quick service restaurants in South Africa. Semi-structured in-depth interviews were conducted with company managers to gather insights and perspectives on food waste. Qualitative data analysis was conducted using QDA Miner 4 to systematically code the data to identify themes and patterns. The resultant analysis identified six main factors that influence food waste in a quick service restaurant supply chain, namely, raw material, manufacturing process, cold chain maintenance, stock management, machinery and training. A conceptual model, based on the results from the current study, proposes the use of technology as a mediating variable in ascertaining the relationship of each of the causes to food waste. The present study makes a contribution to theory by addressing the gap in literature on data from developing countries by providing data from a sub-Saharan context. Further to this, the present study highlights the factors causing food waste and the linkages between them with the use of a current reality tree. The findings provide managers with an understanding of strategies that can be employed to reduce food waste such as, investment in equipment and machinery. Further to this, the present study recommends the use of real demand and waste data in sustainability reporting to foster stakeholder engagement and customer goodwill. Lastly, from a green marketing perspective, the present study recommends

that the company develops consumer marketing messages centred on ‘green’ products to enable the creation of a competitive advantage with the benefits of increased market share and revenue.

Key words: Food waste, Supply chain, Quick service restaurant, Technology, Green Marketing

Declaration

I Sophie Dzumbunu declare that:

- All the work in this research is my own unaided work, except where due recognition has been given
- It is submitted in fulfillment of the requirements for the Master of Commerce (Coursework) in Marketing at the University of the Witwatersrand. It has not been submitted before for any other degree for examination in this or any other university.

Sophie Dzumbunu

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CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

1.1.1. Introduction and Background

A third of food produced for human consumption is lost or wasted globally, equivalent to about 1.3 billion tonnes per year (Food and Agriculture Organisation, 2011). This staggering fact gives rise to the phenomenon of food waste or food loss. Food is any substance – whether processed, semi-processed, or raw – that is intended for human consumption or, more specifically ingestion (Food Loss and Waste Protocol, 2016). Food waste is composed of raw or cooked food materials and includes food waste before, during and after meal preparation in the household, as well as food losses in the manufacturing, distribution, retail and food services activities (European Commission, 2010). Food loss refers to the decrease in food quantity or quality, which makes it unfit for human consumption (Grolleaud, 2002). Goal 12 of the United Nations Sustainable Development Goals is to ensure sustainable consumption and production patterns by halving per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses by 2030 (United Nations, 2015). Verghese, Lewis, Lockrey and Williams (2015) identify food security as an emerging challenge for policy makers and companies in the food supply chain. Verghese et al. (2015) further identify increased efficiency and waste reduction in the supply chain as solutions to the dilemma of growth in demand for food and the threats to food production from climate change, competing land uses, erosion and diminishing supplies of water.

Studies have been conducted to determine the magnitude of household food waste and the associated waste management practices (Nahman and de Lange, 2013; Oelofse and Nahman, 2013; de Lange and Nahman, 2015; Gunders, 2012; European Commission, 2010). Mena, Adenso-Diaz and Yurt (2011) conducted a study to find the root causes of waste in a supplier-retailer interface in the UK and Spain.

FAO (2011) revealed that there are major data gaps in the knowledge of global food loss and waste and that further research in the area is urgent. Oelofse and Nahman (2013) noted that attempts to quantify the actual amount of food waste globally are constrained by limited data, particularly from developing countries. Nahman and de Lange (2013) also recommended research extended to addressing food waste through the value chain and including the costs of other inputs such as wasted emissions and resources used throughout the supply chain. A gap exists in the literature for research specific to food waste in the pre-consumer stages in the quick service restaurant supply chain in South Africa. Furthermore, food waste in a South

African context has mostly been researched using quantitative studies making use of estimates arrived at by extrapolating product volumes and weights and using pricing databases to arrive at the cost of food waste (Oelofse and Nahman, 2013; de Lange and Nahman, 2015). Despite food waste being high on the agenda of global groupings such as the United Nations, one can hardly find studies specific to the quick service restaurant sector in South Africa.

The purpose of this study was to explore what factors influence food waste in the quick service restaurant supply chain in South Africa. Further to this, the study aimed to gain in depth insight into how quick service restaurant organisations can reduce or eliminate such food waste whilst creating a competitive advantage from the company's strategic capabilities.

Champions 12.3. (2016) notes that quantifying food loss and waste within the borders or operations or supply chains can help decision makers better understand how much, where, and why food is being lost or wasted. Exploring food waste in the quick service restaurant supply chain in South Africa is an opportunity for South African organisations to start taking action in reducing food waste. After exploring the influence of supply chain activities on food waste, this research will make recommendations on mitigations to reduce food waste as a means to create value and reduce supply chain costs. This will add to the existing body of knowledge as the business will able to identify and manage key sustainability issues (Accenture, 2017). Sustainability is a complementary factor in the development of green products. Sustainability, which denotes the conscious minimization of the impact on the environment and increased usage of recycled materials, conveys the 6R concept of recover, reuse, recycle, redesign, and remanufacture (Tomasin, Pereira, Borchardt and Sellitto, 2013). As such, this study is positioned in green marketing. Green Marketing refers to a process of selling products and/ or services based on their environmental benefits (Surya and Banu, 2014).

Theories that applied to this study are; Root Cause Analysis and the Natural Resource Based View.

1.1.2. Problem Statement

Food waste refers to food that is in good quality and fit for human consumption but that does not get consumed because it is discarded, either before or after it spoils (Lipinski, Hanson, Lomax, Kitinoja, Waite and Searchinger, 2013). Food waste is also defined as food losses throughout the food supply chain, including production, storage, transportation and processing as well as food that is discarded at retailers and in kitchens of restaurants and households (Lundqvist, de Fraiture and Molden, 2008). Parfitt, Barthel and Macnaughton (2010) define food loss as losses that occur in the production, post-harvest processing and distribution stages of the food supply chain. Food waste describes losses that take place at the retail and consumer stages due to marketing activities, economic forces, regulatory measures, poor stock management and consumer attitudes (FAO, 2011; Parfitt et al. 2010). According to Ventour (2008), up to 81% of food waste consists of food that could have been eaten, if it had been managed, distributed or prepared in a different way and only 19% of food waste consists of inedible items such as peelings and bones, and this is truly unavoidable.

Gustafsson, Cederberg, Sonesson, van Otterdijk and Meybeck (2011) found that in sub-Saharan Africa, consumers are only responsible for approximately 3.5% of overall food waste, with the majority being generated during the pre-consumer stages of the food supply chain. According to Oelofse and Nahman (2013), post-consumer food waste for South Africa is 4.14%. Verghese et al. (2015) found that in an Australian context, factors that contribute to food waste in the food service sector included; complexities involved in balancing and managing inventory stock, the need to maintain a wide variety of menu choices and therefore ingredients, improper food storage, confusion over ‘use-by’ and ‘best-before’ dates and large serving sizes. In Europe 52% of total kcal lost is in the consumption stage of the supply chain, whereas in sub-Saharan Africa, only about 5% is lost in the same stage (FAO, 2011).

According to Lipinski et al. (2013), while food waste reduction increases food availability, it can alleviate poverty and provide gender benefits while reducing pressure for ecosystems, climate and water. Wasted food also implies that the resources used in producing food are wasted, for example, 62% of all water used in South Africa is used by the agricultural sector (Council for Scientific and Industrial Research, 2010). By reducing food waste, such that less food would need to be produced, agricultural water use could therefore be reduced (Lundqvist et al. 2008). Efforts to reduce meat waste are also important in order to reduce the environmental impact of food waste as the production of meat protein has a much higher environmental load than process protein food based on soybeans (Reijnders and Soret, 2003).

Greenhouse gases are released during production, especially meat production, transport, processing and storage of food, thereby contributing to climate change (Gustafsson et al. 2011).

Reducing food loss and waste is a priority on the global agenda as identified by Target 12.3 of the United Nations Sustainable Development Goals. The African Union has already set targets for its member states in line with the United Nations target to reduce food losses along the production and supply chains by 2030. Non adoption of this target by business could be due to the fact that business leaders may not be aware or believe that that there is a solid business case for reducing food loss and waste (Champions 12.3, 2016). Champions 12.3 (2016) illustrates the business case by looking at the costs incurred by business currently in relation to food waste, such as, uneaten food in a restaurant that needs to be disposed of and a waste management company needs to be paid to collect the food and dispose to landfill.

Research Question

What is the influence of processes associated with supply chain activities on food waste in the quick service restaurant supply chain in South Africa?

1.1.3. Purpose of the study

The purpose of this study was to explore the influence of supply chain activities on food waste in the quick service restaurant supply chain in South Africa. Further to this, the study aimed to gain in depth insight into how quick service restaurant organisations can reduce or eliminate such food waste and creation of a competitive advantage from the company's strategic capabilities.

1.1.4. a. Research Objectives

- To explore the factors that influence food waste in a quick service restaurant supply chain in South Africa
- To identify the supply chain activity with the closest relationship to food waste in the South African quick service restaurant sector
- To make recommendations on food waste reduction
- To make recommendations on areas of continuous improvement with an aim of reducing costs as a competitive advantage for the company

1.1.4. b. Research Questions

- RQ1: What factors contribute to food waste in a quick service restaurant supply chain?

  The aim of this question was to explore the causes of food waste in a quick service restaurant supply chain

- RQ2: How do these factors impact on food waste at each stage of the quick service restaurant supply chain?

  The aim of this question was to gain insight into which supply chain activity has the closest relationship with food waste
- RQ3: How can managers in the food supply chain minimise food waste?

  The aim of this question was to obtain a managerial perspective on how actions and decisions can be used to reduce food waste
- RQ4: Why is there such an amount of food waste in the quick service restaurant supply chain?

  The aim of this question was to understand why there is food waste in the quick service restaurant supply chain
- RQ5: How can companies address this issue of food waste and implement strategies to minimise wastage throughout the food supply chain?

  The aim of this question was to probe managers on the possible mitigations for food waste

1.1.5. Justification and Contribution of the study

This study is important for six (6) reasons. Firstly, this research adds to the existing body of knowledge on food waste. There is little knowledge available on food waste in developing countries (Oelofse and Nahman, 2013). Secondly, as it cannot be confirmed whether findings of studies in other countries such as the United Kingdom can be applicable to South Africa (FAO, 2011), this study generates findings specific to the South African quick service restaurant sector. Thirdly, food losses represent a waste of resources used in production such as land, water, energy and inputs, and increasing the green gas emissions (FAO, 2011). Understanding the reasons for food waste in the quick service restaurant supply chain enabled the researcher to make recommendations to the business on possible mitigating factors for food waste. Fourthly, following the research, findings can be used by the business for sustainability reporting. A United Nations Global Compact-Accenture Strategy CEO Study found that sustainability is becoming a business advantage and a means for value creation with 70% of CEOs seeing the Sustainable Development Goals as a clear framework for business to structure sustainability efforts (Accenture, 2016). Fifth, this study makes recommendations on policy implementation that can be considered by government in drafting of legislation relating to food waste. Lastly, this study develops theory on which a quantitative study, such as surveys, can be based to provide more evidence about the impact of different causes (Mena, Adenso-Diaz and Yurt, 2011).

1.1.6. Research Context

Fast Food (the actual industry term is Quick Service Restaurant - QSR) is best described as concepts such as McDonald's, KFC, and Burger King (Celentano, 2017). Celentano (2017) further notes that quick service restaurant concepts have low price points, have average quality food, limited menus and have no table service. Some quick service restaurants offer a sit-in, take-away or drive-through option. Food is prepared as the customer waits. Restaurants can either be owned by a corporate or are franchised. The South African Quick Service Restaurant industry is characterised by several brands such as KFC, Steers, Wimpy, Debonairs, The Fish and Chip Co, and Nando's (BusinessTech, 2016). Menu offerings differ across the brands, with the quick service restaurant brand in this study selling burgers as their biggest menu offering. The scope of the study is limited to the meat product category flowing through the supply chain.

Food waste has become a topical issue in the food service industry and is an opportunity for companies to showcase their sustainability efforts whilst reducing inefficiencies and driving cost savings. WRAP (2009) identify two types of waste; avoidable and unavoidable waste. Avoidable waste is food thrown away that was at some point prior to disposal, edible in the vast majority of situations. Unavoidable food waste, on the other hand, is waste arising from food preparation that is not, and has not been, edible under normal circumstances (WRAP, 2009). These classifications are important in the quick service restaurant industry as there is waste at each stage of the supply chain. Verghese et al. (2015) found that the largest single contributor to waste to landfill in Australia in the commercial and industrial sector is food service activities such as cafes, restaurants, fast food outlets, which generated 661 000 tonnes of food waste per year. The literature reviewed does not focus on food waste in the quick service restaurant sector and specifically in the South African context.

The stages of the food supply chain are; agricultural production, post-harvest handling and storage, processing and packaging, distribution and consumption (FAO, 2011). Food waste arises throughout the food supply chain, including production, storage, transportation, processing, at retailers and in kitchens of restaurants and households (Lundqvist, de Fraiture and Molden, 2008). In developing countries, food waste arises mainly due to financial, managerial and technical limitations in harvesting techniques, storage and cooling facilities (exacerbated by difficult climatic conditions), infrastructure, packaging and marketing systems (Parfitt, Barthel, and McNaughton, 2010). In the European Union, for example, 42% of the total food waste is generated by households, 39% by the production and processing sector, 14% by the food services and catering sector and 5% by the retail and wholesale sector (European

Commission, 2010). Gustafsson et al. (2011) in contrast found that in sub-Saharan Africa, consumers are only responsible for approximately 3.5% of overall food waste, with the majority being generated during the pre-consumer stages of the food supply chain. In a study conducted by Nahman and de Lange (2013), the total cost of food waste across the value chain in South Africa was estimated at R61.5billion per annum, equivalent to 2.1% of gross domestic product. Oelofse and Nahman (2013) found that attempts to quantify the actual amount of food wasted globally are constrained by limited data, particularly from developing countries.

1.2. Literature Review

This section discusses the theoretical grounding of the study as well as the empirical literature.

1.2.1. Theoretical Grounding

This paper is grounded in the Root Cause Analysis and Natural Resource Based View Theories.

Root Cause Analysis (RCA)

The Root Cause Analysis theory refers to a process of identifying and explaining variability in an outcome or process. Root cause analysis (RCA) is a class of problem solving methods aimed at identifying the root causes of problems or events and is based on the fishbone diagram (Assen, Berg and Pietersma, 2009). It is used to explain the variation in any process and the first essential step is to find the causes of variation and to quantify the effect. Low hanging fruit, i.e. the easy to solve causes should be take care of first (Assen et al. 2009). As per the findings of Mena, Adenso-Diaz and Yurt (2011), the comments collected from interviews present a range of reasons for food and packaging waste and as many of these causes are interconnected and appear to be the symptoms of a wider problem and not necessarily the root causes. In the case of this study, the current reality tree will be used to trace the relationships between the causes of food waste in the quick service restaurant supply chain in order to identify the root causes of food waste. For example, it could be found that food waste in the food service stage of the supply chain could be due to breaking of cold chain in the distribution stage. A cold chain is a temperature-controlled supply chain and when it is broken, the low temperature range of the product would not have been maintained.

Natural Resource Based View (NRBV)

The second theory in which the present study is grounded is the Natural Resource Based View. Hart (1995) put forward that it is likely that strategy and competitive advantage in the coming years would be rooted in capabilities that facilitate environmentally sustainable economic activity. The Natural Resource Based View looks at three key strategic capabilities; pollution prevention, product stewardship and sustainable development (Hart, 1995). Pollution

prevention is concerned with the prevention of waste rather than how to clean up waste at the end of the supply chain. Product stewardship expands the scope of pollution prevention to include the entire value chain or life cycle of the organisation's products (Hart and Dowell, 2011). Competitive advantage through product stewardship can be secured through strategic pre-emption, for example, securing exclusive access to resources. Sustainable development seeks to produce in a way that can be maintained indefinitely into the future (Hart, 1995). Other than environmental concerns, sustainable development strategy also looks at economic and social concerns. The Natural Resource Based View theory has been split into clean technology and base of pyramid in the area of sustainable corporate development strategy (Hart, 1997). For purposes of the NRBV, the key clean technology issue lies in understanding which firm resources and capabilities are likely to be associated with effective clean technology commercialization (Hart, 1997). The second major direction in which the sustainable development element of the NRBV has evolved is the increased attention to the role of corporations in alleviating poverty for the poorest of the world's citizens (Hart and Dowell, 2011). In relation to the current study, the Natural Resource Based theory will be used to establish the strategic capabilities of the company and how these can be translated into competitive advantage.

1.2.2. Empirical Literature

Several studies have explored food waste and factors that potentially influence food waste in a food supply chain. The researcher has identified the following categories/themes; processing, packaging, distribution, food preparation and food waste. This section of the literature review will look at each of the themes in depth.

a. Processing

Product waste during start up, rejects due to quality control, spillage, regular planned shutdowns and equipment failures are sources of food waste in the processing stage (Verghese et al. 2015). Food losses at this stage include (trimmings of both the edible (fats, skins, end pieces) and inedible (pits and bones) (Gunders, 2012). In the meat industry, lack of demand for many animal parts such as offal is a contributor to food waste (Stuart, 2009).

Material in the context of this study is limited to meat cuts received from wholesale butcheries, abattoirs and imports that is further processed into specific products such as burger patties or trimmed into steak or chicken fillets. In one study the use of a Lean or Green matrix – a checklist that integrates Lean and Green practices – was shown to consistently increase the

performance of a waste minimisation plan and as a result, the impact on waste reduction can be doubled (Fercoq, Lamouri and Carbone, 2016). Lean manufacturing is an integrated socio technical system whose main objective is to eliminate waste by concurrently reducing and minimising supplier, customer and internal variability (Angelis and Fernandes, 2012). It would seem that food waste in the processing stage of the supply chain is unavoidable but through adoption of mitigating actions, the magnitude can be reduced. Waste generation and water use are very common issues dealt with in an environmental plan in any industry, and waste generation is the area that is closest to the Lean Manufacturing concept, as it is focused on the reduction of any type of excess(Yu et al. 2009). Lean practitioners traditionally have focused on what they refer to as the seven forms of waste: over-production, defects, unnecessary inventory, inappropriate processing, excessive transportation, waiting, and unnecessary motion (Pepper and Spedding, 2009). Environmental waste can be added to that list. Bicheno (2000) identifies wasted materials as one of the "new" wastes.

b. Packaging

Gustafsson et al. (2011) identify 3 types of packaging; primary, secondary and tertiary packaging. Primary packaging holds the basic product and secondary packaging is designed to hold several primary packages. Tertiary packaging comes into use when a number of primary of secondary packages need to be moved at the same time and are packed on a pallet for example. Marsh and Bugusu (2007) state that packaging reduces the total waste by extending shelf life of foods, thereby prolonging their visual appearance. Consumer Goods Forum (2011) describe the role of packaging in the global food supply chain as including; 'to protect the product, promote the product, provide information on product usage, health and safety, disposal, enable convenient transportation and usage of the product, allow utilisation of the product through the supply chain, and support efficient handling of the product throughout the supply chain.' Packaging is a means of ensuring safe and efficient delivery of the goods in sound condition to the ultimate consumer (based on Paine (1981)), used by Bjarmeno, Jonson and Johnsson (2000); adopted from Gustafsson et al. (2011).

Over and above the possible impact of packaging on food waste, Gustafsson et al. (2011) highlight the importance of packaging solution selections that not only give proper performance but also use a minimum of resources in order to keep the environmental impact as low as possible. Verghese et al. (2015) recommend an analysis of food waste in different food service premises (such as hotels, cafes, takeaways) to identify opportunities for packaging

innovation and increased food recovery. They also found that there is a critical trade-off between packaging consumption and food waste that need to be investigated further, for example to shift to single serve formats in some food categories may result in more packaging per serve but reduce the potential for food waste. FAO (1989), highlight the need for any assessment of food packaging impact on the environment to consider the positive benefits of reduced food waste throughout the supply chain. Most of the literature reviewed seemed to be of the view that there is a relationship between packaging and food waste.

c. Distribution

Distribution plays a vital role in the movement of finished goods or products from manufacturing or warehouse to the quick service restaurant outlet. According to van Assen et al. (2009) outbound logistics refers to activities such as order processing, warehousing, scheduling transportation and distribution management. Van Assen et al. (2009) also discuss Factory Gate Pricing which is a modern replenishment method aimed at removing unnecessary transportation costs and improving the efficiency of the supply chain. Gustafsson et al. (2011) note that the process of retailer control of supply systems and the use of computer technology for control of central distribution have been key features of recent years. Verghese et al. (2015) found that food waste in the distribution stage of the food supply chain is as a result of damage in transit or storage due to packaging failures, product spoilage, and fresh produce not meeting specifications or damaged during handling, inadequate remaining shelf life due to poor stock rotation or low sales. It would seem that there is a link between packaging and distribution resulting in food waste. Gustafsson et al. (2011) highlight the importance of taking into account the components in supply that are often forgotten when designing a new packaging systems – highlighting the link between packaging and distribution. Set up of modern retail and the proliferation of shopping malls in South Africa poses a distribution challenge in that some quick service restaurants are not even equipped with a receiving bay and product is delivered via elevators and sometimes using the main walkways in the mall. This has an impact on the choice of packaging for distribution. Another important element in the meat food supply chain is the need for temperature controlled distribution (Gustafsson et al. 2011) and if not well maintained, this can result in significant food losses.

d. Food Service

An audit of food waste in ten restaurants in the United Kingdom by the Sustainable Restaurants Association (SRA) identified three main sources of food waste as in Figure 1.1:



Figure 1.1: Sources of food waste in 10 UK restaurants

Source: Sustainable Restaurant Association

A study by Unilever Food Solutions (2011) found that consumption out of home shifts waste away from home to the restaurant and/or processing facility. Ingredients are packed in bulk and therefore packaging is more efficient. There are significant opportunities to reduce food waste and increase recovery in the food services sector, primarily by changing procurement and cooking practices in kitchens and by improving the infrastructure for collection and recovery of food waste (Verghese et al. 2013). Food waste in the food service stage of the supply chain is due to trimmings and other food preparation waste, poor inventory management, such as over-ordering, improper food handling, confusion over use-by and best-before dates, and plate left overs. Another waste challenge at the food service level is the disposal of packaging.

e. Food waste

'Food' refers to any substance – whether processed, semi-processed, or raw – that is intended for human consumption or, more specifically ingestion (Food Loss and Waste Protocol, 2016). Food loss and food waste refer to food that is intended to be eaten by people that leaves the food supply chain somewhere between being ready for harvest and being consumed. Food loss is typically considered unintended and caused by poor functioning of the food production and supply chain system or by poor institutional and legal frameworks, for example, food loss due to poor infrastructure like refrigeration (FAO, 2010). Food waste occurs due to intended behaviours – by choice, such as poor stock management or neglect, expiry or spoiling of food (FAO, 2010). For the purposes of this study, the term 'food waste' will be used to encompass both food waste and food loss. The associated costs of food waste in some cases are often too buried in operational budgets and are accepted as the cost of doing business (Champion 12.3, 2016). Champion 12.3(2016) also points out that in other cases, decision makers may believe that the costs of taking action – such as identifying food loss and waste hotspots, purchasing new equipment and implementing process of behavioural change –outweigh the benefits.

Efforts to reduce meat waste are also important in order to reduce the environmental impact of food waste (the production of meat protein has a much higher environmental load than process

protein food based on soybeans (Reijnders and Soret, 2003). In light of the threats associated with global change and considering the concern over food security in large parts of the developing world (Gustafsson et al. 2011), it is important to understand the magnitude of food waste globally. In the context of this study, food waste will be any food that is 'lost' at each stage of the quick service restaurant supply chain.

1.3. Research Design and Methodology

The research design and methodology section reviews the research philosophy, research approach and strategy. It also discusses the research design for the study, including the sampling design incorporating the case study selection, sampling method and sample size. The questionnaire design outlines the type of questions to be asked to respondents. The questionnaire is attached at the end of the report. A detailed discussion of the research design and methodology is found in Chapter 3 of this report.

1.4. Data Analysis Approach

Figure 1.2. outlines the data analysis approach that was used for this study. The approach is thereafter discussed in further detail below the diagram.

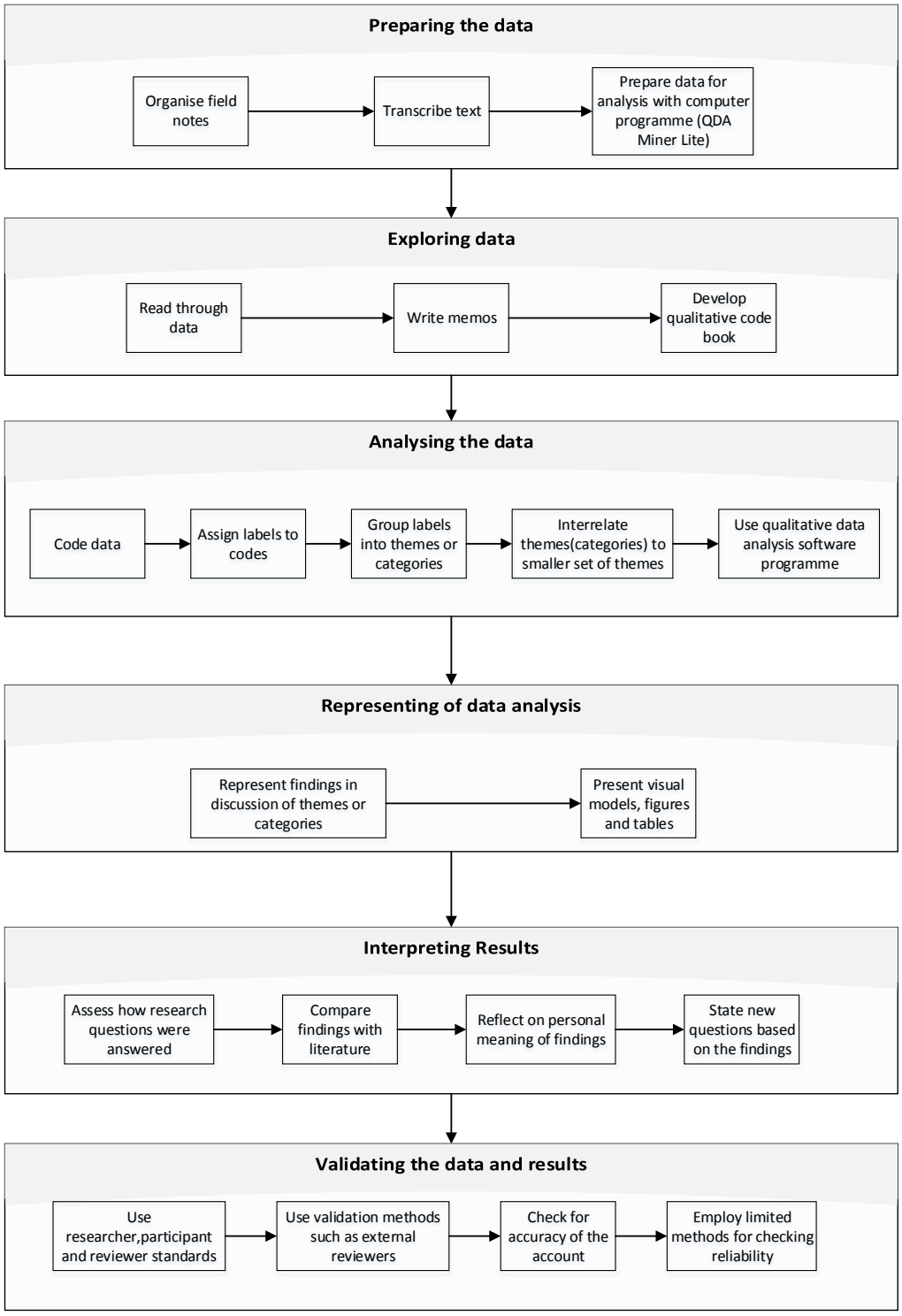


Figure 1.2: Data Analysis

Source: Adapted from ((Creswell and Plano Clark, 2011) and Clark, 2012)

As presented in Figure 1.2, the data analysis was conducted in the following stages; preparing the data, exploring data, analysing data, representing of data analysis, interpreting results, and finally, validating the data and results.

a. Preparing the data

Data analysis involved organising field notes, transcribing of text and preparation of data for analysis with QDA Miner 4 computer programme.

b. Exploring data

This stage of analysis involved reading through the data, writing of memos and development of a qualitative code book. Memos are typically short phrases or ideas written in the margins of transcripts of field notes (Creswell and Plano Clark, 2011)

c. Analysing the data

Actual data analysis was conducted by coding the data, assigning labels to coded and grouping labels into themes or categories. Thereafter, themes or categories were interrelated into smaller set of themes before data is analysed using qualitative analysis software. The coding label can come from the exact words of the participants, phrases composed by the researcher or concepts used in the social or human sciences (Creswell and Plano Clark, 2011).

d. Representing the findings

Findings will be represented in discussion of themes or categories with presentation of visual models, figures and tables. Writing strategies for providing evidence of themes or categories include conveying subthemes or subcategories; citing specific quotes; using different sources of data to cite multiple items of evidence; and providing multiple perspectives from individuals in a study to show the divergent views (Creswell and Plano Clark, 2011).

e. Interpreting Results

Firstly, an assessment of whether the research questions were answered was conducted. This was followed by a comparison of the findings with literature. The researcher then reflected on personal meanings of findings and stated new questions based on the findings. The reflective role of the researcher sets qualitative research apart from quantitative research as their personal views and characterisations come in to play (Creswell and Plano Clark, 2011).

f. Validating the data and results

The standards of quality in qualitative studies are; validity, credibility, and trustworthiness (Morrow and Smith, 2000). Lincoln and Guba (2000) elaborate on these criteria by looking at transferability, dependability, and confirmability.

i. Validity

Overall, checking for qualitative validity means assessing whether the information obtained through the qualitative data collection is accurate (Creswell and Plano Clark, 2011). Member checking was used by taking summaries of findings back to key participants and confirming the accuracy of the accounts.

ii. Credibility

Credibility refers to the idea of internal consistency where the core issue is how to ensure rigour in the research process and how this is communicated to others that it has been done (Lincoln and Guba, 2000).In this study, this was achieved by taking summaries of findings back to key participants and confirming the accuracy of the accounts. A thorough description of the source data and the fit between the data and the emerging analysis will be given to enhance credibility (Morrow, 2005). Through prior contact the researcher developed a relationship of trust with most of the participants as well as an understanding of the organisation and this enhanced credibility of the research (Shenton, 2004).

iii. Transferability

Transferability refers to the extent to which the reader is able to generalise the findings of a study to his or her own context (Morrow, 2005). Information on the research context, processes, participants, and researcher-participant relationships was clearly outlined in the current study to enable the reader to decide how the findings may transfer (Morrow, 2005).

iv. Dependability

Dependability looks at the way in which a study is conducted and should be consistent across time, researchers and analysis techniques (Gasson, 2004). Based on Morrow (2005), the chronology of research activities and processes, influences on the data collection and analysis, emerging themes, categories and memos for this study were examined by the Supervisor to ensure dependability. This enables a future researcher to repeat the work (Shenton, 2004).

v. Confirmability

Confirmability is based on the acknowledgement that the research is not objective (Morrow, 2005). Steps must be taken to ensure as far as possible that the work's findings are the result of experiences and ideas of the informants, rather than the characteristics and preferences of the researcher (Shenton, 2004).As this is a qualitative study employing in-depth interviews as

the strategy, the findings will be representative of the situation being researched. Subjectivity was managed throughout the research by reflecting on the researcher's values and objectives and how these affected the research.

Ethical Considerations

Ethics are defined as the norms and standards of behaviour that guide moral choices about our behaviour and our relationships with others (Cooper and Schindler, 2011). The goal of ethics in research is to ensure that no-one is harmed or suffers adverse consequences from research activities (Cooper and Schindler, 2011).

Cooper and Schindler (2011) examine ethical considerations as follows:

1. **Ethical treatment of participants**

   Participants must not suffer physical harm, discomfort, pain, embarrassment or loss of privacy.

2. **Deception**

   Deception occurs when the participants are told only part of the truth or the truth is fully compromised.

3. **Informed Consent**

   Securing informed consent from participants is a matter of fully disclosing the procedures of the survey and interview before requesting permission to proceed with the study.

4. **Right to privacy**

   The privacy guarantee is important not only to maintain validity of the research but also to protect the participants. Once a guarantee of confidentiality is given, protecting that confidentiality is essential.

   For this study, the purpose of the study will be explained to the company under research. Waste information is considered to be sensitive in many organisations, and therefore written approval will be obtained from the company to conduct the study and a non-disclosure agreement signed. The name of the company and quick service restaurant brand will be kept anonymous. The researcher will also obtain the necessary ethics clearance from the School's Ethics Committee.

Structure of the dissertation

This section looks at the flow of the research from commencement right up to conclusions and implications. The major components of the dissertation are; overview of the study, literature review, methodology, analysis and discussion of data, and conclusion and implications.

Chapter 1: Overview of the Study

The dissertation will start off with an overview of the study. The overview contains an introduction, background, research problem, research questions, justification for the study, methodology, outline of the report, delimitations of scope and key assumptions, and finally the conclusion.

Chapter 2: Literature Review

The literature review section of the study is comprised of an introduction, research context, theoretical grounding, empirical literature review and conclusion.

Chapter 3: Research design and Methodology

Research design and methodology contains an introduction, a discussion of the research strategy, research philosophy, research design, qualitative research, research approach adopted for this study, research procedure and methods, target population and sampling, procedure for data collection, data processing and analysis, research reliability and validity measures, and limitations of the study.

Chapter 4: Data analysis

This chapter presents and describes the results. As this is a qualitative study, this section will identify and discuss the major themes identified in the study.

Chapter 5: Discussion of results, Conclusion, Recommendations, and Future research

The dissertation will end with conclusions, recommendations and future research. Conclusions will be stated with reference to each of the research questions. Managerial, theoretical, marketing implications will be discussed in this chapter. Limitations and future research will close off the chapter.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

The literature review section consists of the research context, two (2) theoretical groundings, literature review of major themes, and lastly, a conclusion. The background of the company under study was looked at in detail in the research context section of the literature review. The theoretical grounding section explored the theories of Root Cause Analysis and Natural Resource Based View. The literature review of major themes delved into extant literature to reveal the causes of food waste along the food supply chain and the supply chain elements under review are: processing, packaging, distribution and food service. The literature review section wound off with a conclusion and the next chapter; Research Design and Methodology will follow.

2.2. Research Context

The research context section gives an overview of the company, product and/or sample under study.

2.2.1 QSR Sector and company under study

The company under study is listed on the Johannesburg Stock exchange with a market capitalization of 14.79billion (Bloomberg, 2017). The company operates in the consumer services category focusing on branded food services (Integrated Annual Report, 2017). Fast Food (the actual industry term is Quick Service Restaurant - QSR) is best described as concepts such as McDonald's, KFC, and Burger King (Celentano, 2017). Some quick service restaurants offer a sit-in, take-away or drive-through option. Food is prepared as the customer waits. Restaurants can either be owned by a corporate or are franchised. The South African Quick Service Restaurant industry is characterised by several brands such as KFC, Steers, Wimpy, Debonairs, The Fish and Chip Co, and Nando’s (BusinessTech, 2016). The company owns the highest number of quick service restaurants in South Africa, with the number standing at 2270 as at the end of FY17(Integrated Annual Report, 2017).

2.2.2 Supply Chain

If a company is using goods and services from outside sources, it needs to choose one of the supply chain strategies such as negotiating with many supplier, long-term relationships with a few partners, vertical integration, keiretsu or developing virtual companies that use suppliers on an as-needed basis (Heizer and Render, 2012). Through backward integration, the company under study has representation or control of the supply chain from ‘farm to fork’. A supply chain is the alignment of firms that bring products or services to market (Lambert, Stock and

Ellram, 1998). The stages of the food supply chain are; agricultural production, post-harvest handling and storage, processing and packing, distribution and consumption (FAO, 2011). The scope of the research is limited to food waste in the processing and packaging, warehousing, distribution and food preparation stages of the supply chain as illustrated in Figure 2.1.

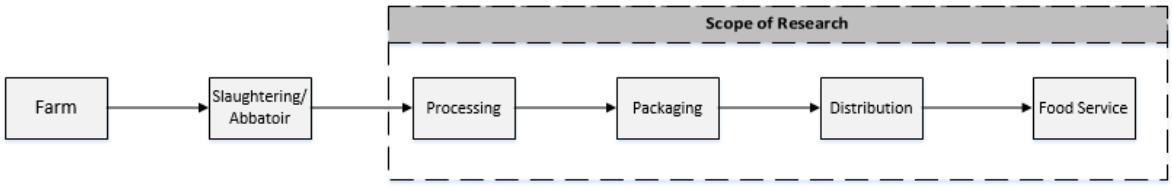


Figure 2.1: Scope of the research

Source: Compiled by the researcher (2017)

Derived from the scope of the research depicted in Figure 2.1, this study focused on one brand within the company's portfolio and the meat product category is the choice of product to be studied. The meat product category consists of beef, chicken, pork and fish. In 2016, 7.2million kg of beef, 5.2million kg of pork, 4.68million kg of chicken and 2.2.million kg of fish flowed through the company's supply chain (Integrated Annual Report, 2017). The choice of meat as the product category to be studied was based on its contribution to waste is supported by the findings of scholars who find that meat products generate high burdens at the production stage (Williams, Audsley and Sandars, 2006); and that greenhouse gases are produced during the production of meat (Gustafsson et al. 2011). Meat is also fast becoming a major component of consumers' diets with the general trend being in favour of more nutritious and more diversified diets with a higher proportion of animal products and high value crops and away from traditional cereals (Lundqvist, 2008). This concurs with the findings of Wasserman (2009) who found that as more people expect higher standards of living, one of the first changes in diet is to want more animal protein, notably seafood and beef. The quick service restaurant brand under study sells burgers as its biggest menu offering.

2.3. Theoretical Grounding

This paper is grounded in the Root Cause Analysis and Natural Resource Based View Theories. The theoretical grounding section will look at the two theories in depth, their applications in previous studies and relevance to this study.

2.3.1. Root Cause Analysis (RCA)

In order to ensure its place in the market, an organisation has to produce such products and services that meet wishes and expectations of customers (Stefanovic, Kiss, Stanojevic and Janjic, 2014). They further note that an organisation needs to make continuous improvements in order to compete effectively whilst meeting increased consumer demands for higher quality, and one way of doing this is practicing Ishikawa. One of the means of reducing inefficiencies in the supply chain is to implement Lean Management. Lean Management involves identifying all types of waste in the value stream of the supply chain and taking steps to minimise them (Wu and Wee, 2009). Root cause analysis (RCA) is a class of problem solving methods aimed at identifying the root causes of problems or events (Assen, Berg and Pietersma, 2009).

The cause-effect diagram is the result of a general analysis of the impact (cause) that causes a particular outcome or observed phenomena (Stefanovic et al. 2014). It is used to identify the actual causes of a particular condition as a result of the company's operations and also looks at the relationship in the flow of materials, energy and information which provide the basis for effective troubleshooting (Stefanovic et al. 2014). The Ishikawa diagram, also known as Fishbone diagram or Cause-and-effect diagram is considered as one of the seven basic tools of quality control (Kram, Tosanovic and Hegedic, 2015). Stefanovic et al. (2014) define cause as a set of environmental conditions and processes of the system that result in a particular state of the outcome of the work: from the standpoint of achieving the projected state. They further define effect as: a certain outcome of the work of the observed view of the system at a given time and under given circumstances. As per the findings of Mena et al. (2011), the comments collected from interviews present a range of reasons for food and packaging waste and as many of these causes are interconnected and appear to be the symptoms of a wider problem and not necessarily the root causes. Figure 2.2 presents the current reality tree, as used by Mena et al. (2011) to trace the relationships between the causes of food and packaging waste in a supplier-retailer interface. The current reality tree highlights the root causes of food and packaging waste.

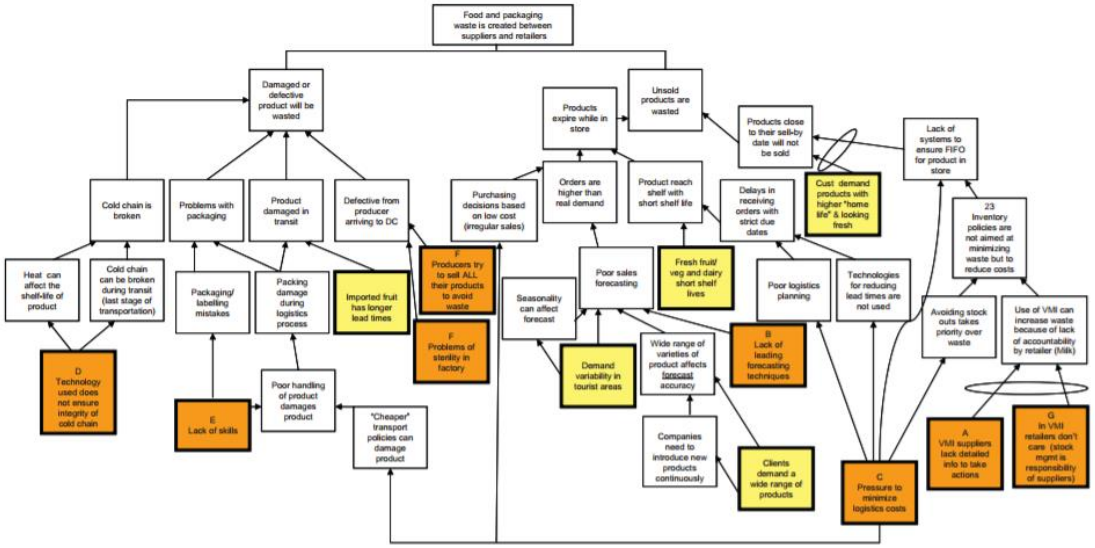


Figure 2.2: Current Reality Tree: Spain

Source: Resources, Conservation and Recycling 55 (2011) 648-658

In the case of this study, the current reality tree was used to trace the relationships between the causes of food waste in the quick service restaurant supply chain in order to identify the root causes of food waste. For example, it could be found that food waste in the food service stage of the supply chain could be due to breaking of cold chain in the distribution stage. Findings will be presented as a current reality tree.

2.3.2. Natural Resource Based View Theory (NRBV)

The second theory in which the present study is grounded is the Natural Resource Based View. Hart (1995) put forward that it is likely that strategy and competitive advantage in the coming years would be rooted in capabilities that facilitate environmentally sustainable economic activity. This is in line with the earlier works of Barney (1991); Wernerfelt (1984) in the Resource Based View where competitive advantage can be gained by the use of a firm's resources that are valuable and rare, and this advantage can be sustained for longer periods of time if the resources can be protected from imitation, substitution and transferability. Gold, Seuring and Beske (2010) extended this logic to argue that the supply chain collaboration can be a source of sustained competitive advantage because it grows historically and involves socially complex interactions and causally ambiguous relationships that can be particularly difficult to imitate for competitors. Wernerfelt (1984) defined resources as anything that could be thought of as a strength and weakness of a given firm. Barney (1991) on the other hand defines resources as assets, capabilities, organisational process, firm attributes, information, and knowledge controlled by an enterprise that enable the firm to conceive and implement

strategies with the goal to improve its efficiency and effectiveness. Christmann (2000) applied the concept of complementary assets, developed by the Resource Based View, to analyse the competitive effects of environmental practices and found that capabilities for process innovation and implementation moderate the relationship between environmental best practice and cost advantage.

The Natural Resource Based View looks at three key strategic capabilities; pollution prevention, product stewardship and sustainable development (Hart, 1995). Hart (1995) argued that firms need to develop environmentally sustainable capabilities to remain competitive. Hart (1995) focuses exclusively on natural resources and emphasises the link between a firm's relationship to the natural environment and its ability to create a competitive advantage. Hart (1995) proposed linkages among strategic capabilities, environmental factors, resources and the potential source of competitive advantage as shown in Hart's original table in Figure 2.3.

Stage	Internal (competitive advantage)	External (social legitimacy)
Pollution prevention	Tacit (causally ambiguous) For example: sharing real demand data and waste date	Transparency • Public scrutiny
Product Stewardship	Socially complex (process based)For example: Industry best practice sharing, training	Legislation Stakeholder integration • Education on shelf-life
Sustainable development	Rare (firm specific) For example: lifecycle environmental impact, lifecycle cost	Safety, storage Collaboration Education

Figure 2.3: A path to a sustainable competitive advantage

Source: Mena et al. (2014); adapted from Hart (1995)

As depicted in Figure 2.3, lower costs, rather than higher costs, can be an outcome of pollution prevention done well (Hart, 1995). Improved relationships across supply networks can lead to improved environmental and financial outcomes (Lai, Cheng and Tang, 2010). Carter and Carter (1998) argued that closer relationships with suppliers lead to greater supplier involvement in environmental initiatives, such as, recycling, reuse and waste reduction. Mena et al. (2014) found that because food systems depend on accurate data, improving transparency of demand and supply is likely to improve initial planting and slaughter. They further linked this to the NRBV where Hart (1995) proposed that pollution is a form of waste that can be prevented by focusing on internal systems, such as total quality management. Mena et al. (2014) propounded that improved supply-chain wide transparency of demand information

upstream in the supply network versus a focus on only internal requirements can reduce supply-chain wide food waste.

The Natural Resource Based View theory has evolved with the area of sustainable corporate development strategy being split into clean technology and base of pyramid (Hart, 1997). The second major direction in which the sustainable development element of the NRBV has evolved is the increased attention to the role of corporations in alleviating poverty for the poorest of the world's citizens (Hart and Dowell, 2011). Following the method used by Mena et al. (2014), this research aims to contribute to the development of theory by building on NRBV and exploring the aspects of NRBV capabilities related to waste for meat products in the quick service restaurant supply chain.

2.4. Literature Review of major themes

2.4.1. Food Waste

i. Definitions of food waste

'Food' refers to any substance – whether processed, semi-processed, or raw – that is intended for human consumption or, more specifically ingestion (Food Loss and Waste Protocol, 2016). Several scholars have defined food waste and these definitions vary as below. Food waste refers to food that is in good quality and fit for human consumption but that does not get consumed because it is discarded, either before or after it spoils (Lipinski, Hanson, Lomax, Kitinoja, Waite and Searchinger, 2013). European Commission (1991) defines waste as any substance or object the holder discards, intends to discard or is required to discard. Food waste is composed of raw or cooked food materials and includes food waste before, during and after meal preparation in the household, as well as food losses in the manufacturing, distribution, retail and food services activities (European Commission, 2010). It is also defined as food produced to be addressed to humans that is disposed or recovered, excluding the fractions that are fed to animals and sent to bio-based material production or biochemical processing (Ostergren and Gustavsson, 2014). Wastage generally refers to the deliberate discarding and throwing away of food that is fit for purpose and perfectly good to eat (Knight and Davis, 2007).

Some scholars have differentiated between food waste and food loss based on which part of the food supply chain the loss occurs and why it occurs. Food loss refers to the decrease in food quantity or quality, which makes it unfit for human consumption (Grolleaud, 2002). Food loss is the amount of food intended for human consumption that for any reason is not destined to its

main purpose (FAO, 2014). Parfitt et al. (2010) define food loss as losses that occur in the production, post-harvest processing and distribution stages of the food supply chain. Food waste describes losses that take place at the retail and consumer stages due to marketing activities, economic forces, regulatory measures, poor stock management and consumer attitudes (FAO, 2011; Parfitt et al. 2010). Food loss is typically considered unintended and caused by poor functioning of the food production and supply chain system or by poor institutional and legal frameworks, for example, food loss due to poor infrastructure like refrigeration (FAO, 2010).Food waste, on the other hand, occurs due to intended behaviours – by choice, such as poor stock management or neglect, expiry or spoiling of food (FAO, 2010). For the purposes of this study, the term 'food waste' will be used to encompass both food waste and food loss.

ii. Types of food waste

Gobel et al. (2012) as cited by Priefer et al. (2016) further classify food waste into unavoidable and avoidable food waste where unavoidable food waste are the non-edible parts of raw products. According to WRAP (2009), unavoidable food waste is waste arising from food preparation that is not, and has not been, edible under normal circumstances. Avoidable food waste, on the other hand, consists of products that are still fit for human consumption at the time of discarding or products that would have been edible if they were eaten in time (Gobel et al. 2012). WRAP (2009) concurs with this definition of avoidable waste, stating that it is food thrown away that was at some point prior to disposal, edible in the vast majority of situations. According to Ventour (2008), up to 81% of food waste consists of food that could have been eaten, if it had been managed, distributed or prepared in a different way and only 19% of food waste consists of inedible items such as peelings and bones, and this is truly unavoidable.

iii. Importance of food waste reduction

Food waste reduction is important for various reasons and several literature was reviewed to unravel the benefits thereof. According to Lipinski et al. (2013), while food waste reduction increases food availability, it can alleviate poverty and provide gender benefits while reducing pressure for ecosystems, climate and water. Interviews with government and business leaders indicate that there are a number of strategic yet nonfinancial motivators for reducing food loss and waste. These relate to food security, waste regulations, environmental sustainability, stakeholder relationships, and a sense of ethical responsibility (Champion 12.3, 2016). The

disposal of inedible food represents the loss of potentially valuable resources that could be used as an input to other processes such as composting, the production of biogas or animal feed (Nahman et al. 2012). Wasted food also implies that the resources used in producing food are wasted, for example, 62% of all water used in South Africa is used by the agricultural sector (Council for Scientific and Industrial Research, 2010). By reducing food waste, such that less food would need to be produced, agricultural water use could therefore be reduced (Lundqvist et al. 2008).

Efforts to reduce meat waste are also important in order to reduce the environmental impact of food waste as the production of meat protein has a much higher environmental load than process protein food based on soybeans (Reijnders and Soret, 2003). Greenhouse gases are released during production, especially meat production, transport, processing and storage of food, thereby contributing to climate change (Gustafsson et al. 2011). The disposal of food waste to landfill is also a significant contributor to greenhouse gas emissions, as well as leachate (Hartmann and Ahring, 2006; WRAP, 2008). Landfill gas, generated during decomposition of organic waste, is largely made up of methane, 40-70% by dry volume (European Commission, 2000) which has 20-25 times stronger warming effect than CO2 on a molecular basis (El-Fadel, Findikakis and Leckie, 1997). In light of the threats associated with global change and considering the concern over food security in large parts of the developing world (Gustafsson et al. 2011), it is important to understand the magnitude of food waste globally. The costs of food waste tend to be under-valued, particularly in developed countries where food represents only a small portion of consumers' total budgets (Gunders, 2012; Institute of Mechanical Engineers, 2013). Increasing demand for natural resources, fuelled by growth in population and wealth, is considered a major threat to sustainable development, raising calls for a complete redesign of supply systems to achieve greater resource efficacy and efficiency (Mena, Terry, Williams and Ellram, 2014).

On a per capita basis, overall food waste throughout the supply chain is far higher in developed than developing countries (Nahman and de Lange, 2012). According to Gustafsson et al. (2011), food waste amounts to 280-300kg/person/annum in Europe and North America respectively, compared to 170kg/person/annum in sub-Saharan Africa. In the United Kingdom, the cost of household food waste is estimated at about £10.2billion per annum or £420 per household per year (Ventour, 2008). Nahman et al. (2012) estimated the cost of post-consumer food waste in South Africa at approximately R21.7billion per annum. This included the costs of wasted edible food as well as bot the financial and external costs of disposal to landfill.

Nahman and de Lange (2013) further looked at the cost of food waste across the food value chain in South Africa, and this was estimated at R61.5billion per annum(including pre and post-consumer food waste), and this was equivalent to 2.1% of South Africa's 2011 GDP. Food waste in high income countries is mainly caused by the tendency of consumers and the catering industry to buy more food than they need, and of farmers to leave food in the field in response to either market forces, weather or pest-related damage (Gustafsson et al. 2011; Gunders, 2012). In contrast, Parfitt et al. (2010) found that in developing countries, food waste arises mainly due to financial, managerial and technical limitations in harvesting techniques, storage and cooling facilities, infrastructure, packaging and marketing systems.

Nahman and de Lange (2013) found that although meat contributes significantly less quantities of food waste when compared to fruits and vegetables, the cost of food waste for meat paints a very dramatic picture as depicted in Figure 2.4.

Commodity group	Agricultural production	Post-harvest handling and storage	Processing and packaging	Distribution	Consumption	Total (Thousand Rands)
Cereals	885 241	1 389 970	840 498	706 094	453 674	4 275 477
Roots and Tubers	586 814	735 983	716 636	410 081	324 916	2 774 431
Oil seeds & Pulses	690 445	505 045	1 393 923	517 629	258 051	3 365 093
Fruits and Vegetables	3 102 702	2 622 700	7 983 722	6 370 082	2 301 683	22 380 890
Meat	5 753 134	312 479	2 855 605	6 182 060	2 179 439	17 282 718
Fish and Seafood	959 025	1 142 350	1 879 166	3 408 000	434 520	7 823 061
Milk	558 420	994 422	11 550	2 020 358	21 333	3 606 083
Total	12 535 782	7 702 949	15 681 100	19 614 305	5 973 616	61 507 753

Figure 2.4: The cost of food waste along the value chain: Evidence from South Africa

Source: Nahman and de Lange (2013)

Nahman and de Lange (2013) found that meat, together with seafood, contributes 41% to the total cost of food waste in South Africa as a result of their associated market prices. Nahman and de Lange (2013) concluded that interventions should be targeted at all stages of the meat and fruit and vegetable value chain and the processing and packaging and distribution stages of the value chain for all commodities. The above findings of Nahman and de Lange (2013) together with the environmental impact of meat production (Reijnders and Soret, 2003; Gustafsson et al. 2011), reinforce the importance of interrogating the causes of meat food waste in the quick service restaurant sector in South Africa.

iv. Supply chain stages and food waste

Food waste arises throughout the food supply chain, including during production, storage, transportation, processing and at retailers and in the kitchens of restaurants and households (Lundqvist et al. 2008). Estimates suggest that post-consumer food waste accounts for only 4.14% of food waste in South Africa (Oelofse and Nahman, in press). This is in contrast to the figures from the European Union where 42% of the total waste is generated by households, 39% by the production and processing sector, 14% by the food services and catering sector and 5% by the retail and wholesale sector (European Commission, 2010). Raak, Symmank, Zahn, Aschermann-Witzel and Rohm (2017) identify three main areas for food waste generation in available literature, and these are; product deterioration and spoilage during logistical operations, by-products from food processing and consumer perception of quality and safety. Food loss or spoilage often occurs because of lack of or failing infrastructure (Parfitt et al. 2010). Although food is wasted at all parts of the supply chain stages, the cause of food waste does not necessarily arise at the same stage as the waste itself (Adenso-Diaz and Mena, 2014; Mena, Terry, Williams and Ellram, 2014; Gobel, Langen, Blumenthal, Teitscheid and Ritter, 2015). Food waste by stage of the supply chain is explored in the existing literature in the sections that follow.

The Quick Service Restaurant supply chain elements

2.4.2. Processing

Lundqvist et al. (2008) found that spoilage during processing and technical infrastructure are factors that contribute to food waste in the processing stage of the supply chain. Spoilage is another term used to highlight problems with the harvested crops and other food items during transport, processing and packaging (Lundqvist et al. 2008). Verghese et al. (2015) identify sources of food waste in the processing stage as product waste during start up, rejects due to quality control, spillage, regular planned shutdowns and equipment failures. Food losses at this stage include (trimmings of both the edible (fats, skins, end pieces) and inedible (pits and bones) (Gunders, 2012). In the meat industry, lack of demand for many animal parts such as offal is a contributor to food waste (Stuart, 2009). The possible reasons for food waste in the processing stage for animal and animal products are processes food losses(inefficiencies, contamination), unavoidable losses(bones, leather) and food damaged due to inappropriate packaging (Corrado, Ardente, Sala and Saouter, 2016). Priefer, Jorisse and Brautigam (2016) found that the reason for food waste in the manufacturing stage of the food supply chain to be; irregular sized products trimmed to fit or rejected completely, inconsistency of manufacturing processes leading to misshapen products or product damage, contamination in the production

process and food spoilage due to packaging problems. Mena, Terry, Williams and Ellram (2014) found that planning, forecasting and information flow, promotion management, availability and inventory management, and process control were the main causes of food waste in the processing stage of the meat supply chain.

Processing and manufacturing are important in the food supply chain as they introduce the picture of food preservation and safety, separation and refinement of raw materials and finished product assembly (Mena et al. 2014). Quality of products is of paramount importance to food service organisations and this might be delivered at the expense of other service delivery elements. Mena, Adenso and Yurt (2010) found that quality issues can lead to waste and sometimes quality is more important to companies than the waste created. Raak et al. (2017) conducted expert interviews which revealed the caused for food waste in the processing sector as; losses resulting from processing operations and quality assurance, and products not fulfilling quality demands from trade. They further identify the drivers for processing-related food waste as; research and development, cleaning losses and samples for quality control and analysis (resulting in intended losses);power blackouts, equipment defects, residues from technical operations, human errors and presumable causes with safety hazards resulting in unintended losses. In the case of meat, Raak et al. (2017) found that in severe cases, entire production lots have to be eliminated when foreign body contamination is suspected.

Gustafsson et al. (2011) estimate that 5% of meat is wasted in the processing and packaging stage. Based on the production figures for 2009, Oelofse and Nahman (2013) found that 67 000 tonnes of meat was wasted in the processing and packaging stage of the supply chain. They further found that 27% of food waste happens in the processing and packaging stages for all commodity groups. For the meat category, Nahman and de Lange (2013) found that processing and packaging contributed 17% of the total cost of food waste. 39% of food losses in the European Union occur in food manufacturing (European Commission, 2011). Lipinski et al. (2013) suggest re-engineering of manufacturing processes and improvement in supply chain management as possible approaches to reducing food waste. Meat and milk are almost unavoidably contaminated to some extent during production(Betts, 2006), but microorganisms may be eliminated by heat treatment, or alteration of the food, by freezing for example, so that microbial growth is unlikely(Raak et al. 2017).

2.4.3. Packaging

Gustafsson et al. (2011) identify 3 types of packaging; primary, secondary and tertiary packaging. Primary packaging holds the basic product and secondary packaging is designed to

hold several primary packages. Tertiary packaging comes into use when a number of primary of secondary packages need to be moved at the same time and are packed on a pallet for example. Mena et al. (2014) found that packaging protects product form damage and can extend the shelf life of some products. They also state the meat products require both primary and secondary packaging and this kind of waste needs to be disposed of appropriately due to possible microbial contamination. In a Norwegian study, 15% of the consumers stated that packaging is an important cause for food waste, and 30% of the consumers stated that the too large packages are one important cause for food waste (Fredriksen, Sorensen, Maroni and Krokan, 2010). It is still uncertain however, how extensive the packaging related food waste is and, therefore, it is uncertain to what extent packaging can be used to reduce food waste (Sonesson, Antesson, Davis and Sjoden, 2005; Fredriksen et al. 2010). Mena et al. (2014) found that promotions management, availability and inventory management, product specifications, process control, and packaging and labelling were the main causes of food waste in the packaging stage of the meat supply chain.

Lipinski et al. (2013) suggested the use of reusable plastic crates instead of bags as packaging for crops and a change in food date labels to reduce consumer confusion about best before date in order to reduce food waste. They further recommend improved packaging to keep food fresher for longer as a possible approach to reducing food waste. Previous studies have shown a large potential in packaging development, since packaging can reduce food losses directly and indirectly (Williams, Wikstrom, Otterbring, Lofgren and Gustafsson, 2011). Providing information on storage of food item to make it durable for a long time or how to interpret best before dates are indirect ways to reduce food losses. Variation in packaging sizes is a direct aspect (Williams et al. 2011). When relating packaging to food waste, food gone past its sell by date was mentioned as the main driver (Lyndhurst, Cox and Downing, 2007). Shelf life is defined as the time span during which a particular food remains safe, complies with label declarations and nutritional data, and retains its expected sensory, chemical, physical and microbiological characteristics (Betts, 2006). Further definitions of food product dates are outlined in Table 2.1.

Term	Definition
Sell by/Display until	how long to display product in store
Best Before	recommends by when one should consume the product in order to experience peak flavour and quality and is not related to food safety
Use-by	the last date recommended for use of the product from a food safety perspective

Table 2.1: Definitions of food product dates

Source: USDA (2011)

Mena et al. (2014) applied Hart's Natural Resource Based View theory and observed that processes that reduce waste in one area (product waste), but contribute to waste in another area (packaging waste) are less than optimal. Mena, Adenso-Diaz and Yurt (2010) note that packaging will at some point go to waste, either in the supply chain or at the point of consumption, so excessive packaging needs to be avoided. This is critical in the choice of packaging to be used and how much to use. Intelligent food packaging – that aims to provide the user with reliable information on food quality and safety, environmental conditions during storage and transportation, and or package integrity – is an option of packaging that can be used to minimize food waste as a result of packaging (European Commission, 2011). Rossaint and Kreyenschmidt (2015) assumed that temperature indicators could help reduce poultry waste in the German food supply chain by 35%.

2.4.4. Distribution

According to van Assen et al. (2009) outbound logistics refers to activities such as order processing, warehousing, scheduling transportation and distribution management. Lipinski et al. (2013) suggest an improvement in inventory systems as a means to reducing food waste. Verghese et al. (2015) found that food waste in the distribution stage of the food supply chain is as a result of damage in transit or storage due to packaging failures, product spoilage, fresh produce not meeting specifications or damaged during handling and, inadequate remaining shelf life due to poor stock rotation or low sales. This is similar to the findings of Priefer, Jorissen and Brautigam (2016) who found that, in distribution, losses may arise due to packaging, damages, non-compliance with food safety requirements, exceeding expiry dates, inadequate stock management, marketing strategies and logistical constraints. They further find that lack of cold storage or interruption of the cold chain and packaging defects also cause food waste in the distribution stage off the supply chain. Li and Thomas (2014) also found that all logistical operations along the food supply chain bear the risk for mechanical product damages such as package deformation.

With meat being temperature sensitive in fresh or frozen form, cold chain maintenance throughout distribution is of utmost importance with Kreyenschmidt et al. (2010) suggesting further studies on the use of temperature time indicators which show the state of a product via colour changes. This is assumed to reduce food waste by indicating the real perishableness of

a product. However, this can also result in an increase in food waste. Gustafsson et al. (2011) found that 7% of meat products are wasted in the distribution stage of the supply chain in sub-Saharan Africa. Corrado et al. (2016) find that food waste in the distribution stage of the supply chain for animal and animal products is as a result of food damaged due to lack of cooling, storage facilities, expired food, unsold food and rejected food after quality control. A high fraction of food losses was recently attributed to insufficient cold chain realisation (Jedermann, Nicomento, Uysal, and Lang, 2014). Improved logistics may help to optimise the supply chain and radio frequency identification(RFID) and GPS technologies ensure fast communication and contribute to better transport modalities and up to date information concerning shelf life (Grunow and Piramuthu, 2013; Kumari, Narsaiah, Grewal and Anurag, 2015). Intelligent packaging can monitor quality and safety attributes of products along the supply chain, so that weak points in logistics may be uncovered (Heising, Dekker, Bartels and Van Boekel, 2014; Rossaint and Kreyenschmidt, 2015; Vanderroost, Ragaert, Devlieghere and Meulenaer, 2014).

2.4.5. Food Service

Demand for convenience food and its popularity can be explained by change in household demographics such as larger number of working women and an inter-generational shift in domestic cooking skills (Brunner, van der Horst and Siegrist, 2010). Use of convenience food in the United Kingdom has been recognized as central to domestic food production (Burnett, 1979; DEFRA, 2015). The catering and food services sector is the fastest growing sector of the food chain in the developed world and many of these businesses are truly global: backed by powerful advertising, the consumer recognizes the offering of convenience and reliability, whether home or abroad (Lillford, 2008). Lillford (2008) states that these companies have massive volume turnover, for example, the largest provider of ice-cream is probably not Unilever or Nestle, but McDonalds.

Priefer, Jorissen and Brautigam (2016) found that difficulties in assessing demand, hygiene rules (such as disposal of cooked food after a certain time-frame), and difficulties in assessing the demand (number of customers) result in food waste at the food service outlet. They further found that; training of staff as well as the improvement of the internal routines for purchasing, storing and freezing is crucial for the hospitality sector. Corrado et al. (2016) concluded that food waste in the consumption stage of the food supply chain is as a result of food damage due to lack of storage facilities, excess food preparation, passed expiry date, inappropriate pack-sizes and low consumer appreciation. Demand forecasting based on historical consumption data is also key to reducing food waste in the food service outlet (Priefer, Jorissen and

Brautigam, 2016). Priefer, Jorissen and Brautigam (2016) concluded that collection and documentation of food waste data helps to identify the change in food waste composition and detect the most vulnerable points at each restaurant.

2.5. Conclusion

The literature review section consisted of the research context, two (2) theoretical groundings and a literature review of major themes. The background of the company under study was detailed in the research context section of the literature review. The theoretical grounding section explored the theories of Root Cause Analysis and Natural Resource Based View. The literature review of major themes delved into extant literature to reveal the causes of food waste along the food supply chain and the supply chain elements under review were: processing, packaging, distribution and food service. In the next chapter of the research report (Chapter 3): Research Design and Methodology, the research philosophy, approach, method, strategy and design applied for this study will be explored.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

The research design and methodology section outlines the research philosophy, approach, method and strategy. The research design specifies the sampling design which consists of the case study selection, sampling method and sample size. The questionnaire design details the questions posed to the respondents.

3.2. Research Philosophy and Design

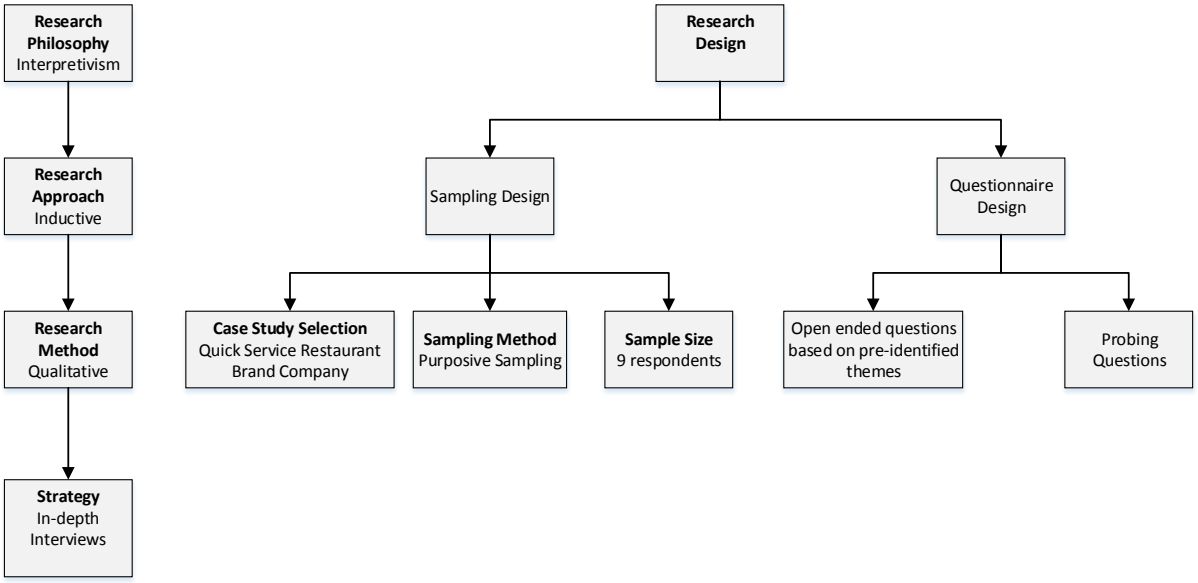


Figure 3.1: Research Philosophy and Design

Source: Compiled by Researcher (2017)

Figure 3.1 presents a summary of the research philosophy and design followed by a discussion of the methodology adapted for the purpose of the present study.

3.2.1. Research Philosophy

A researcher's philosophy is his or her personal view of what constitutes acceptable knowledge and the process by which this is developed (Saunders and Tausey, 2012). The main research philosophies are positivism, realism, interpretivism (constructivism) and pragmatism.

According to Slife and Williams (quoted by Creswell and Plano Clark, 2011), positivism is often associated with quantitative approaches where researchers make claims for knowledge based on cause-and-effect thinking, focusing on select variables to interrelate, detailed observation and measures of variable and the testing of theories that are continually. Realism is a philosophical position associated with scientific enquiry and states that reality exists independent of the mind and that the researcher's senses show them the truth, although the

researcher is influenced by world views and their own experiences (Saunders and Tausey, 2012). Realism would be associated with a mixed-method approach. Constructivism is typically associated with qualitative approaches and the worldview is made up of understanding or meaning of phenomena, formed through participants and their subjective views. Research in constructivism is shaped 'from the bottom up' – from individual perspectives to broad patterns and, ultimately, to broad understandings ((Creswell and Plano Clark, 2011) and Clark, 2011). For researchers who adopt pragmatism, the importance of research is in the findings' practical implications (Saunders and Tausey, 2012). Pragmatism uses multiple methods of data collection to inform the problems under study (Creswell and Plano Clark, 2011) and (Clark, 2011).

The present study is positioned in the interpretivism philosophy as it sought to explore the factors that influence food waste in a quick service restaurant supply chain. Insights were gathered from managers and their perceptions used to build understanding.

3.2.2. Research Approach

A research approach is the process of deciding whether the research calls for descriptive, exploratory or causal research (Kolb, 2008). It is the nature of the research that will be conducted in order to answer a research question. There are three possible research approaches; deduction, induction and abduction.

Deduction arguments are based on laws, rules and accepted principles. Deduction is a form of argument that purports to be conclusive and that the conclusion must follow from the reasons given (Cooper and Schindler, 2011). In a deductive approach, researchers test theory (Creswell and Plano Clark, 2011). Deduction tests theory through observations and is oriented to cause and effect. It follows a predetermined design and separates data collection and analysis (Morgan, 2014). In deduction, conclusions are drawn from one or more particular facts or pieces of evidence (Cooper and Schindler, 2011).The inductive approach begins with observations to broader observations and ultimately theory (Creswell and Plano Clark, 2011). The deductive approach is normally associated with quantitative studies whilst the induction approach is associated with quantitative studies.

This study aimed to understand what causes and why food waste happens in the quick service restaurant supply chain. The research approach was inductive as what was being researched is a function of a particular set of circumstances and individuals at a specific time (Saunders and Tausey, 2012). Induction generates theory from observations and is oriented to discovery and

observation (Morgan, 2014). The inductive approach enabled the researcher to obtain rich meanings, understand the causes for food waste and broadly interpret the information provided by the participants. This approach is ideal for an exploratory study.

3.2.3. Research Method

The research method details how the research was be conducted and can be classified as quantitative, qualitative or mixed methods. Quantitative research employs measurement procedures that incorporate concrete specifications of the particular phenomenon of interest (Westerman, 2014). Quantitative research emphasises things that can be measured and results do not depend on beliefs (Morgan, 2014). Qualitative research looks for an in-depth understanding of a central phenomenon (Creswell and Plano Clark, 2011) and (Clark, 2012). Qualitative research emphasises meanings and interpretations and tries to understand others' perspectives (Morgan, 2014). The purpose of qualitative research is based on researcher immersion in the phenomenon to be studied, gathering data which provide a detailed description of events, situations and interaction between people and things, providing depth and detail (Cooper and Schindler, 2011). In mixed methods, the researcher collects and analyses persuasively and rigorously both qualitative and qualitative data (Creswell and Plano Clark, 2011).

The research method for this study was qualitative in the form of an exploratory case study. Prior research has been limited by availability of data and no previous work on food waste could be found in a South African and quick service restaurant context. As such, qualitative research was the ideal method as it resulted in an in-depth understanding of food waste and enabled theory building for further research.

3.2.4. Research Strategy

Semi structured in-depth interviews were used as the strategy for data collection. The typical semi-structured interview includes both the topics of interest to the researcher and additional interests and insights that the participant raises (Morgan, 2014). Interviews in a case study are standardised, open-ended and phenomenological (Henning, Smit and Van Rensburg, 2004). (Henning, Smit and Van Rensburg, 2004) further describe an in-depth interview as a face to face interaction between the interviewer and an informant which seeks to build the kind of intimacy that is common for mutual self-disclosure. The researcher needs to make sense of what the research participant is telling them to increase understanding of that person's perspective of the research topic (Morgan, 2014). Morgan (2014) further notes that interviews

allow interview topics to emerge during conversation, the interviewer listens to others' interpretations and perspectives and can collect a range of factors related to a topic.

3.3. Research Design

Research design is the plan and structure of investigation that is employed to obtain answers to research questions (Cooper and Schindler, 2011). It is the procedure for collecting, analysing, interpreting, and reporting data in research studies (Creswell and Plano Clark, 2011). Research design constitutes the blueprint for the collection, measurement and analysis of data (Cooper and Schindler, 2011). Research design is made up of sampling design, questionnaire and data collection techniques

3.3.1. Case Study Selection Criteria

According to Henning, Smit and Van Rensburg (2004), case study design is employed to gain an in-depth understanding of the situation and meaning for those involved. They further discuss that the interest is in the process rather than the outcome, in context rather than a specific variable, in discovery rather than confirmation. The case study is a research strategy focused on understanding the dynamics present within single settings (Huberman, Miles and Saldana, 2002). The present study followed a qualitative case study design. The quick service restaurant company under study was chosen for the following reasons:

- It owns the highest number of quick service restaurants in South Africa
- The company has representation or control of supply chain elements from 'farm to fork'
- It is listed on the Johannesburg stock exchange with a market capitalisation of 14.79 billion (the other listed company in the quick service restaurant sector has a capitalisation of 776.07 million) (Bloomberg, 2017)

The research was conducted with a focus on one quick service restaurant brand within the company and explored the causes of food waste along its supply chain. The quick service restaurant company in the present study is based in Johannesburg, with the quick service restaurant stores being spread across the whole of South Africa.

3.3.2. Sampling Design

The sampling design for this study focused on four aspects: target population, sampling frame, sample size and sampling method. These are discussed in more detail below:

Target Population

A target population are people, events or records that contain the desired information and can answer the measurement questions (Cooper and Schindler, 2011). It is the total collection of elements about which we wish to make some inferences. The population for this research were all quick service restaurants in South Africa.

Sampling frame

A sample frame examines a portion of the target population, and the portion must be carefully selected to represent that population (Cooper and Schindler, 2011). For the present study, the sampling frame consisted of all employees of the quick service restaurant company under study.

Sampling Method

Non-probability and probability sampling are the two methods that are used to select members of a sample. Non-probability sampling is arbitrary and subjective (Cooper and Schindler, 2011). Probability sampling on the other hand is based on the concept of random selection where there is a probability of a single person in a sample frame being chosen to participate (Kolb, 2008). In qualitative research, the inquirer purposefully selects individuals and sites that can provide the necessary information. Purposeful sampling in qualitative research means that researchers intentionally select participants who have experienced the central phenomenon of the key concept being explored in the study (Creswell and Plano Clark, 2011) and (Clark, 2012). Kolb (2008) describes the process of purposive sampling as follows; identifying the characteristics of the participants, developing a list of potential participants and inviting them to participate. For this study, non-probability sampling was used in the form of purposeful sampling. This form of sampling method was ideal as it eliminated time-wasting by only selecting participants who had supply chain exposure and hence experience with the phenomenon of food waste.

3.3.3. Sample Size

Kolb (2008) defines a sample size as the number of subjects that should be included in the research to ensure that the results are representative of the entire population. For this case study, the sample size was made up of managers who work for the company under study. All participants were either a managerial or director role and had manufacturing (processing), packaging and quality, distribution and food service supply chain experience. The following 9 people were interviewed:

- Manufacturing and Managing Executive
- Group Technical Manager
- Quality Control Manager
- Quality Assurance Manager
- Group Quality Assurance Manager
- Plant Manager
- Warehouse Manager
- Store Manager
- Franchise Store Owner

The central idea is that if participants are purposefully chosen to be different in the first place, then their views will reflect this difference and provide a good qualitative study in which the intent is to provide a complex picture of the phenomenon(Creswell and Plano Clark, 2011) and (Clark, 2012).The employment capacity was of importance as the researcher wanted to gather rich insights on food waste in the quick service restaurant supply chain and hence the decision to interview participants in a managerial position. The validity, meaningfulness and insights generated from qualitative inquiry have more to do with the information richness of the cases selected and the observational or analytical capabilities of the researcher than with the sample size (Paton, 1990).

3.3.4. Data collection Procedure

Table 3.1 outlines the data collection procedure that was followed.

Data collection procedure and description

Procedure	**Description**
Collecting information	• In-depth interviews were scheduled by appointment with the interviewee. • Interviews took between 30-45 minutes each. • Interviews were held at the respondents' place of work with a single respondent at a time.

	Structure of the interview o Opening – the research topic and aim and role of the specific interview in the research was clarified (Henning et al. 2004). o Questioning – the questions started by being very general in nature and then moved on to more specific information (Kolb, 2008). It is also important for the interviewer to summarise the conversation at intervals to reflect understanding (Henning et al. 2004). o Probing – questions were asked to ensure that the information the participant had provided had been correctly understood (Kolb, 2008). This was also done by asking the participant to expand on a statement or clarify. o Closing – The interviewer thanked the respondent for participating and asked if they had any questions.
Recording the data	• The interviewer took down notes during the interview quoting some statements from the respondents to indicate emphasis. • For confidentiality reasons, recordings were not taken.

Table 3.1: Data collection procedure

Source: Compiled by researcher (2017)

3.3.5. Research Instrument and Consistency Matrix

Table 3.2 provides an overview of questions that were asked during the interview as a guide to ensure that the research objectives were met. One instrument was designed and the research questions were be adapted to each respondent with the aim of achieving the same research objective.

Interview Question	Research Objective	Possible rephrasing
RQ1: What factors contribute to food waste in a quick service restaurant supply chain?	To explore the factors that influence food waste in a quick service restaurant supply chain in South Africa.	✓ How would you define the quick service restaurant supply chain? ✓ In your experience, what are the factors that influence food waste in the supply chain?
RQ2: How do these factors impact on food waste at each stage of the quick service restaurant supply chain?	To identify the supply chain activity with the closest relationship to food waste in the South African quick service restaurant sector.	✓ What would you say are the stages of the quick service restaurant supply chain? ✓ How does …impact food waste in the …part of the supply chain?
RQ3: How can managers in the food supply chain minimise food waste?	To make recommendations on food waste reduction.	✓ As a Packaging manager, what changes would you make in your processes to minimise or reduce food waste? ✓ What processes would you implement in manufacturing in order to minimise food waste?

RQ4: Why is there such an amount of food waste in the quick service restaurant supply chain?	To make recommendations on food waste reduction.	✓ What are the reasons for food waste in the sector?
RQ5: How can companies address this issue of food waste and implement strategies to minimise wastage throughout the food supply chain?	To make recommendations on adoption of green marketing.	✓ As a manager, what are the strategies that you would recommend to the organisation to minimise food waste?

Table 3.2: Research Instrument and Consistency Matrix

Source: Compiled by the researcher (2017)

The notes taken by the researcher during the interviews were organised and transcribed and analysis of the data will be explored in the chapter that follows i.e. data analysis and discussion.

3.4. Conclusion

This chapter outlined the research philosophy, design and methodology followed for the current study. The data collection procedure was described, detailing the actual collection of the information and recording of the data. Lastly, the research instrument and consistency matrix were outlined as a guide to ensure that the research objectives were met. Chapter 4, which follows, will consist of the data analysis and discussion.

CHAPTER 4: DATA ANALYSIS

4.1. Introduction

The main purpose of this chapter was to analyse the data collected and discuss the findings of the research with an aim of answering the primary research question of the study, i.e. what is the influence of supply chain activities on food waste in the quick service restaurant supply chain in South Africa? This chapter starts off by discussing the demographic data that was provided by the respondents. This is followed by an in-depth analysis of the major themes which will be outlined and summarised in the form of figures and tables and discussed in detail.

4.2. Data Analysis

The process of data analysis started with organising the field notes that were typed and saved as word documents. This was followed by transcribing the text and preparing it for analysis with QDA Miner 4. The researcher read through the data, wrote memos and developed a set of codes to be used in the actual data analysis. Data was coded manually and themes were identified. Data was also coded in QDA Miner 4 by assigning labels to data and grouping the labels into themes. QDA Miner 4 was used for the systematic process of coding and identification of themes and patterns.

4.3. Results

4.3.1. Demographics

This section provides an overview of the demographics of the respondents. 'Demographics' consists of level of management, number of years with the company and level of education. 'Level of management' refers to the position held by the respondent within the management structure of the organization. Four of the nine respondents are in middle management, three in senior management and two at executive level. 'Number of years with the company', on the other hand, refers to the employment tenure of the respondent with the organization. Two of the respondents have been with the organization for less than one year and three respondents for between one to four years. Finally, two respondents each have been with the organization for between five to eight years and nine to twelve years. The level of education of the respondents refers to the level of qualification of the respondents. Qualifications range between Matric, Undergraduate, Honours and Masters. One respondent has a matric and an additional one holds an undergraduate degree. The majority of the respondents, totaling six, hold an Honours degree. Finally, one respondent has a Masters degree.

The demographics above show that all the respondents are in management position and are educated. The majority of the respondents have been with the organization for a period of more than a year and it is derived that they have substantial knowledge of the organization. It can also be deduced that the choice of respondents was ideal in that they are at a level in the organisation at which they have a view of the operations and can give an educated opinion and insights into food waste.

4.3.2. Themes

Coded data was analysed using QDA Miner 4 and the following major themes were identified: product, process, machinery, people and green marketing. The first four themes are concerned with the causes of food waste and the green marketing theme unravels insights into the marketing of products as 'green' and the benefit of this to the company. Table 4.1 summarises the themes and sub-themes identified in the data for the current study.

Theme/sub-theme	**Count**	**% Codes**	**Cases**	**% Cases**
Product				
• Raw material	9	6.5%	7	77.8%
• Finished product	12	8.7%	7	77.8%
Process				
• Manufacturing process	21	15.2%	6	66.7%
• Cold chain maintenance	14	10.1%	7	77.8%
• Stock management	12	8.7%	5	55.6%
• Food preparation	7	5.1%	6	66.7%
Machinery				
• Machine failure	12	8.7%	6	66.7%
• Maintenance	1	0.7%	1	11.1%
People				
• Training	5	3.6%	3	33.3%
• Attitude	2	1.4%	1	11.1%
• Not following process	11	8%	8	88.9%
Green marketing				
• How to market products as green	16	11.6%	8	88.9%
• Benefits of green marketing	16	11.6%	9	100%

Table 4.1: Presentation of themes and sub-themes

Source: Compiled by the researcher (2017)

This section outlines the themes and sub-themes identified in the data highlighting the distribution codes by number of cases and frequency.

Figure 4.1 summarises the distribution of codes by the number of cases.

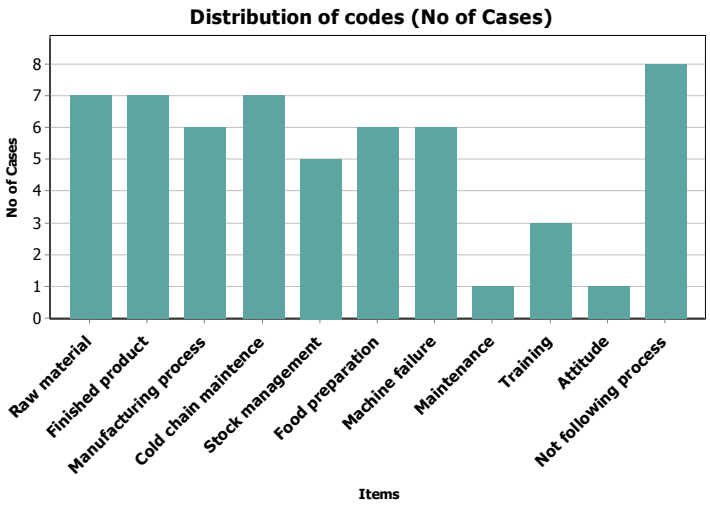


Figure 4.1: Summary of the distribution of codes by the number of cases

Source: Data Analysis of current research data in QDA Miner 4 (2017)

Raw material was identified as a cause of food waste in seven of the nine cases whereas finished product was identified in seven cases. The sub-theme of manufacturing process was identified as a cause of food waste in six cases with cold chain maintenance being identified in seven of the nine cases. Stock management was highlighted in five cases as a cause of food waste and food preparation in the 'process' category and was identified in six cases. Machine failure, as part of the main theme of 'machinery', was mentioned in six cases. Maintenance, in the same theme of 'machinery' was identified as a cause of food waste once in one case. Training as a cause of food waste was identified in three cases, and attitude, in one case. In the 'people' category, not following process was identified in eight cases. Lastly, under the theme of 'green marketing', how to market the company's products as green products and the benefits of green marketing were identified in eight and nine cases respectively.

Figure 4.2 summarises the distribution of codes by frequency and highlights the number of times a sub-theme was mentioned by the respondents.

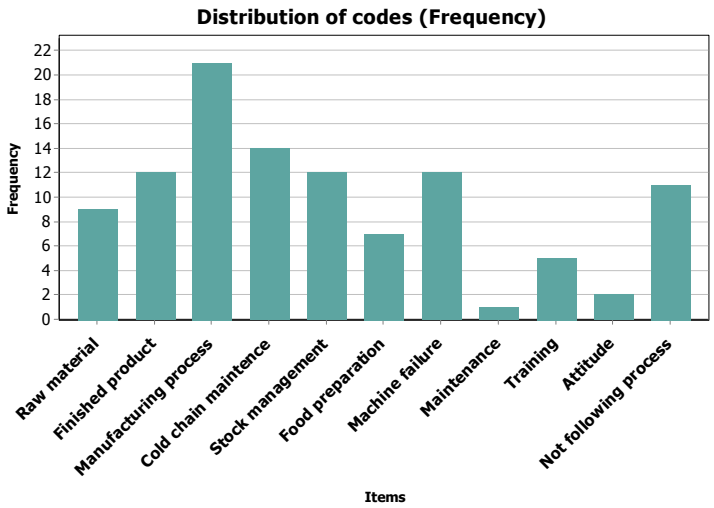


Figure 4.2: Summary of the distribution of codes by frequency

Source: Data Analysis of current research data in QDA Miner 4 (2017)

Raw material as a sub-theme was mentioned 9 times with finished product having a count of twelve. As part of the 'process' theme, manufacturing process had the highest count of all the sub-themes, coming in at twenty-one whilst cold chain maintenance had a count of fourteen. Stock management was mentioned twelve times. The last sub-theme in the 'process' category, food preparation was the least mentioned cause of food waste coming in at a count of seven. Machine failure, as part of the main theme of 'machinery', was mentioned twelve times. Maintenance had the least count of all sub-themes, with a count of one. Training of people as a cause of food waste was identified five times and attitude, twice. In the 'people' category, not following process was identified the highest number of times, with a count of eleven. Lastly, under the theme of 'green marketing', how to market the company's products as green products and the benefits of green marketing were mentioned sixteen times each.

The section below outlines the detail of the themes and sub-themes as identified in the current research.

I. Product

The first theme that was identified in the present study is product. Product is any form of food waste as a result of the product itself. The theme is analysed under the sub-themes of raw material and finished product.

a. Raw material

Raw material consists of unprocessed product that is supplied to the manufacturing plant by suppliers. Raw material impacts food waste if the incorrect specification of product is supplied as explained by respondent 5-

> *The main influence on food waste would be the supplier. Although we have a strict supplier checklist, in the event of a supplier not being able to supply to specification, this can result in food waste. For example, we use specific size cuts of chicken breasts, and if a different size is supplied we cannot use the chicken for a specific menu item and the chicken can be regarded as waste.*

This is echoed by the respondent 6 who noted that-

> *The company specifies the criteria of goods to be supplied by the suppliers. If the supplier does not meet the specifications, product is rejected leading to food waste, for example, incorrectly sized chicken fillets.*

Raw material is also identified as a cause of food waste when part of an uncooked item of food is discarded, not because it cannot be eaten, but because the standard operating protocol states that it should not be part of the final product sold to the consumer where respondent 9 provided an example of prawn heads as below-

> *Food waste is food that the store does not use but could be used by society, for example, cutting off prawn heads and throwing them away. These heads can be processed into fish pops or cakes and consumed.*

Raw material is further identified as a cause of food waste when raw material is received and not in checked full due to the large quantities received and is only identified as being unsuitable for production when sent to the line. Respondent 1 pointed out that this could be due to temperature inconsistencies. Respondent 6 noted that any raw material that cannot be used in the production facility is regarded as food waste. Respondent 3 noted that raw material can be rejected if it is not to specification, where meat with bones is supplied instead of fillet.

b. Finished Product

The second sub-theme that was identified amongst the data was that of finished product. Finished product refers to the output of manufacturing and the food that is prepared at the store for sale to the customers. Respondent 7 noted that finished product after manufacturing results in food waste as "*…product that tastes bad and poor quality product result in stock recalls".*

He further notes that customer not finishing food also results in food waste at the store and this sentiment is supported by respondent 9. Handling of finished product is identified by several of the respondents as causing food waste, where respondent 8, respondent 1 and respondent 4 pointed out that handling of boxes during delivery can result in food waste. Further contributions of finished product to food waste as cited by respondent 1 are when "*…product is mixed and not meeting quality control standards….and metal being detected in product result in food waste".*

Respondent 5 noted that-

> *Online quality checks can result in food waste if the Quality Controller rejects a product, for example, if an incorrect spice is used for a product the product cannot be reworked and has to be disposed of.*

II. Process

The second theme that was identified in the present study is process. Process is defined as an outline of the steps to be taken in order to achieve something. The theme is divided into sub-themes of: manufacturing process, cold chain maintenance, stock management and food preparation. Research findings of the sub-themes are detailed below.

a. Manufacturing Process

The first sub-theme, manufacturing process, has the highest count of all the sub-themes in terms of frequency. According to respondent 1, the manufacturing process is whereby meat raw material is converted into finished product, for example, meat is minced and blended to make patties. The term manufacturing is used inter-changeably with production and is the hub of the company, where respondent 1 noted that-

> *In production, scrapings contribute to food waste. Scrapings constitute 0.1% of input and can be deemed as unavoidable food waste.*

As explained by respondent 2, *"there is waste in manufacturing due to trimming and cooking."* Respondent 6 gave a detailed outline of waste in the manufacturing process where-

> *Food waste in patty production is found in thawing through blood loss which results in a loss in mass. There is also waste in cutting, mincing, patty formation and negligence when product ends up on the floor. In chicken fillet production, product is cut to specification and off-cuts cannot be re-used for the same product.*

He further notes that if the cleaning process is not separated from production, this results in food waste as cleaning chemicals are not supposed to come into contact with food. According to respondent 5, food waste in the manufacturing process is measured against a target-

> *Food waste is one of the most important things as there is a cost linked to waste where if the number increases, it tells you that something is not right in the factory. The process outline shows an expected norm of waste which varies by product, where for example, for a pork banger waste is expected to be between 15-20% of input.*

Floor sweepings are waste that is generated due to the manufacturing process and respondent 5 pointed out that they get between 5 and 8kg of floor sweepings everyday dependant on the product being manufactured. Respondent 3 gave a detailed outline of food waste in the manufacturing process-

> *In the production of patties, there is waste when the meat is split and the flaker produces the most waste. There is minimal waste in the forming of patties by the machine. Cleaning waste is generated when we clean the machines.*

Respondent 3 further notes that the manual processes in the manufacturing process contribute to food waste and she would reduce this by automating the plant. Also cited by several of the respondents as a cause of food waste in the manufacturing process is that product can be incorrectly blended resulting in food waste.

b. Cold Chain Maintenance

The second sub-theme is cold chain maintenance. This entails the monitoring and control of temperatures throughout the supply chain. The standard operating procedure outlines the process where, for example, a driver is supposed to keep his engine running when docked at the distribution centre to deliver stock so as to keep the truck freezer running. Lack of cold chain maintenance results in food waste as product can go off or become unsuitable for production. It is noted that poor cold chain maintenance occurs mainly in the distribution phase of the supply chain. As a cause of food waste, this sub-theme received the second highest count in terms of frequency. Respondent 7 expressed that-

> *Factors that influence food waste are temperature loss….and temperature control.*

with respondent 3 highlighting it as "lack of cold chain maintenance". An example cited by respondent 4 is-

Breaking of the cold chain in another part of the supply chain can result in sour tasting pork bangers.

Respondent 6 notes that 'from a stock management point of view, temperatures need to be managed well to minimise food waste'. Respondent 6 further suggests that distribution has the largest amount of food waste in the quick service restaurant supply chain due to poor cold chain maintenance. He outlines that-

Off-loading procedures at the plant, stores and DCs where product is left outside also contributes to food waste. Breaking of the cold chain is a huge factor that contributes to food waste although deliveries are somewhat scheduled to reduce this.

As a result of lack of temperature control throughout all stages of the supply chain, respondent 2 highlights that food has to be destroyed as it is not fit for human consumption. Respondent 5 emphasised that-

Temperature abuse of products means that they cannot be reworked and this could be due to freezer breakdowns.

c. Stock Management

The third sub heading, stock management refers to the way in which raw materials and finished product are ordered and rotated through the supply chain. It also looks at frequency and timing of ordering where respondent 9 pointed out that-

Poor planning and execution result in food waste, for example, if we order every week and use FIFO method, we will not run out of stock and no stock will reach its expiry date.

This is also echoed by respondent 5 who hints at improper planning at store level resulting in food waste. Respondent 4 emphasised the importance of planning in that *"poor stock management practices, not following FIFO method, result in food waste".* Respondent 4 further notes that over stocking due to poor forecasting results in food waste. Respondent 8 concurred on the importance of forecasting as he says-

Patties take 2 days to defrost and therefore forecasting is essential… and over-ordering could also lead to food waste.

Lastly, respondent 7 explained that not segregating meat during storage results in food waste as different types of meat have different storage requirements and bacterial counts. Stock rotation is also important at the warehouse so as to reduce food waste.

d. Food Preparation

Fourthly, food preparation takes place during manufacturing and at the store. In the process category, this sub-theme received the lowest count in terms of frequency and was mentioned in six cases. Incorrect cooking was cited by several respondents as the cause of food waste due to food preparation. This is elaborated on by respondent 9 who pointed out that "…*staff overcooking patties (chicken and beef) results in food waste as this compromises quality".*

Respondent 6 highlighted that-

> *In production of pizza toppings, there is food waste during cooking when oils and juices accumulate.*

At store level, respondent 1 notes that 'cooking processes…and cooking too much food' result in food waste. This was also echoed by respondent 2.

III. Machinery

The third theme that has been identified from the data collected in the present study is machinery. Machinery refers to any cause of food waste that is related to machines in any part of the supply chain. Machinery is divided into two sub-themes: machine failure and maintenance.

a. Machine failure

The first sub-theme that has been identified within 'machinery' is the possibility of machine failure. This sub-theme had the same frequency counts as finished product and stock management. Most of the food waste related to machine failure is as a result of product falling on the floor where respondent 2 pointed out that "…*on the packaging line patties fall off the conveyor resulting in food waste as they are considered to be contaminated".*

Respondent 1 explained that-

> *Power cuts can result in food having to be disposed of due to inconsistent temperature caused by the break in electricity supply*

Respondent 1 further explained that although this rarely happens, the sheer volume of products held at each point in time, be they raw material or finished product, means that the food waste

is of a large magnitude. He elaborated to say: 'if there is product in the blenders and there is a power cut, the flap opens up and product is lost resulting in food waste'. Respondent 6 noted that-

> *If there is no consistency in end-of-shift procedures, such as removal of meat from machinery, this can result in food waste.*

During distribution, malfunctioning compressors result in food waste due to inconsistent temperatures, as pointed out by respondent 4. Lastly, respondent 7 added that "*…in production, food waste is caused by machine failure".*

b. Maintenance

Maintenance, the second sub-theme in 'machinery', is the sub-theme with the least frequency count and is only noted I one case. It is however considered to be of importance due to its impact on food waste based on the volume of operation of the company. Maintenance was brought up by respondent 5 who pointed out that:

> *Equipment that is not properly maintained, such as vacuum sealers, results in product going off and hence food waste. It is important from a quality perspective in that food waste due to vacuum bags not sealing properly might only be picked at another part of the supply chain after the company has already incurred other costs for the product which has to be ultimately thrown away.*

IV. People

The fourth theme, 'people' refers to the human behaviors of not following process and attitude. The third sub-theme identified in the data is training. The three sub-themes falling under 'people' are discussed in further detail below.

a. Training

Training of people is key to the functioning of any organisation and lack of training is identified as a contributing factor to food waste. Respondent 5 noted that when a new machine was installed, there were a lot of quality complaints and-

> *On observing I noted that people were not trained to use the machinery and hence the complaints and high volumes of waste*

She further notes that use of untrained staff at any part of the supply chain can result in food waste. Respondent 5 stressed that "…*if staff is not trained correctly on thawing and cooking of product this results in food waste".*

Respondent 4 added that-

> *Due to high staff turnover, there is need for constant re-training, which sometimes does not happen on time*

Insights on training were received only from managers who have responsibility for quality.

b. Attitude

Attitude of staff was cited twice in 1 case, by respondent 9 who stated that-

> *If there is no buy-in from company employees, there will be food waste as there is no incentive for them not to waste. People must be motivated in order to reduce food waste*

c. Not following process

Not following process results in food waste and this was noted to happen at any part of the supply chain. It was cited as a cause of food waste in the quick service restaurant supply chain in 8 cases and had the highest frequency count of all the sub-themes in the 'people' category.

Respondent 9 shed insight on this, stating that, "*preparing too much food with the intention to precook and store results in excess food being thrown away after a period of time".*Contributors to food waste due to not following process as identified by the respondents are: incorrect defrosting practices and not cooking correctly at the restaurant, where the respondent 6 highlighted that, "t*hawing processes at the store result in food waste",* and respondent 4 elaborated that *"if procedures are not followed, this results in food waste, for example, thawing or storage at a particular temperature can result in product deterioration".* Interesting 'people' dimensions brought in by respondent 4 were that-

> *Waste can be related to negligence or horseplay… at times staff take shortcuts to serve quicker, for example, cooking for a shorter period of time, thereby serving uncooked food which the customer rejects or throws away.*

V. Green Marketing

The fifth and final theme that has been identified in this study is green marketing. Sub-themes for 'green marketing' are how to market the company's products as being green and the benefits of green marketing to the company. How to market the company's products as being green and

the benefits of green marketing were cited in eight and nine cases respectively. Graphs in Appendix 1 present the benefits of green marketing as receiving the most insights when based on the number of words used by respondents.

a. How to market the company's products as being green

The first sub-theme refers to activities and processes the organization can adopt in order to market the company's product as 'green'. Key insights shared by the respondents revolved around specific aspects of the product, manufacturing processes and how to create a consumer message around this. As explained respondent 1-

> *Procurement is done centrally and therefore good quality product is used as input. Processing facilities are FSC2200 certified and this international accreditation ensures production at the highest levels. Obtaining this certification is difficult and is certification that standards and measures in the manufacturing environment are high. There is value addition to raw materials and this is proof that our products are green. The company can also introduce a burger without a bun for high protein, low carb diets as well as introduce other menu items that provide for other diets such as banting. The company has full control of the distribution supply chain and therefore products get to the user in the correct state. On the whole, the company is mindful of how waste is handled with a clear outline of responsibility and accountability for products that come out of the production process through recycling and responsible disposal of waste and communicating these messages to the consumers will position our products as being green.*

Further insights were obtained from respondent 9 who explained that-

> *Most of our competitors in the QSR sector are not considered green as most of the foods are processed……Our burger patties are made from 100% pure beef and chicken fillets and therefore have minimal additives to them apart from the seasoning. Our patties are flame grilled and this just tastes so much better other than being a healthier way of cooking. We take pride in the taste of our food and it identifies with the South African way of cooking food and the company can use any of these things to market our products as being green.*

Respondent 6 illustrated examples of how to market the company's products as being green as-

The company could begin showing numbers on carbon emissions and carbon footprint. Waste stream re-use by re-using everything that is considered waste, can also be a way of the company being 'green'

The fact that the company recycles everything that can be recycled was noted by respondent 4 as being a commitment to sustainability. Other initiatives that he noted can be highlighted to consumers were-

Use of ozone friendly detergents has been adopted and communication of all of these efforts to the consumers will undoubtedly position the company as being green. Some of our products boast 100% pure beef and this is a big tick for the health conscious consumer. This could be used to position our products as being green.

Respondent 4 further highlighted the difficulty in proving these claims to the consumer and this was echoed by respondent 5-

I believe that because we find ways of reworking products, we minimise waste……..Legislation however makes it difficult to state certain things or claims on products or packaging. This can however still be done through advertising. The company can focus on proper use, recycling, waste disposal and separation of waste.

b. Benefits of Green Marketing

Secondly, 'benefits for green marketing' to the organisation were shared by all the respondents. This is the only sub-theme where all the respondents had something to say. Insights shared revolve around appeal to a different or new set of consumers, profit gains, brand loyalty and positioning. Respondent 8 touched on all of these aspects-

Our brand is not the cheapest in the QSR sector and has a reputation for being a top brand. The company should start thinking about why people pay bit more to eat our food, what is the noble cause and what gives people the reason to buy from us? Marketing our products as 'green' would increase sales and turnover and a brand that is perceived to be 'green' is less likely to be attacked on social media. People love to take on the big corporates especially the 'non-caring' ones and positioning our products as green could 'shield' the company from such attacks. Telling our consumers all the things we are doing for the communities and environment will position us as a caring company and foster brand loyalty from 'green' consumers.

Respondent 5 was clear on the market growth benefits of a green brand being that, "*there are a lot of myths about what goes into a product and highlighting what we use in our products would benefit the company by attracting a bigger market".* Respondent 2 was more specific on which market the company would attract growth in, where *"a green message would appeal to the younger generation of consumers who are trendy".* Respondent 6 drew attention to the benefits of a green product as being-

> *...financial as this would draw more environmentally conscious consumers to our business and these tend to be fairly affluent. The 'green' positioning can be derived from a corporate social responsibility programme where consumers become loyal to our brands based on how we give back to the community*

Corporate brand benefits were cited by respondent 5 who pointed out that-

> *People want to do business with responsible companies, those that are environmentally friendly. Government is drawing legislation on waste disposal and companies that start taking these initiatives seriously will be better placed for consumer demands for accountability from the corporate world.*

Respondent 4 elaborated that *"consumer knowledge of the meaning of green products is limited and marketing of this could increase education".*

4.4. Strategies to minimise food waste: participant insights

Participants were asked to give strategies that they would put in place in their department to minimise food waste as well as recommendations that they would make to the organisation to reduce food waste. This section outlines the responses to these questions with respondent 7 suggesting-

That everything is tracked through the use of scanners and barcodes so as to assist in warehouse management. Plant automation would reduce food waste as well as use of frozen meat that has a longer shelf life……Installation of a screw conveyor to cover the meat during grinding so that meat does not fall on the floor. Using better equipment and plant automation to reduce manual labour can minimise food waste. Finding better tools to measure food waste can also minimise food waste.

Respondent 3 hinted that "*using better processing equipment and mounting trays to catch waste so that it can be put back into the process can reduce food waste. I would recommend that the company invests in equipment and machinery so as to reduce food waste".*

Recommendations from respondent 4 were that food waste can be reduced-

…by following procedures and investing in technology, for example, changing the conveyor that is causing product to fall on the floor. I would recommend use of PDCA (Plan-Do-Check-Act) principle throughout the organisation to minimise food waste. Improvement in systems, such as freezing operations and bacon lines can minimise food waste. Modification of processes and infrastructure can be another strategy to minimise food waste.

Respondent 6 suggested recommendations with a bias towards his area of management-

Food waste can be reduced by good housekeeping and cleanliness. Better processes, such as cooking in a bag as opposed to a tray can reduce food waste. Better technology, such as machinery, can also reduce food waste. Food waste can be reduced by training operators on what contributes to food waste…There needs to be a better understanding of all the inputs that contribute to food waste across the value chain. I would recommend that the organisation invests in processes to track supply chain variations such as temperature and stock age. Tracking of manufacturing waste numbers by product line can assist in minimising waste as well as give an understanding of our capabilities. Knowing what food waste costs the business would also minimise food waste.

Recommendations from respondent 1 were to-

Put in place controls and processes to track and measure. Investment in education and training of people can reduce food waste. Setting of targets for food waste can enable investigation and correction to reduce food waste…I would recommend that the organisation invests in people and the right equipment. I would clear up and clean up the mess then start to maintain. Good housekeeping reduces food waste as equipment is in a good state of repair and the environment is clean. I would also recommend driving a food waste reduction culture with managers and staff. Understanding the allowable levels of food waste enables controls to be put in place to minimise food waste. The company needs to partner with the right people – people who are passionate about food waste – in order to drive this culture within the business.

Respondent 2 suggested the following strategies-

Food waste can be reduced by putting in place lean processes and becoming more automated. Technical processes for producing meat can be improved on and x-rays and metal detectors can be placed on the production line. Constant monitoring of temperature and adherence to meat safety regulations can reduce food waste. Monitoring of transport systems for

temperature variations and calibration of equipment can reduce food waste. Training on temperature monitoring and thawing processes in the QSR environment can reduce food waste.

Food waste reduction strategies from respondent 5 were that-

Food waste can be reduced by educating staff. It is important to educate staff at all levels of the organisation as this reduces the impact of negligence on the bottom-line. Proper maintenance of equipment, including preventative maintenance plans, can reduce food waste due to machine stoppages and start-ups. Adopting a strategy of 'slow and steady' by not pushing numbers and making sure that everything is done properly can reduce food waste.

Lastly, from respondent 9's perspective, the following food waste reductions strategies could be implemented-

Proper planning at the store can reduce food waste. By forecasting accurately, ordering can be more precise and hence a reduction in food waste. Sticking to the preparation motto: do less more often, food waste can be reduced. By doing more frequently, consistency of quality is ensured thereby minimising waste…Everything must be dated for delivery, manufacturing date, expiry date, defrosting date and when it is cooked.

4.5. Summary of main findings

In summary, the themes identified in the present research are, product, process, machinery, people and green marketing. The sub-themes for 'product' are raw material and finished goods. Manufacturing process, cold chain maintenance, stock management and food preparation are the sub-themes for 'process'. Thirdly, machine failure and maintenance are sub-themes for 'machinery'. The fourth sub-theme identified in the present study is 'people', with sub-themes of training, attitude and not following process. Lastly, 'green marketing' as a theme has sub-themes of how to market products as green and benefits of green marketing.

4.6. Conclusion

This chapter reviewed the qualitative data analysis which was done using a qualitative data analysis programme, QDA Miner 4. Themes and subthemes were identified and unravelled the causes of food waste in the South African quick service restaurant supply chain as well as green marketing. The next chapter will incorporate a discussion of results of the present study and outline the conclusions, recommendations and future research.

CHAPTER 5: DISCUSSION OF RESULTS, CONCLUSION, RECOMMENDATIONS AND FUTURE RESEARCH

5.1. Introduction

This chapter presents a summary of the findings for the current research study. This chapter will discuss of the findings of the present research by relating them to the research questions and comparing them with the findings in the literature review. Further, this chapter will incorporate the development of a conceptual model by bringing together the themes, sub-themes and recommendations. Conclusions are stated with reference to each of the research questions after which managerial and theoretical implications are discussed. Lastly, limitations and future research will close off the chapter.

5.2. Discussion of results

This section revisits the objectives of the present study and provides an overview of the findings in a summary structure. It further refers to the previous research by comparing and contrasting the results to the existing literature.

5.2.1. Findings of the current research in relation to the research questions

The research questions stated at the commencement of this research were:

- RQ1: What factors contribute to food waste in a quick service restaurant supply chain?
- RQ2: How do these factors impact on food waste at each stage of the quick service restaurant supply chain?
- RQ3: How can managers in the food supply chain minimise food waste?
- RQ4: Why is there such an amount of food waste in the quick service restaurant supply chain?
- RQ5: How can companies address this issue of food waste and implement strategies to minimise wastage throughout the food supply chain?

RQ1: What factors contribute to food waste in a quick service restaurant supply chain?

The current study identified the factors contributing to food waste in the quick service restaurant supply chain are; product, process, machinery and people. Figure 4.3 summarises the causes of food waste in a South African quick service restaurant supply chain. Based on the results of the current study the themes and sub-themes are illustrated in the current reality tree by applying the theory of root cause analysis. The tree also illustrates the interconnections between the causes of food waste.

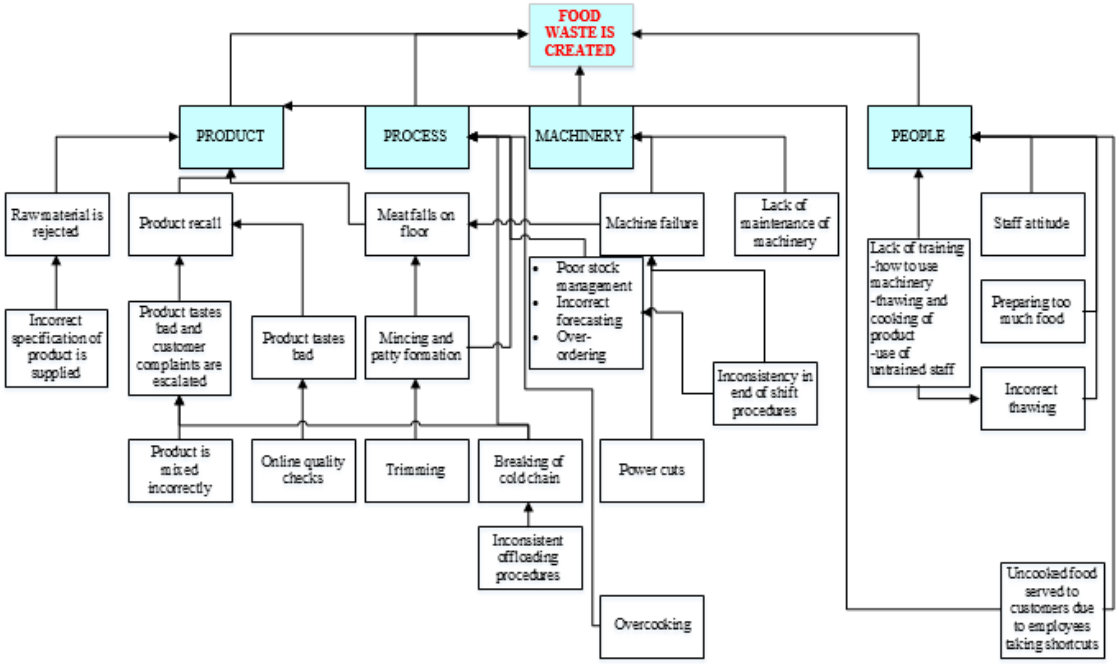


Figure 5.1: Current Reality Tree for the South African quick service restaurant supply chain

Source: Compiled by researcher (2017)

RQ2: How do these factors impact on food waste at each stage of the quick service restaurant supply chain?

Key to the current research was understanding the South African quick service restaurant supply chain from the context of the respondents. Descriptions centred on the flow of raw material from suppliers which is processed into finished product at manufacturing. Finished product is sent to a main DC for storage and is in turn sent to regional DCs for onward delivery to the franchised stores. The respondents shared their insights on the structure of the supply chain where respondent 5 put it as-

Suppliers deliver raw materials to the manufacturing plant and these are converted to finished product that is sent to the DC. The DC delivers stock to regional DCs for final delivery to the stores.

In slightly different words, respondent 6 described the supply chain as-

Suppliers provide raw materials which are transformed into finished product in manufacturing. Logistics provides the trucks that collect finished product from the plant and takes it to the DC where it is stored. Thereafter stock is sent to the regional DCs who distribute product to franchised restaurants.

A more detailed description was provided by respondent 7 who stated that-

The supply chain starts with suppliers where the cow is slaughtered and the carcass is separated. Meat is blast frozen or kept fresh and ordered by the company. Orders are placed for a month and staggered on delivery schedules. Frozen meat is kept at -25 ºC and chilled at 1-5 ºC. Meat is received where it is weighed and temperature is checked. Meat is stored in the bulk freezer or chiller for thawing and is thereafter sent to processing. Finished product is sent to Crown Mines for storage after which it is sent to the regional DCs for dispatch to stores

Drawing from the descriptions of the respondents, a supply chain map was drawn and is illustrated in Figure 4.4.

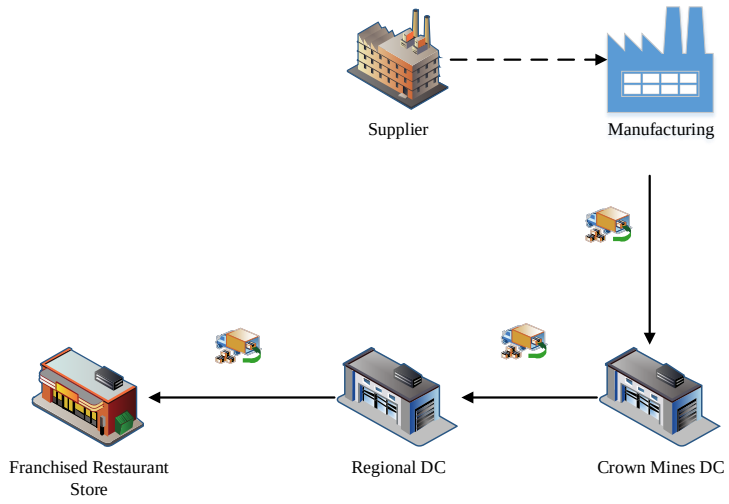


Figure 5.2: The South African quick service restaurant supply chain

Source: Compiled by the researcher (2017)

The stages of the quick service restaurant supply chain were identified as: Supplier→Manufacturing→Crown Mines DC→Regional DC→Franchised Restaurant Store

The current reality tree in Figure 4.3 highlights the interconnections between the causes of food waste. It further illustrates how these factors influence food waste at each stage of the supply chain. For example, product that is incorrectly mixed in manufacturing might not be picked in the random quality checks during manufacturing. The defect would then be identified at the store. A customer complaint will be raised resulting in a product recall of products from the same batch in other parts of the supply chain resulting in food waste. The impact of causes of food waste at each stage of the supply chain will be discussed below with the use of examples from the research.

Product as a factor affecting food waste is found in all stages of the supply chain. In the supplier stage, raw material not meeting company specifications results in product being rejected creating food waste as a result of a product. In manufacturing, meat falling on the floor can be linked to both product and machinery. At the DC levels product food waste is inherent in product handling. Uncooked food being served to the customers at the store can be linked to both product and people as staff take shortcuts resulting in product food waste as the final product has to be thrown away.

Process also influences food waste at all parts of the supply chain with inconsistent offloading procedures in the supplier stage resulting in food waste due to breaking of the cold chain. The processes of mincing and patty formation result in food waste in the manufacturing stage of the supply chain. Inconsistent offloading procedures will also impact the DC stages of the supply chain and result in food waste as a result of breaking of the cold chain and product damage. Incorrect forecasting, over-ordering and poor stock management are process related causes of food waste in the store stage of the supply chain.

The impact of machinery is not so evident in the supplier stage of the supply chain but the researcher would consider that freezers in truck not working on delivery of raw materials would impact food waste at this stage of the supply chain. This would also impact the DC stages of the supply chain. The greatest impact of machinery is in the manufacturing stage of the supply chain as this is where there is the highest use of machinery. Machine failure, product falling on floor and waste due to lack of maintenance are examples of how machinery influences food waste in the manufacturing stage of the supply chain. The research did not point to food waste as a result of machinery in the store stage of the supply chain but it can be derived that faulty freezers and chillers that would result in food waste.

People as a factor influencing food waste was more prevalent in the store stage of the supply chain than in any other stage. It can however be derived that a driver deciding to switch off the truck engine when delivering product throughout the supply chain would impact food waste due to a break in the cold chain. In the manufacturing stage, horse play and negligence are people factors that influence food waste. At DC levels, product damage due to forklift drivers driving into product is a people factor. At store level, training, not following procedure and staff attitude are people factors that influence food waste.

RQ3: How can managers in the food supply chain minimise food waste?

Respondents made suggestions on minimisation of food waste based on what they would change in their respective departments. These insights can be summarised as: tracking of product and raw materials through the use of technology such as barcodes and scanners, installations of x-ray machines and metal detectors and developing ways to track and measure waste. Plant automation, following procedures, good housekeeping and cleanliness, changing cooking processes and training were the other suggestions made by the managers. Other insights shared as ways to minimise food waste were: setting of waste targets to trigger investigation and correction, proper planning including ordering and forecasting and working smarter. The researcher found that this question was empowering for the managers as it gave them an opportunity to share what they would change within their area of operation and because they are the people on the ground, these sentiments may not be shared by staff in other departments.

RQ4: Why is there such an amount of food waste in the quick service restaurant supply chain?

The insights on the causes of food waste in the quick service restaurant supply chain unravelled the possible extent and magnitude of food waste. The Warehouse Manager hinted on the magnitude of food waste in saying; "although the allowable amount of waste is not more than 1% of input, sheer volumes of production results in the waste being a lot". If 7 000 000kg of meat was processed in manufacturing in a period of 1 year, 70 000kg of waste would be generated if there was no excessive waste. It is evident that the high scale of production means that a lot of food waste is generated. Respondent 3 gave an idea of the volumes of cleaning waste generated at one of the manufacturing sites where 150kg of chicken waste and 153kg of beef waste was generated for a particular month. Assuming constant volumes throughout the year, at least 3 tonnes of cleaning waste was generated for this plant for the 2 product types.

RQ5: How can companies address this issue of food waste and implement strategies to minimise wastage throughout the food supply chain?

Respondents were also asked to share insights on strategies they would recommend to the company to minimise food waste. This question is different from RQ3 in that RQ5 looked at areas outside the respondent's area of management and were thought to be general ideas, some of which they had no authority to implement.

The researcher found that in addressing food waste the company would need to make changes to the current way of doing things. An observation was made that it would seem that the

company is using old machinery and some of the processes are highly manual. This is evidenced by the frequency of automation as a recommendation to minimise food waste. It was also observed that most of the strategies that were recommended speak to the causes of food waste as identified by the themes. The researcher summarised the respondent strategies by linking them to the cause of food waste that they address in Table 4.2.

Strategy	**Cause of food waste addressed**
Use better equipment - improvement in systems such as freezing operations, calibration of equipment, installation of a screw conveyor	Machinery
Plant automation to reduce manual labour	Machinery
Use of PDCA (Plan-Do-Check-Act) principle, adopting a strategy of 'slow and steady' by not pushing numbers and making sure that everything is done properly, doing things more frequently to ensure consistency of quality	Process
Training – understanding of food waste and the associated costs, develop a culture of waste reduction, temperature monitoring and thawing processes	People, Product
Processes to track supply chain variations such as temperature and stock age. Tracking of manufacturing waste numbers	Process
Equipment maintenance – including preventative maintenance	Machinery

Table 5.1: Strategies to minimise wastage in the quick service restaurant supply chain

Source: Compiled by the researcher (2017)

5.2.2. Comparison of the current findings with previous literature

This section provides a comparison of the findings of the current study with those in previous literature. The comparisons are summarised under the headings; definitions of and types of food waste, and the quick service restaurant supply chain elements and food waste.

a. Definitions of and types of food waste

Food waste refers to food that is in good quality and fit for human consumption but that does not get consumed because it is discarded, either before or after it spoils (Lipinski et al. 2013). The current research concurs with the literature review in that, according to respondent 9, meat that is suitable for human consumption is discarded as it is not part of the menu item. The literature review defined food waste from a total supply chain point of view where food waste is food losses throughout the food supply chain, including production, storage, transportation and processing as well as food that is discarded at retailers and in kitchens of restaurants and households (Lundqvist et al. 2008). The current research however defined food waste from an operational point of view dependent on the role of the respondent in the supply chain. Respondent 6 defined food waste as *"…any food stream that I cannot use within the production facility. It could be contaminated, expired or food that does not meet the quality specifications".* Respondent 5 defined food waste as "*what you cannot salvage, re-work or recycle"* and respondent 1 put it simply as that *"food waste is something that does not form part of the final product".*

Gobel et al. (2012) classified food waste into unavoidable and avoidable food waste. The findings of the current research also point towards this where respondent 1 highlights that *"…in production, scrapings contribute to food waste. Scrapings constitute 0.1% of input and can be deemed as unavoidable food waste".* Respondent 4 gave a detailed example in his definition of waste where he detailed that *"…the process outline shows an expected norm of waste which varies by product, where for example, for a pork banger waste is expected to be between 15-20% of input. There is avoidable and unavoidable food waste".* A different classification of food waste was unravelled by respondent 2 who pointed out that the types of food waste are *"...wet waste, such as – meat off cuts, blood and fat, and dry waste – such as packaging and spices".*

b. The Quick Service Restaurant supply chain elements and food waste

The current research found that raw materials contribute to food waste if the incorrect product specification is supplied. It was also found that at store level prawns (considered to be a raw

material) are not cooked in full as the heads are cut off and thrown away resulting in food waste whereas they could be reworked into another product like fish pops. Raw material as a factor contributing to food waste is not identified in the literature review and is therefore considered to be a contribution of this research to existing literature. The findings of the research allude to all of these sources of food waste in the quick service restaurant supply chain. The research concurs with the findings of Raak et al. (2017) who found that the causes for food waste in the processing sector are losses resulting from processing operations and quality assurance, and products not fulfilling quality demands from trade.

In the current research, manufacturing process and finished product as factors contributing to food waste detail the impact of production, cutting, mincing, patty formation, and online quality checks on food waste. This is in line with the findings of Mena et al. (2010) who found that quality issues can lead to waste and sometimes quality is more important to companies than the waste created. In the case under study in this research, manufacturing process had the highest count in terms of frequency, making it the most important factor influencing food waste in the quick service restaurant supply chain. This is supported by the findings of Oelofse and Nahman (2013) who found that 27% of food waste happens in the processing and packaging stages of the supply chain. Findings of previous research highlighted in the literature review point out to power blackouts, equipment defects, residues from technical operations, human errors as resulting in unintended losses. The current research concurs with these findings where machine failure due to power cuts, inconsistencies in end of shift procedures and the use of manual labour all contribute to food waste.

It was noted that the current research highlighted the issue of machinery to a large extent in the strategies to minimise food waste, and when compared with the literature review, it would seem that the machinery in use in the current case is old and hence the prevalence of concerns and strategies around machinery. In addition to machinery, the research also found that where equipment has been replaced, staff are not well trained on how to use it thereby resulting in "complaints and high volumes of waste". The researcher noted that existing literature focused on developed countries which would inherently be more technologically advanced. The current research found that product that is not mixed correctly or according to recipe has to be discarded resulting in food waste. It was noted that most of these processes are manual and this could be where the factors that influence food waste differ to those found in developed countries.

The literature review identified packaging as a cause of food waste (Fredriksen et al. 2010). The current research highlighted packaging in the form of vacuum bags where the cause of food waste was machine related if the vacuum sealing machine is not working well. Secondary packaging in the form of boxes is raised in the current research when food waste occurs as a result of product damage due to packaging failure when a forklift driver damages the outer case. Contrary to the existing literature on packaging where it was found that packaging and labelling were the main causes of food waste in the packaging stage of the meat supply chain (Mena et al. 2014), this research did not identify packaging as major factor contributing to food waste. Packaging is however mentioned, for example, in the strategies to market the company's products as being 'green' when the respondent 7 highlights the fact that the company recycles boxes.

The current research highlighted the role of distribution in storage and final delivery of product to the franchised restaurant stores. Processes at the DC were raised in reference to cold chain maintenance and product damage during picking and storage of products where respondent 6 points out that *"…in Logistics, there is food waste due to product handling and poor temperature controls"*. This is line with the findings of Priefer at al. (2016) who found that lack of cold storage or interruption of the cold chain and packaging defects also cause food waste in the distribution stage of the supply chain. In the current case, it should be noted that an interview was not conducted with the Distribution and Logistics Manager as there were concerns around confidentiality.

At store level, Corrado et al. (2016) concluded that food waste in the consumption stage of the food supply chain is as a result of food damage due to lack of storage facilities, excess food preparation, passed expiry date, inappropriate pack-sizes and low consumer appreciation. The current research identifies with these findings on excess food preparation. The current case concurs with the findings of Priefer et al. (2016) that training of staff as well as the improvement of the internal routines for purchasing, storing and freezing is crucial in the hospitality sector. Additional factors that result in food waste at store level that were identified by the current research were the use of untrained staff due to high staff turnover, staff taking shortcuts to serve quicker resulting in them serving customers uncooked food and staff motivation.

From a food waste reduction strategy perspective, the literature review identified re-engineering of manufacturing processes and improvement in supply chain management as

possible approaches (Lipinski et al. 2013). The current research placed an emphasis on plant automation and use of better equipment as strategies to minimise food waste. Lipinski at al. (2013) suggested the use of reusable plastic crates instead of bags in order to reduce food waste. Current findings did not point towards a need for change in packaging but rather an increase in recycling efforts as the company already recycles packaging material. Training people on food waste, associated costs, temperature monitoring and thawing processes were identified as possible initiatives in food waste reduction in the current study. From a process perspective, research participants in the current study suggested the development of processes to track supply chain variations and the tracking of manufacturing waste numbers as ways to reduce food waste. This is in line with the conclusions of Priefer et al. (2016) that documentation of food waste data helps to identify changes in waste composition and detect the most vulnerable points.

A key suggestion from the research participants was the use of technology in minimising food waste. From a warehousing point of view to manage raw material and finished products, a suggestion was made to use technology *"…to ensure everything is tracked through the use of scanners and barcodes so as to assist in warehouse management".* In the manufacturing environment, respondent 4 suggested *"…investing in technology, for example, changing the conveyor that is causing product to fall on the floor".* It was also proposed that technology is used to track supply chain variations in temperature and stock age. Technology can also be used to minimise human interference by generating forecasts, triggers for ordering and stock management reports.

The Natural Resource Based View Theory (NRBV) put forward that it is likely that strategy and competitive advantage in the coming years would be rooted in capabilities that facilitate environmentally sustainable economic activity. The present research found that the company is currently engaged in recycling of packaging and manufacturing waste. The company's products are deemed to be 'green' by the research participants on the basis of the sourcing of raw materials, manufacturing process and the final product that the consumer eats. Total supply chain control puts the company in a position to conceive and implement strategies with the goal to improve its efficiency and effectiveness as identified in the literature review (Barney, 1991).

5.3. Conceptual Model

Based on the themes and sub-themes identified in the present study, the researcher proposes the following conceptual model:

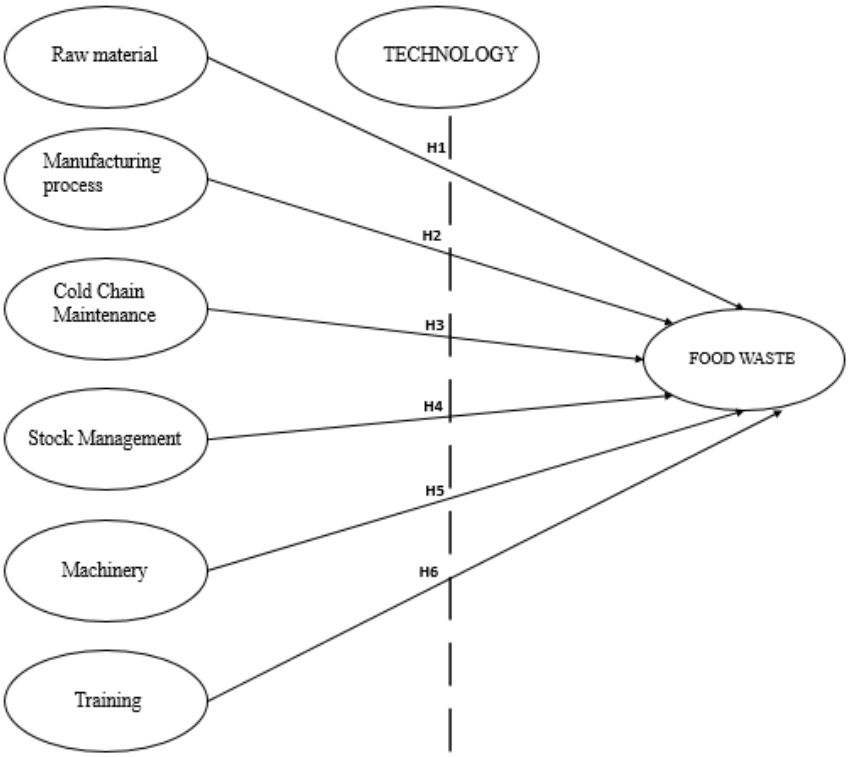


Figure 5.3: Proposed conceptual model

Source: Compiled by the researcher (2017)

5.4. Conclusion

In conclusion, six main factors were identified to influence food waste in a quick service restaurant supply chain, namely; raw material, manufacturing process, cold chain maintenance, stock management, machinery and training. These factors influence food waste at various stages of the supply chain. The supply chain stages for this sector were identified as; Supplier→Manufacturing→Crown Mines DC→Regional DC→Franchised Restaurant Store. The causes of food waste identified by this research are linked to the stages of the supply chain.

Raw material comprises the inputs for production such as meat. It was found that should raw material not be supplied to specification, this results in food waste. Raw material impacts the supplier and manufacturing stages of the supply chain where the actual food waste could be recorded in any of these two parts of the supply chain. The manufacturing process as a cause of food waste stood out as the biggest cause for concern. This impacts that manufacturing stage of the supply chain. It can therefore be concluded that manufacturing has the greatest impact on food waste. Although cold chain maintenance affects all levels of the supply chain, it was not as prominent a theme as manufacturing process. Cold chain maintenance had the second highest frequency count of all the themes under the causes of food waste. Stock management

impacts food waste in the manufacturing, DC and franchised restaurant store parts of the supply chain. Machinery mainly impacts the manufacturing process with limited applicability to the rest of the supply chain when looked at from a refrigeration perspective which then also links it to cold chain maintenance. The training aspect looks at people and this applies to all stages of the quick service restaurant supply chain. On the whole, it can therefore be concluded that supply chain activities have an influence on food waste and this research has unravelled the specific causes at each stage.

Furthermore, this research, based on strategy suggestions from the participants, found that managers can reduce food waste within their area of management by:

- Tracking of raw material and products through the use of technology
- Installation of x-ray machines and metal detectors
- Developing ways to track and measure waste
- Reporting on waste to trigger investigation and correction
- Proper planning, including ordering and forecasting
- Training

From a company perspective, food waste can be reduced by:

- Using better equipment
- Plant automation
- Improvement in processes, by using the PDCA (Plan-Do-Check-Act) principle, and
- Training

5.5. Theoretical and Managerial Implications

5.5.1. Theoretical Implications

Theoretically, this study makes a contribution in the context of a sub-Saharan country. This addresses the gap in literature on data from developing countries (FAO, 2011; Oelofse and Nahman, 2013; Nahman and de Lange, 2013).

This study proposes differences in countries from a supply chain perspective where it was assumed that the machinery in use in the current case is somewhat not as technologically advanced as what is used in developed countries. This is supported in that the current study identified the use of manual labour as a cause of food waste and investment in machinery stood out as one of the key recommendations from respondents.

Linkages between the causes of food waste and further links to supply chain elements have not been explored in existing literature in a South African context. These factors and linkages are highlighted in the present study with the use of the current reality tree.

The present study proposes a conceptual model that puts forward the causes of food waste with a mediating variable of technology. The current research found that technology is a key to minimising food waste in the quick service restaurant supply chain.

Based on the suggestion of managers who were the respondents, the present research made recommendations on food waste reduction specific to the South African quick service restaurant sector.

5.5.2. Managerial Implications

The current research provides a number of practical managerial implications for managers and marketers. Based on the evidence from the research the researcher would recommend:

- That the company develops consumer marketing messages centred around 'green' products to enable the creation of a competitive advantage in the quick service restaurant sector with the benefits of increased market share and revenue
- Harnessing of the company's strategic capabilities such as real demand and waste data for sustainability reporting so as to foster stakeholder engagement and customer goodwill. This will also position the company well from a waste legislation and reporting perspective
- The company embarks on an internal marketing campaign to increase food waste awareness and reduction initiatives. This culture has an impact on the bottom line as food waste reduction means an increase in production output and efficiencies that reduce costs
- Empowering of managers to implement food waste reduction measures and strategies within their levels of authority to foster a food waste culture at all levels of the organisation
- The company invests in equipment and machinery to increase production efficiencies thereby creating a competitive advantage for the company

5.6. Limitations of the study

Although this research has contributed to existing literature and made recommendations to marketers and managers, it had some limitations. The present study focused on one case that was chosen on the basis of scale of operations and implemented due to the willingness of a

Director within the company to become a project sponsor for the study and the advantage that the company has total supply chain control. This made it possible for the researcher to have a view of the major supply chain elements in the quick service restaurant sector, though limited to one brand. Food waste is a topical issue and the 'secret recipe' phenomenon in the quick service restaurant made it difficult to get another brand that could be used as a case for comparison. The vast array of product categories sold within the sector may raise issues of a case study not being representative of all the different quick service restaurant brands. Another limitation of this particular case study was that the supply chain elements are controlled by a holding company, which might limit visibility of the real causes of food waste.

Limitations within the case itself were that some respondents felt they were being assessed for performance regarding waste and hence were not forthcoming with responses to questions. The general idea in these cases was that there is no waste. This was however contradicted by feedback from other respondents who pointed out to these areas as contributing to waste. Towards the end of the data collection phase, the appointed research co-ordinator for the project left the organisation and this made it difficult to get buy-in to conduct some interviews. Although the project sponsor is still with the organisation, there was a reshuffle at Director Level, changing the areas of influence. Another limitation was that the researcher was not able to interview the Logistics and Warehouse manager due to issues of confidentiality as this function is run as a separate division to the rest of the organisation. Nine respondents were however interviewed and saturation was reached.

5.7. Recommendations for further research

The present research significantly contributed to literature on South Africa and specifically on the quick service restaurant sector by unravelling the causes of food waste. A quantitative study based on the proposed conceptual model could be conducted to ascertain the impact of each of the causes on food waste with the mediating factor of technology. This study would add to the existing literature by determining quantities of waste which have been lacking from a sub-Saharan point of view. As the present study focused on one case, future studies may compare two cases in a sub-Saharan context or even a sub-Saharan case with one from a more developed economy. A consumer study could be conducted to gather insights on green products and sustainability.

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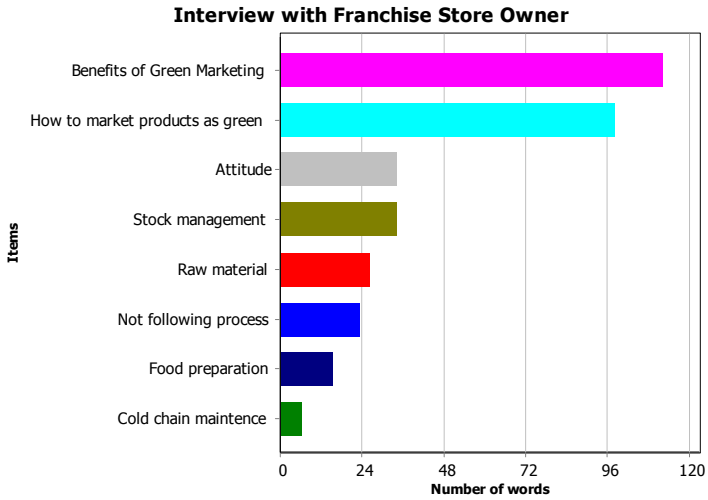
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APPENDICES

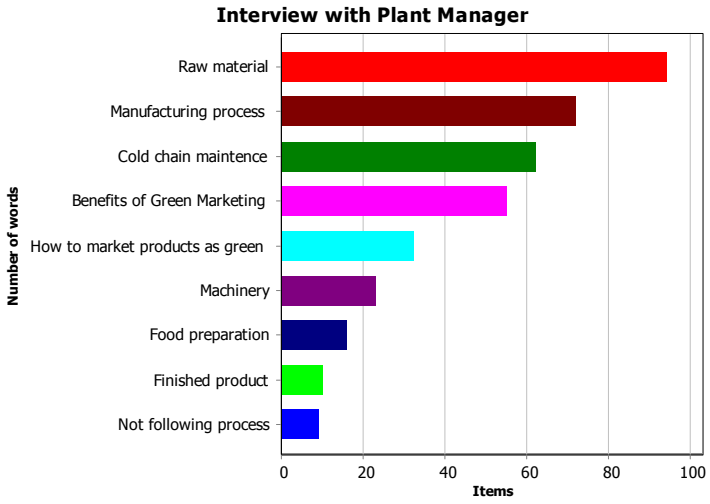
Appendix 1: Summary of the number of words for each codes by respondent





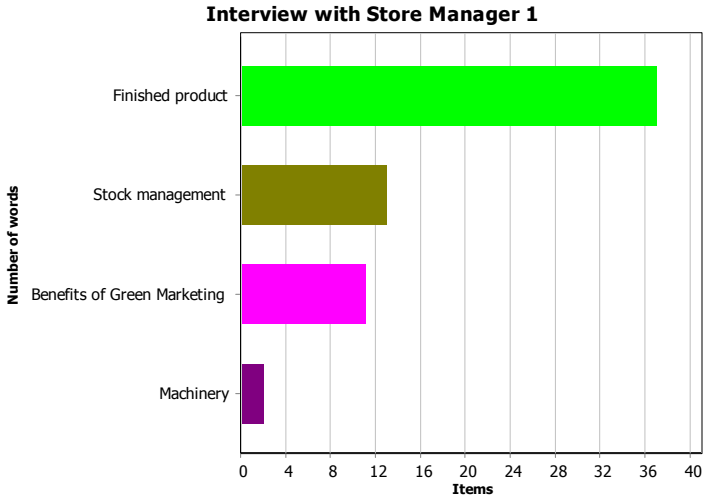



Interview with Managing Executive
How to market products as green
Manufacturing process
Machinery
Finished product
Raw material
Benefits of Green Marketing
Food preparation
Not following process
Number of words
0
26
52
78
104
130
Items


Interview with Plant Manager
Raw material
Manufacturing process
Cold chain maintence
Benefits of Green Marketing
How to market products as green
Machinery
Food preparation
Finished product
Not following process
Number of words
0
20
40
60
80
100
Items


Interview with Quality Assurance Manager
Benefits of Green Marketing
Not following process
How to market products as green
Manufacturing process
Stock management
Cold chain maintence
Finished product
Training
Machinery
Number of words
0
8
16
24
32
40
48
56
64
72
Items


Interview with Quality Control Manager
Manufacturing process
How to market products as green
Raw material
Benefits of Green Marketing
Cold chain maintence
Not following process
Finished product
Number of words
0 6 12 18 24 30 36 42 48 54
Items


Interview with Store Manager 1
Finished product
Stock management
Benefits of Green Marketing
Machinery
Number of words
0 4 8 12 16 20 24 28 32 36 40
Items


Interview with Warehouse Manager
Benefits of Green Marketing
Manufacturing process
How to market products as green
Cold chain maintence
Machinery
Raw material
Finished product
Stock management
Not following process
Food preparation
Number of words
0 5 10 15 20 25 30 35 40 45 50
Items

Appendix 2: Interview Guide

Opening

My name is Sophie Dzumbunu and I am a Masters student in the Marketing Division at the University of the Witwatersrand, Johannesburg. As part of my course, I am conducting research on the causes of food waste in a quick service restaurant supply chain in South Africa. I would therefore like to interview you to gain an in-depth understanding of your views regarding food waste and how it can be reduced.

Please note that all information that will be provided during this interview will be kept confidential, will only be used for academic and research purposes and will not be sold or given to any third party. I will use this information to answer my research questions and fulfil the objectives of this research. May you please take a quick look at this Participation letter that was sent through to you with the invite for the interview and sign it for me if you are happy for us to proceed with the interview. The interview should take between 30-45 minutes.

The following questions will be asked in the opening:

- Position
    - Please tell me about yourself. What is your position within the company?
    - What are you responsible for in your role?
    - What do you love most about your role?
    - Are you permanently employed by the company?
- Experience in current role and previous work experience/roles
    - For how many years have you been employed by the company?
    - What other roles have you held in food service/quick service restaurant/manufacturing/quality/logistics/ warehouse?

These questions serve to confirm that participant being interviewed is the intended respondent and will serve as an ice-breaker as the participant gets to tell the researcher about themselves without immediately going into the research questions. Answers to these questions will also give the researcher background information about the participant and establish rapport between the researcher and participant.

Discussion points:

1. What is your understanding of food waste? How would you define food waste?(View on how the participant understands the phenomenon of food waste)
2. How does your position have influence on food waste?(Obtain the participant's view on the impact of their role on food waste)
3. How would you define the quick service restaurant supply chain? What are the stages of the quick service restaurant supply chain?**(RQ1)**
4. In your experience, what are the factors that influence food waste in the supply chain?**(RQ1)**

Questions 4 and 5 are linked to the objective: To explore the factors that influence food waste in a quick service restaurant supply chain in South Africa

5. How does your area of management result in food waste? **(RQ2)**
6. In what areas or processes do you find food waste in…(manufacturing, quality, packaging, warehousing, logistics, food preparation)**(RQ2)**

7. How is food waste in your area of management influenced by another stage of the supply chain?**(RQ2)**

The above questions are linked to the objective: To identify the supply chain activity with the closest relationship to food waste in the South African quick service restaurant sector.

8. How do you think food waste can be reduced? **(RQ3)**

9. As a manager, what changes would you make in processes within your department to minimise or reduce food waste?**(RQ3)**

Question 8 and 9 seek to probe participants for their views of food waste reduction measures as we all their recommendations on how to reduce food waste

10. In what area of the supply chain would you say there is the largest amount of food waste? **(RQ4)**
11. Why would this area have the most amount of food waste?**(RQ4)**
12. Other than your area of management, what would you say are the reasons for food waste in the quick service restaurant industry? **(RQ4)**

The above questions will assist the researcher in understanding why there is food waste in the quick service restaurant supply chain

13. As a manager, what are the strategies that you would recommend to the organisation to minimise food waste?**(RQ5)**
14. How would you market the company's products as being 'green'?**(RQ5)**
15. What advantages would the company derive from positioning their products as being 'green'?**(RQ5)**

Questions 13, 14 and 15 are linked to the objective: To make recommendations on areas of continuous improvement with an aim of reducing costs as a competitive advantage for the company

With each question, participants will be probed for further detail in order to ensure understanding of the participant's views and get clarity where needed. If the participant responds without giving detail, they can be asked to expand on the statement or explain further.

Closing

It has been a pleasure getting to know your insights on food waste in the quick service restaurant supply chain and the possible actions in reducing food waste. In summary, this is the information I have recorded during the interview…….Have I captured this correctly? Would there be anything you would like to add or ask?

I would like to thank you for taking time to allow me to conduct this interview. May I please call you or send you an email should I have further questions or am unclear about anything?

Once again, thank you, and have a good day further.

Appendix 3: Participation Letter

Participation Letter

Date: 11 August 2017

Dear Participant

My name is Sophie Dzumbunu and I am a Masters student in the Marketing Division at the University of the Witwatersrand, Johannesburg. I am conducting research on the causes of food waste in a quick service restaurant supply chain in South Africa. Food waste is composed of raw or cooked food materials and includes food waste before, during and after meal preparation in the household, as well as food losses in the manufacturing, distribution, retail and food services activities.

As employees of the company, you are **invited** to take part in this survey. The purpose of this study is to explore what factors influence food waste in the quick service restaurant supply chain in South Africa. Further to this, the study aims to gain in depth insight into how quick service restaurant organisations can reduce or eliminate such food waste and creation of a competitive advantage from the company's strategic capabilities.

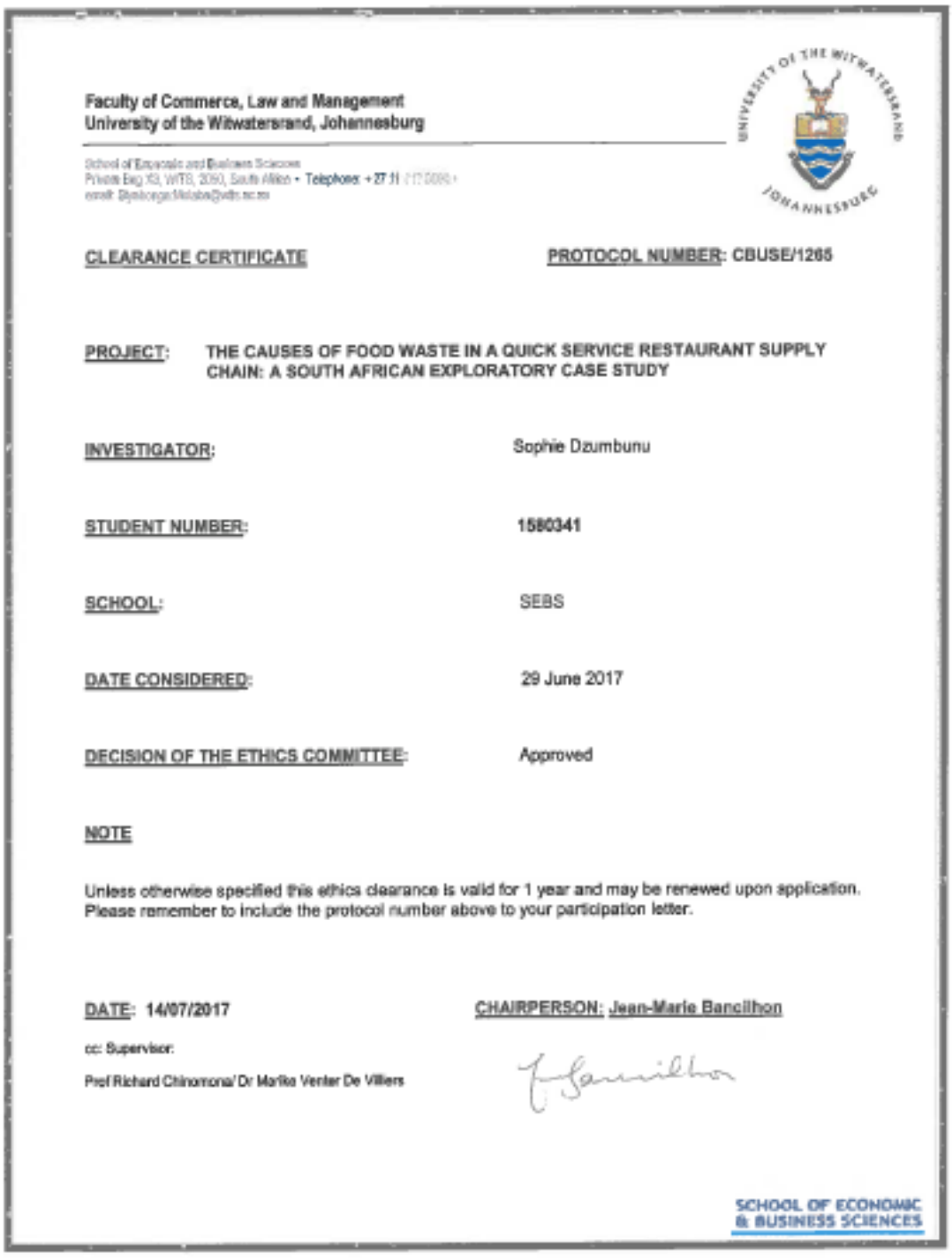
Your response is important and there are no right or wrong answers. This survey is both confidential and anonymous. Anonymity and confidentiality are guaranteed by not being identified by name or job title in the final report. Your participation is completely voluntary and involves no risk, penalty, or loss of benefits whether or not you participate. You may withdraw from the interview at any stage.

The research will be conducted by means of a semi-structured in-depth interview. The researcher will ask questions to which you will be asked to respond. The researcher will take down notes during the interview. The entire interview should take between 30 to 45 minutes. The notes and findings will be summarised and sent to you to confirm the accuracy of the accounts. The research was approved by the SEBS Ethics Committee (Non-Medical), Protocol Number: CBUSE/1265

Thank you for considering participating. Should you have any questions, or require clarification, please contact me on (071) 053-8798 or mailto:sophie.dzumbunu43@gmail.com
My supervisor's name and email are: Dr. Marike Venter De Villiers - marike.venterdevilliers@wits.ac.za /011 717 8067

Kind regards
Sophie Dzumbunu
Masters Student: Marketing Division
School of Economic and Business Sciences
University of the Witwatersrand, Johannesburg

Appendix 4: Ethical Clearance Certificate



Faculty of Commerce, Law and Management
University of the Witwatersrand, Johannesburg

School of Economic and Business Sciences
Private Bag X3, WITS, 2050, South Africa • Telephone: +27 11 [illegible]
email: Blyskeoge.Matoba@wits.ac.za

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: CBUSE/1265**

PROJECT: THE CAUSES OF FOOD WASTE IN A QUICK SERVICE RESTAURANT SUPPLY CHAIN: A SOUTH AFRICAN EXPLORATORY CASE STUDY

INVESTIGATOR: Sophie Dzumbunu

STUDENT NUMBER: 1580341

SCHOOL: SEBS

DATE CONSIDERED: 29 June 2017

DECISION OF THE ETHICS COMMITTEE: Approved

NOTE

Unless otherwise specified this ethics clearance is valid for 1 year and may be renewed upon application.
Please remember to include the protocol number above to your participation letter.

DATE: 14/07/2017 **CHAIRPERSON:** Jean-Marie Bancilhon

cc: Supervisor:

Prof Richard Chinomona/ Dr Marike Venter De Villiers

SCHOOL OF ECONOMIC & BUSINESS SCIENCES