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TITLE: The adoption of eco-innovations: a study of SMEs in the Scottish food and drink sector.

YEAR: 2018

THE ADOPTION OF ECO-INNOVATIONS: A STUDY OF SMES IN THE SCOTTISH FOOD AND DRINK SECTOR

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A thesis submitted in partial fulfilment of the requirement of the

Robert Gordon University

for the degree of Doctor of Philosophy

Aberdeen Business School
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MAY 2018

DECLARATION

I hereby declare that this thesis:

"The Adoption of Eco-innovations: A Study of SMEs in the Scottish Food and Drink Sector"

To the best of my knowledge is entirely my own work and where any material could be constructed as the work of others, it is fully cited and referenced with appropriate acknowledgements stated.

KARAN DAKUP

DEDICATION

In loving memory of David Dakup,

"Gone too soon and deeply missed"

ACKNOWLEDGEMENT

I would like to acknowledge and thank my supervisors; Professor Heather Fulford and Dr Bill Sutherland for their invaluable guidance, support and feedback. Heather, thank you for mentoring me, taking the time to see me through despite the challenges encountered along the way and for inspiring me from the start of this journey to the end, with your constant renditions of "*don't worry, be happy*"!

Many thanks to all the research participants (various food and drink businesses) for sparing the time to participate in this research despite their very busy schedules. I also appreciate the help rendered by Mary Holland (Aberdeen & Grampian Chamber of Commerce) at a time when the research struggled to gain access to participants for allowing us access through the networks' forum to gain direct access to the businesses. Also for following the research twitter account and re-tweeting to stir interest of potential participants, making it easier for the research to gain access to the food and drink network and recruit research participants.

I am also grateful to my fellow research students and members of staff at RGU who continually encouraged and cheered me on through this journey, it has been an experience getting to interact and engage with you all.

To my colleagues at GUL, thank you for understanding and allowing me to take time off work to complete this journey. In particular, I acknowledge the ongoing support of Dr David Alleyne, you have been very patient, encouraging and a source of inspiration, thank you.

Finally, I would like to acknowledge the support of my family, to Enehie; thank you for inspiring me and always being there. To Leona, my sweet baby girl; against all odds, we did it! little Dr. Thanks to my parents and siblings for believing in me and for their endless love and support, and thanks to my friends who helped me get through this journey and have been a constant source of encouragement throughout this process.

ABSTRACT

The increasing government and consumer interest in, and growing concerns about environmental issues have pressured businesses to adopt eco-innovative measures and activities. These pressures have been felt particularly by the food and drink sector in Scotland, a sector that is of considerable importance to the Scottish economy. To date, few studies have considered the challenges businesses in this sector face with regard to the adoption of eco-innovations. In particular, there has been little research on the challenges faced by the SMEs in the sector and how they are adopting eco-innovations. This study seeks to address this research gap through utilization of the diffusion of innovation theory to explore the adoption of eco-innovations by the Scottish food and drink SMEs.

A qualitative survey of the website of 52 businesses was used to collect data and analysed using content analysis to generate five categories of eco-innovations namely; Waste, Energy, GSCM, Carbon and Embedding. This data collected informed the next phase of the research where in-depth interviews was conducted with 18 businesses to understand their eco-innovation adoption processes. The findings revealed two groups of attitudes among the participants namely; the positive and the sceptics. The main motivators to adoption were found to be; moral principles and beliefs, eco-consumer drive, cost saving, legislation and the creation of jobs and new opportunities. The major barriers to eco-innovation were more profound and found to include; non-recyclable waste, non-compliance by suppliers, cost of adoption, lack of interest, the challenge of finding credible and reliable sources, attitudes and behaviours, and a general lack of education and awareness. Using the categorisation of eco-innovations that emerged from the website data analysis, the research developed a scale of greenness reflecting the adoption of eco-innovation along with a classification of adopter types namely; advanced, intermediate and basic adopters.

The thesis contributes to the theory of diffusion by illustrating ways to capture and evidence innovation adoption without dependency on the time element and enabled a classification of eco- innovation adopters. The contribution to methodology is viewed from the application of a qualitative approach that enabled the categorisation of the forms of eco-innovation which resulted in the model depicting eco-innovation adoption and the profiling tool for innovation diffusion. Practical contributions are offered to enable businesses to understand their adoption of eco-innovation through the use of the model, adopter type classification and the application of a best practice guide to facilitate adoption. Recommendations for policy, practice and further areas for research are also proposed within the thesis.

Keywords: **Adoption, Eco-innovation, Diffusion of innovation (DOI), SMEs, Food and Drink, Green, Environmental management.**

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Glossary

- SDI - Scottish Development International
- FDF -Food and Drink Federation
- SE - Scottish Enterprise
- SEPA- Scottish Environment Protection Agency
- DTI - Department of Trade and Industry
- DOI- Diffusion of Innovation
- GSCM - Green Supply Chain Management
- ISO - International Standards Organisation
- SALSA - Safe and Local Supplier Approval
- MSC - Marine Stewardship Council
- LEAF- Linking Environment and Farming
- IFM- Integrated Farming Practices
- DEFRA- Department for Environment, Food and Rural Affairs
- OECD- Organisation for Economic Co-operation and Development
- WRAP - Waste and Resource Action Programme
- SCA - Sustained competitive advantage
- RBV- The Resource-based view theory
- EMT - Ecological Modernization Theory
- SMEs- Small and Medium Sized Enterprises
- SFDF- Scottish Food and Drink Federation
- MSC Marine Stewardship Council

CHAPTER ONE- BACKGROUND TO THE STUDY

1.1 Introduction

According to Audit Scotland (2016), Scotland's economy was valued at around £142 billion in 2015. Central to its purpose to maintain sustainable growth, the Scottish government identifies six key growth sectors; food and drink, financial and business services, life sciences, energy (including renewables), sustainable tourism and creative industries (including digital) within the economy. These sectors are noted to offer opportunities for growth due to existing comparative advantages or the ability to capitalise on Scotland's unique natural assets and their distinctive capabilities (Scottish Government 2015).

Data collated by the government on these key sectors highlight growth within these sectors from 2008-2016 set out in Table 1 below.

Table1.1: An overview of key growth enterprises within the Scottish economy

Year	**2013**	**2014**	**2015**	**2016**
Scottish Economy Total	160,050	166,525	170,335	173,995
Food and Drink	17,370	17,455	17,290	17,320
Financial and Business Services	22680	25090	26945	28305
Life Sciences	480	490	520	535
Energy (including Renewables)	3,085	3,580	3,905	3,995
Sustainable Tourism (Tourism related Industries)	13,480	14,000	13,960	14,090
Creative Industries (including Digital)	12,890	13,825	14,590	15,420
Total growth sectors	**69,985**	**74,440**	**77,205**	**79,665**

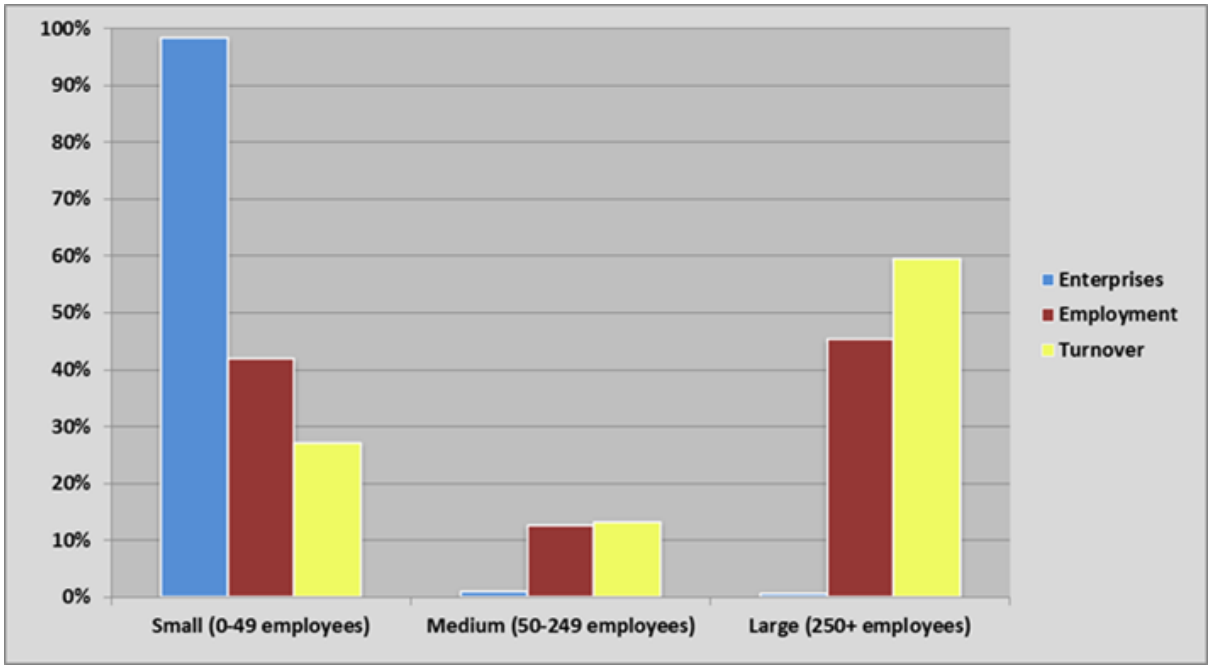
Source: Scottish Government 2016a

As shown in Table 1.1, the six growth sectors vary in size and account for nearly 80,000 enterprises within the Scottish economy out of a total of 173,995 existing enterprises within the economy, with Financial and Business services being the largest, followed by Food and Drink while Life Sciences accounts for the smallest size. Each sector has experienced

different growth rates on a yearly basis, though food and drink saw a slight decline in 2015, but recovered in 2016.

SMEs are essential to the Scottish economy and make a vital contribution to it (Scottish Government 2015), they serve as important growth engines. As at March 2016, there were 348,045 small and medium-sized Enterprises (SMEs) operating in Scotland, providing an estimated 1.2 million jobs. SMEs accounted for 99.3% of all private sector enterprises and accounted for 54.6% of private sector employment and 40.5% of private sector turnover.

Figure 1.1: 2016 Scottish Enterprises by size, employment and turnover



Source: Scottish Government, 2016a

The chart in figure 1.1 shows that small (0 to 49 employees) enterprises alone accounted for 42.0% of private sector employment and 27.2% of private sector turnover, while 2,365 large (250+ employees) enterprises operating in Scotland, as at March 2016, accounted for 45.4% of private sector employment and 59.5% of private sector turnover (Scottish Government 2016a), these figures emphasize the role and significant value of SMEs to the Scottish

economy giving it competitive advantage in global markets. One of the established sectors contributing to the economic growth of Scotland is food and drink (Scottish Enterprise 2013) which is mostly made up of SMEs.

Scotland's food and drink sector is noted to be a high growth area (shown in Table 1.1) to the Scottish economy, with a substantial share in agricultural output. Food and Drink is the largest employer within Scottish manufacturing and accounts for more than a quarter of manufacturing exports. It is also socially and economically important to the UK economy (McCartan-Quinn and Carson 2003; Scottish Enterprise 2013). According to a report by the Bank of Scotland (2016), "the food and drink sector is considered a source of great pride for Scotland, and is key to the ongoing success of the Scottish economy". It is also noted to be the largest manufacturing sector in Scotland, with an annual turnover of £14bn a year.

The sector comprises several distinctive segments such as agriculture, fishing, manufacturing, wholesale, retail, distribution, warehousing, food service and catering such as bars, fast food takeaway, and restaurants (Blackman 2005). There are a total of 18,850 businesses across the food and drink industry supply chain, employing around 115,400 workers (Scottish Government 2016a). The Food and Drinks industry in Scotland manufactures and markets several varieties of food items consumed in the UK and other developed countries. Apart from being a producer and exporter of some iconic products like Scotch whisky, it also produces and exports many characteristic Scottish products such as haggis. According to the Scottish Development International (SDI), Scotland accounts for 80% of the UK fish catch, holds 30% of its beef herd and supplies 10% of its liquid milk (SDI 2013).

The food and drink sector is an important employer and its success is vital to the overall economic performance of the manufacturing sector of the country. It is also primarily made up of SMEs with growth figures for the year 2016 showing 98.8% of the businesses in the

sector registered as small (i.e. 0-49 employees) representing 52.4% of employment within the sector, while 0.8% registered as medium sized (50-249 employees) representing 14.4% of employment, and 0.4 % registered as large enterprises (i.e. having 250+ employees) representing 33.2% of employment in the sector (Scottish Government 2016a). Turnover from the businesses was also reported at £13.5 billion in 2015, further indicating the importance of SMEs within the food and drink sector to the economy.

While the food and drink sector is integral to the growth of the economy, it also plays a significant role in the generation of an environmental impact. The positive contribution of the sector to the economy sits in tension with the fact it also generates a substantial amount of waste. A report by Zero Waste Scotland (2016) estimates that in 2013, 1.3 million tonnes of food and drink was wasted in Scotland with a breakdown as follows; Household waste accounting for 44%, Commercial waste at 55% (out of which Food and Drink manufacturing was 38%, and Other waste at 17%), the report emphasized that the majority of food waste comes from industry and commercial enterprises and further stressed the need for food and drink businesses to reduce the waste generated from farm to fork. In response to this, the Scottish government has committed to achieving a 33% reduction of all food waste generated from Scotland by 2025. Food waste is also linked to the generation of additional emissions through the production of the food and also by disposal by landfill. Given the environmental implications and impact of food waste the Scottish government has also committed to achieving a 42% reduction in GHG emissions by 2020 and an 80% reduction by 2050 across Scotland under the (Climate change) Scotland Act of 2009, the bill was passed on the 4th- August 2009. (Scottish Government 2017).

To meet the reduction target by the set date, there is a need for efficiency in monitoring the activities along the food and drink supply chain and the need for effective disposal of the waste generated.

1.2 The Rationale for studying the Scottish Food and Drink Sector

The food and drink sector is faced with significant environmental challenges that arise from changes in the economic and noneconomic environments such as increased food consumption and the changing societal attitudes toward the consequences of the activities carried out by the industry for example; the staggering amount of waste generated along the food and drink supply chain. Other examples of Scotland's environmental challenges include, "waste, deforestation, soil erosion, water use, carbon emissions and greenhouse gases, landfill, environmental degradation and biodiversity loss" (Audsley et al. 2010; Cranfield 2010; Zero Waste Scotland 2016). The environmental issues affecting the food and drink sector remain a topical issue and a priority to the Scottish government, therefore there is need for further research on the sector as a result, the study is focused on SMEs in the food and drink sector.

Scotland still has some way to go to achieving its goal of an 80% carbon reduction, as such, there is a need for more efficient plans to meeting the zero-waste target. Therefore, businesses are tasked with the challenge to be sustainable and the need to adopt eco-innovations within their operations (Fritz and Schiefer 2008; Zero Waste Scotland 2016a). The current food report published by Zero Waste Scotland (2016b) accounts for a decrease in household food waste by 5.7% between 2009 to 2014, that resulted in a savings to household budgets of £92million, however, it does not account for commercial reductions but goes to show the economic value that can be derived from cutting down on waste. Notwithstanding the lack of baseline figures, there is a need for continued efforts aimed at minimizing the negative environmental impacts generated by this broad and robust sector which can lead to positive improvements for the environment and businesses for example; energy efficiency, reduction in the use of raw materials and water consumption, these can further improve the profitability of the business (Hyde et al. 2001).

Scottish food and drink federation (SFDF) also known as food and drink federation Scotland, operates as an independent trade association and is a part of the Food and Drink Federation (FDF) that represents food and drink businesses in Scotland (from global brands through to small and medium-sized enterprises). The association represents the industry and its members' views when communicating with legislators, regulators, the Scottish Government, Scottish Parliament and Food standards Scotland. In addition, to further the agenda of the sector and contribute to its growth, the SFDF also collaborates with similar associations such as; Scottish Enterprise (SE), CBI Scotland, Scotland Food and Drink, Scottish Retail Consortium. Other notable partnerships include academic and research institutes and the agricultural sector (Food and Drink Federation 2016).

SFDF supports and ensures their members are actively involved in decisions and their views are considered towards the development of industry policy and other range of issues affecting the food and drink industry in Scotland while working to improve the socio-environment in which its members operate.

In order to deliver major improvements to the environment by food and drink businesses, the association launched the Five-fold Environmental Ambition in 2007 (renewed in 2017 as Ambition 2025- Shaping Sustainable Value Chains). The renewed targets set around reducing the industry's environmental impact in five key areas are identified in Table 1.2.

Table 1.2: 2025 Environmental Commitment

Core Areas	Targets
Co2 emissions	Achieve a 55% absolute reduction in CO2 emissions by 2025.
Food Waste target	Send zero food waste to landfill from members' own direct operations from 2016 and beyond and reduce food waste across the whole supply chain from farm to fork, including within members' own operations.
Packaging	Minimise the impact of used packaging associated with food and drink products and to encourage innovation in packaging technology and design that contributes to overall product sustainability.

Water	Deliver continuous improvement in the use of water across the whole supply chain and take action to ensure sustainable water management and stewardship. Contribute to an industry-wide target to reduce water use by 20% by 2020 compared to 2007.
Transport	Reduce the environmental impact of our members' transport operations, whether from own fleet operations and third-party hauliers, in terms of both carbon intensity and air quality aspects. Embed a fewer and friendlier food miles approach within food transport practices.
Sustainable Supply Chains	Promote the recognition and uptake of sustainability standards and innovations in the food and drink sector.

Source: Food and Drink Federation 2016

The major challenges for Scottish food and drink SMEs lies in their logistics distribution and production process, these result in further environmental impact such as waste, pollution and emissions of gases. Therefore, there is a need for better efficiency in reducing carbon emission and cutting down on waste (GES 2011). The adoption of eco-innovations by these businesses depending on the degree of implementation can help reduce the negative impact on the environment and also help businesses to systematically assess and improve their environmental performance; this can be seen in the adoption of recycling practices, the use of renewable energy systems and encouraging re-use (Darnall and Kim 2012; Vilchez et al. 2016). Growing pressure from stakeholders such as consumers, government regulators, environmental activists, are triggering factors for companies to adopt a certain level of commitment to green and sustainable practices (Hassini et al. 2012). By aiming to improve the environmental activities of the business this mitigates against negative impact generated and will enable the sustainability and resilience of the business in the long-term.

The study chose to focus on SME's within the sector because they hold a vital economic importance to the Scottish economy and the UK. Being the largest manufacturing sector in Scotland and the UK economy (Food and Drink Federation 2016), the sector carries a significant environmental impact on climate change, food supply and agricultural practices.

As an individual food and drink business the impact generated might by insignificant but a culmination of activities carried out by SMEs within the sector is significant and should not be ignored (Revell, Stokes and Chen 2010). As a result, the adoption of environmental innovations by individual businesses goes a long way in curbing the collective impact and ensuring the industry is able to achieve the Scottish green ambition target set. It is therefore important for this study to understand how eco-innovations are adopted with business activity and processes.

Therefore, this study is focused on the adoption of eco-innovations by Scottish food and drink SMEs. Participants used in this study have a turnover of under £50 million, with no more than two hundred and fifty employees and are directly involved in the day to day running of the business.

1.3 Research context

Eco-innovations refer to environment-friendly activities such as green design, green operations, material sourcing and selection, green packaging, green procurement, reuse and recycling, waste management and reverse logistics, eco-innovations are adopted to address the negative impact of activities on the environment (Seroka-Stolka 2016). A look at broadly defined eco-innovations from the literature on activities, practices and technologies adopted by businesses to reduce the negative environmental impact of their business process and activities on the environment relate to terminologies, such as “green”, “sustainability”, “eco-friendly”, “environmental” and are further classified to relate to three main categories; Pollution Prevention, Pollution Control and Management Systems (Klassen and Whybark 1999; Vachon and Klassen 2007; Hajmohammad et al. 2013).

The main aim of these three categories is to improve the environmental performance of the companies. For instance, the adoption of new green technologies has been noted to

address issues of pollution at the source and it is further acknowledged that such innovations result also in waste reduction, cost reduction benefits and the development of valuable resources (Hart 1995; Hajmohammad et al. 2013). Other innovations that also seek to address environmental issues at source include the use of an environmental management system by the company, for example: Lean management practices, Kaizen, ISO 14001, Recycling and Reuse etc.

Eco- innovation adoption is increasingly gaining relevance in the business environment as more businesses become aware of environmental impacts and aim to be environmentally sustainable. However, research in the field is still preliminary (Diaz-Garcia et al. 2015) and lacking in specific study research and empirical data (Macaneiro, Da Cunha, and Balbinot 2013, p. 179). Therefore, there is a need for further empirical research into environmental adoptions by SMEs, and the need to probe deeper into the barriers and drivers of their adoption of environmental practices, while assessing the environmental awareness and perceptions of environmental issues (Revell, Stokes and Chen 2010; Sarkis et al. 2011; Hajmohammad et al. 2013, Cuerva et al. 2014), specifically in the context of a UK-based study. It is in this context that the study focuses on understanding the adoption of the eco-innovations with specific focus on Scottish food and drink SMEs. It seeks to investigate how Scottish food and drink businesses are adopting eco-innovations within their business and reduce the environmental impact created by the industry. The study seeks to understand the awareness-knowledge of businesses on eco-innovation adoption, the relevance of eco-innovations to these businesses the motivators and barriers encountered with adoption and to identify the prominent forms of eco-innovations adopted and reflect the extent of eco-innovation adoption and its diffusion within the food and drink sector.

Like most developed nations, the Scottish Government has placed a significant importance on the need for more sustainable business operations, however, the smooth adoption of these eco-innovations by businesses is slow due to existing challenges. Eco-innovations

have generally been associated with cost, for SMEs in the food and drink sector struggling to keep the business afloat, the idea of added cost will be unwelcome. A general lack of understanding of eco-innovations and how to implement these within business can further make it more difficult (Arundel and Kemp 2009). However, there is growing recognition of the importance of adopting eco-innovations by businesses through the Scotland's ambitious target and the need to achieve a low carbon economy, this poses a challenge for all businesses, including those in the food and drink industry.

1.4 Aims, Objectives and Questions

To achieve industry sustainability and meet the Scottish green ambition goal of achieving zero waste it is important to have a good understanding of the practices the Scottish food and drink businesses are adopting to improve their environmental performance therefore, the main aim of this research thesis is "To investigate the adoption of eco-innovations by Scottish food and drink SMEs".

Objectives

The study conducts an empirical assessment of on-going eco-innovations adopted by Scottish food and drink SMEs, evaluating the extent to which these SME's are involved in incorporating green environmental management innovations into their businesses as well as assessing the motivators and barriers to adopting these eco-innovations and has set the following objectives for the study:

1. Assess the awareness of eco-innovations in Scottish food and drink sector SMEs.
2. Investigate the importance Scottish SMEs in the food and drink sector place on eco-innovations.
3. Identify the forms of eco-innovation adopted by the SMEs.
4. Identify and examine the motivators and barriers to eco-innovation adoption efforts by SMEs in the Scottish food and drink sector.

5. Generate a scale of greenness based on the forms of eco-innovations adopted by the SMEs.

In line with the research aim and objectives, the central question to this study is "**What is the extent of adoption and diffusion of eco-innovations by Scottish food and drink SMEs**?" Sub-questions investigated include:

- Q1. How aware and informed are Scottish SMEs about the concept of eco-innovations?
- Q2. What level of importance is accorded to the adoption of eco-innovations by the Scottish food and drink SMEs?
- Q3. What forms of eco-innovations are adopted by the SMEs in the Scottish food and drink sector?
- Q4. What are the motivators or barriers food and drink businesses experience in the adoption of eco-innovations?
- Q5. What would a scale of greenness reflecting eco-innovation adoption comprise?

1.5 Methodology

This study makes use of qualitative methods and as such it adopts an interpretivist philosophical approach. The interpretivist approach is well suited to social science research; where the objects of study are complex and can be influenced by multiple factors, events, and social interactions (Schwandt 1994). By adopting an interpretivist approach, the research is able to capture the subjective experiences of the participants of study, which in this study involves investigating the impact of the adoption of eco-innovations by Scottish food and drink SMEs.

A pilot study was conducted at the early stage of the research using interviews to gain insights on the sector for the research. Secondary data gathered from the websites of food

and drink businesses was analysed using a web-based content analysis approach which also informed the interview process at the third and final stage of the research, this served as the primary data collected for the study. The research made use of an interview guide, with open-ended questions to interview owner-managers from eighteen (18) SMEs. The use of a semi-structured interview allowed for flexibility to explore unexpected themes which the participants considered vital. The interview data gathered was managed using Nvivo (data analysis software), the information was further analysed using a thematic analysis approach and the findings are interpreted and presented in chapter 6.

1.6 Originality of Research

Despite the relevance of the food and drink sector holds to the economy, there are very limited studies relating to the sectors efforts on the adoption of eco-innovations. Within the literature most studies focus on issues relating to; the adoption of green supply chain management (see: Chen 2005; Seuring and Muller 2008; Sarkis et al. 2011; Vachon and Klassen 2007; Vachon and Mao 2008). The perception of the consumers on green issues (see: Chang 2011, Jayaram and Avittathur 2015; Namkung and Jang 2013; Raska and Shaw 2012). In addition to this, the locations of some of these studies can also be considered a limitation, most of the studies are outside the UK and relate to the context of specific countries and specific industries or sectors within those countries (see: Kushwaha and Sharma 2016; Rahbauer et al. 2016; Zailani et al. 2015). This research aims to address this location and industry gap by building to the knowledge of eco-innovation adoption specific to the country of research, Scotland.

It further assists practitioners and government agencies, charged with the mandate to support SMEs, to better understand and facilitate eco-innovation adoption. It contributes to the existing literature of environmental management in the following ways:

Contribution to theory: the study has contributed by the useful application of Rogers (2003) innovation model to capture snapshots of eco-innovation adoption and illustrating the extent of diffusion without needing to apply the time applied within Rogers model (suitable to longitudinal type studies). Therefore, the study has provided an alternative way for further research studies to capture adoption based on the extent of innovativeness (focused on the forms of adoption) without the obstacle of capturing the time element. In addition, the study was also able to classify participants using an adopter typology can does not require a time element making it suitable for its application and use by both short and long-term research to apply.

The contribution to methodology: can be seen from the systematic categorization of the forms of eco-innovations namely; Waste, Energy, GSCM, Carbon and Embedding. This was achieved through the qualitative website analysis conducted on the 52 businesses which resulted in the creation of a set of main categories and sub-categories relating to eco-innovation adoption within the Scottish food and drink industry. The methodology adopted by the study has provided useful ways to depict models such as; the diffusion of eco-innovations profile, scale of greenness, eco-innovation adopter categories and the eco-innovation tool as proposed within this study and it is hoped that this can be further expanded upon in further studies.

The contribution to practice: is established from the practical contribution to small and medium-sized enterprise business owners within the food and drink sector, providing a useful guideline from best-practice studies for the adoption of eco-innovations by businesses. This is achieved through the use of the environmental “scale of greenness” which aims to classify the eco-innovation activities adopted by ranking them by the extent of their innovativeness and also enables the businesses to identify what adopter type they fall under i.e. advanced, intermediate or basic. Through this process, the businesses are able to identify and improve their green status.

It further provides useful recommendations for policy makers that might influence policy change towards more practical solutions towards eco-innovation adoption and facilitate the achievement of a zero-waste, energy efficient green Scotland.

1.7 Thesis structure

Figure 1.2 illustrates the outline of this thesis which is split into 8 chapters. Details of the chapter's contents are summarised below.

Chapter 1 is an outline of the research and gives a general background to the study, scope of research, aims, objectives and questions asked and addressed by the research.

Chapter 2 provides a review of the relevant literature as it relates to SMEs, their key characteristics, issues, and considers the literature on green environmental practices including the challenges and benefits of eco-innovation adoption. This chapter helps in identifying existing motivators and barriers to eco-adoption linked to RQ 4. The chapter further identifies the key stakeholders, environmental support organisations and green schemes relevant to the adoption of eco-innovations.

Chapter 3 reviews the key terms and concepts that relate to eco-adoption, environmental innovations and identifies related theories within literature associated with eco-innovation. The focus is narrowed to "the diffusion of innovation", which is applied in the research to generate a scale of greenness and adopter categories.

Chapter 4 presents the methodological approach, research philosophy and rationale for the choice of approaches and strategies used in the study design. The chapter provides an account of the methods used in conducting the research, how the data is collected,

managed, analysed and interpreted to address the research questions established in Chapter 1.

Chapter 5 presents the findings from the data collected from the websites of food and drink businesses, a content analysis of the information on the website is conducted and explained in relation to the research questions.

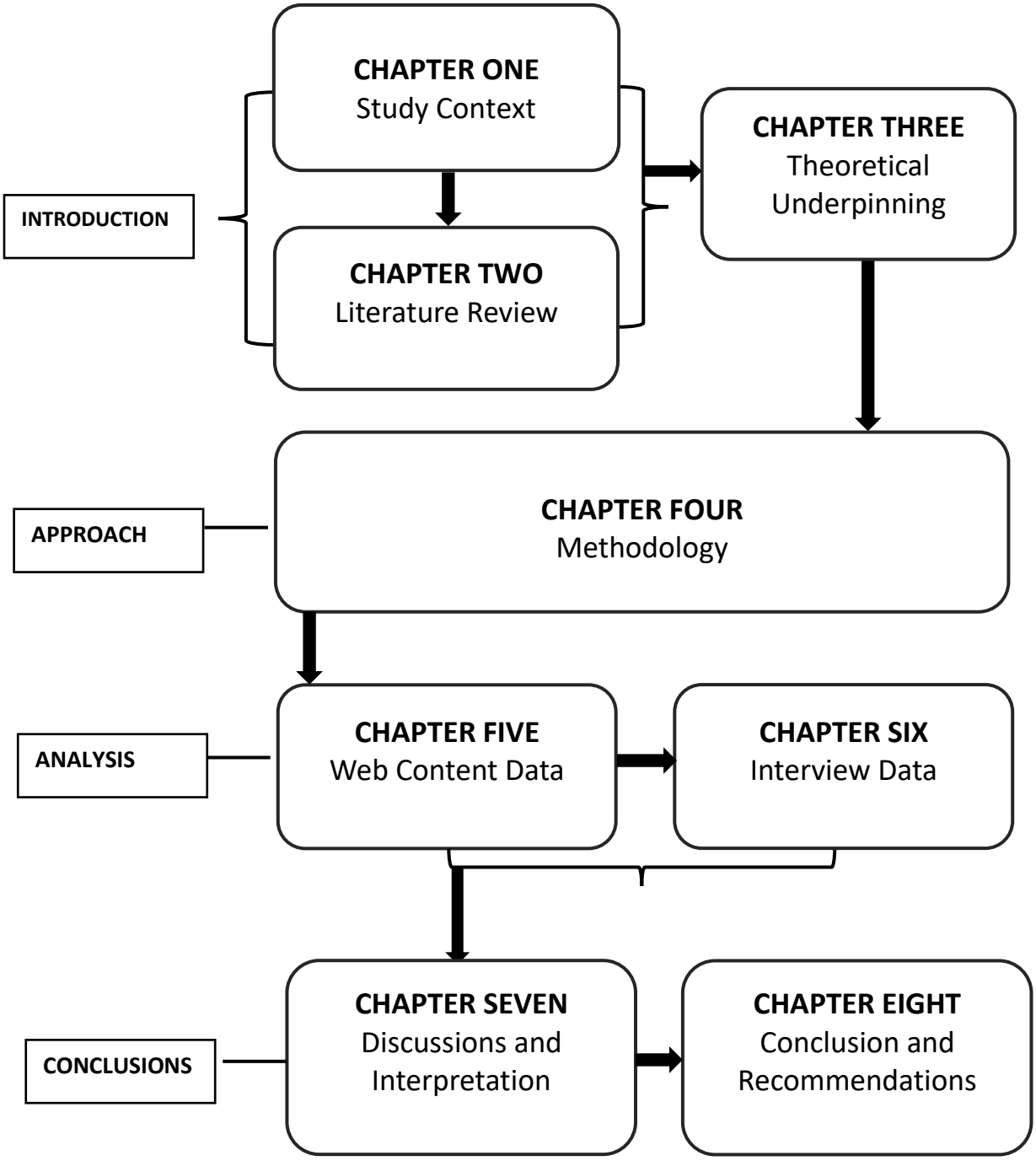
Chapter 6 gives a detailed analysis of the data obtained from the interviews. A thematic analysis of the findings is presented in relation to how the businesses are impacted by the adoption of eco-innovations.

Chapter 7 is a detailed discussion of the research investigation from the semi-structured interviews, the attributes associated with eco-adoption in this study, along with emergent themes and issues that impact the adoption process, it compares with the literature and interprets in order to address the research questions of the study. This chapter concludes with a conceptual model that depicts eco-innovations adopted by SMEs. The outcome is the development of a scale of greenness and a categorization for eco-innovation adopters, along with a tool guide to enhance the adoption of eco-innovation by businesses.

Chapter 8 the research aim and objectives are revisited to see how well they have been achieved in this study. A summary on the key findings of the research, its recommendations, the contributions and limitations to the study are discussed, along with recommendations towards policy, practice and future research.

This chapter provides an overview of the study, the aim and objectives, a background to the Scottish food and drink sector, the methodology, highlights the significance and contribution of the study and lastly, presents the structure of the thesis by chapters.

Figure 1.2. Structure of the research



Source: Author generated

CHAPTER 2- LITERATURE SURVEY: SMES, ECO-INNOVATION AND THE SCOTTISH FOOD AND DRINK SECTOR

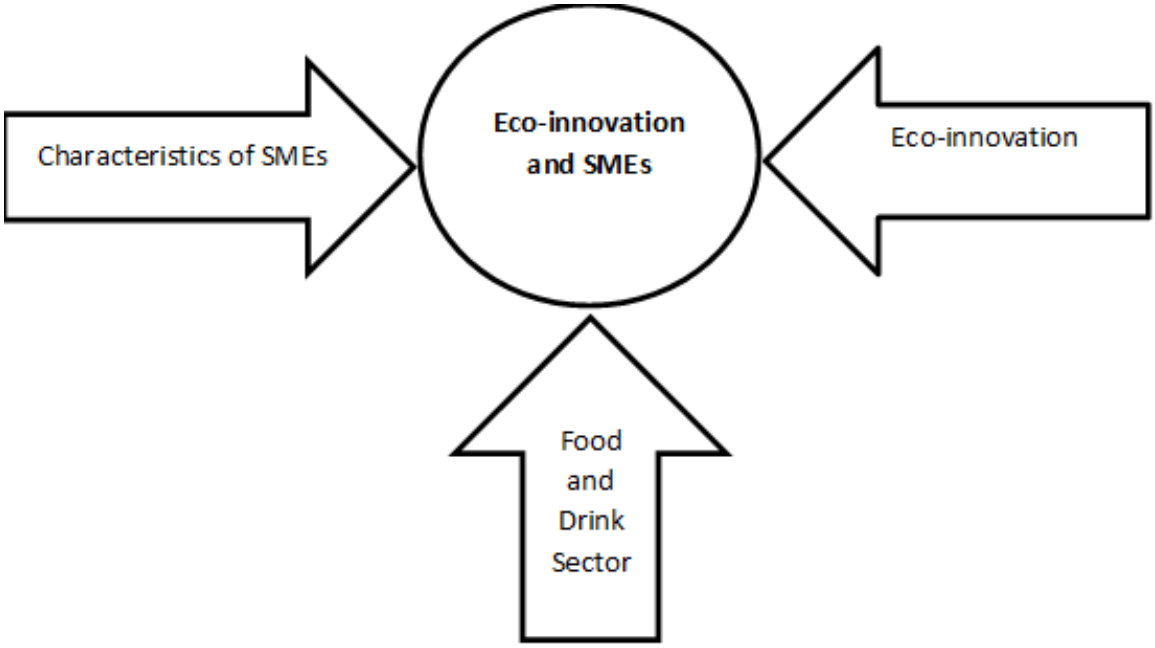
2.1 Introduction

The aim of this chapter is to identify and review research related to SMEs, and their adoption of eco- innovation. This chapter begins with a general discussion of SMEs and their key characteristics and then moves on to introduce the concept of eco-innovation and its key themes such as awareness and attitudes towards its adoption, forms and the factors that influence their ability to adopt eco- innovations within businesses, and eco-innovation strategies identified within SMEs.

The chapter then narrows the focus of eco-adoption down to the context of study which is SMEs in the food and drink sector in Scotland, highlighting the need for further research in the field and the relevance of conducting the study. It then takes into consideration environmental regulations, policies and standards applicable to businesses in Scotland which are deemed relevant to the context of study, identifying the current types of environmental management certifications associated with the sector, and ends with a discussion on the relevance of the adoption of eco-innovation for SMEs in the sector. The last section summarises the main points and concludes the chapter.

In looking at SMEs and eco-innovation adoption, it is important to state that in order to give a comprehensive and detailed understanding, this research will draw on a wide range of academic articles that relate to environmental management practices, green management, and environmental sustainability due to the broad nature of this subject, figure 2.1 highlights the focus of the study as covered within this Chapter.

Figure 2.1: Literature Map



Source: Author generated

2.2 SMEs: A Definition

A number of definitions exist for SMEs and the term is often used to refer to small businesses (Curran and Blackburn 2000; Deakins and Freel 2009) as a result, definitions can vary depending on the criteria being used or the context of research or the country. For example, while the threshold on SMEs set by the European Union is a limit of 250 employees, countries like the United States views SMEs to include less than 500 employees and Japan to include less than 300 employees. The definition set out by the European Commission (2018) classifies SMEs by their number of employees, their turnover and their size as detailed in table (2.1).

Table 2.1: Definition of SMEs

Category	No of Employees	Turnover (Euro)	Balance Sheet (Euro)
Micro	<10	< 2 million	< 2 million
Small	<50	< 10 million	< 10 million
Medium	<250	< 50 million	< 43 million

Source: European Commission 2018

According to the Companies Act of 2006 amended in 2016 (legislation.gov.uk) the UK in section 382 and 465 defines SMEs accordingly: A small company employs not more than 50 employees, has a turnover of less than £10.2 million net and a balance sheet total of less than £5.1 million net and a medium-sized business employs not more than 250 employees, has a turnover less of than £36 million and a balance sheet total of less than £18 million. The aim of classification is to ensure that businesses that are regarded as SMEs have access to capital and financial assistance, to improve their access to research and development and promote their growth and innovation (Curran and Blackburn 2000; Curran 2006). This definition is also applicable to Scotland. For the purpose of this study, SMEs will be defined simply as any business that employs less than 250 employees including direct contract hires to deliver its products and services.

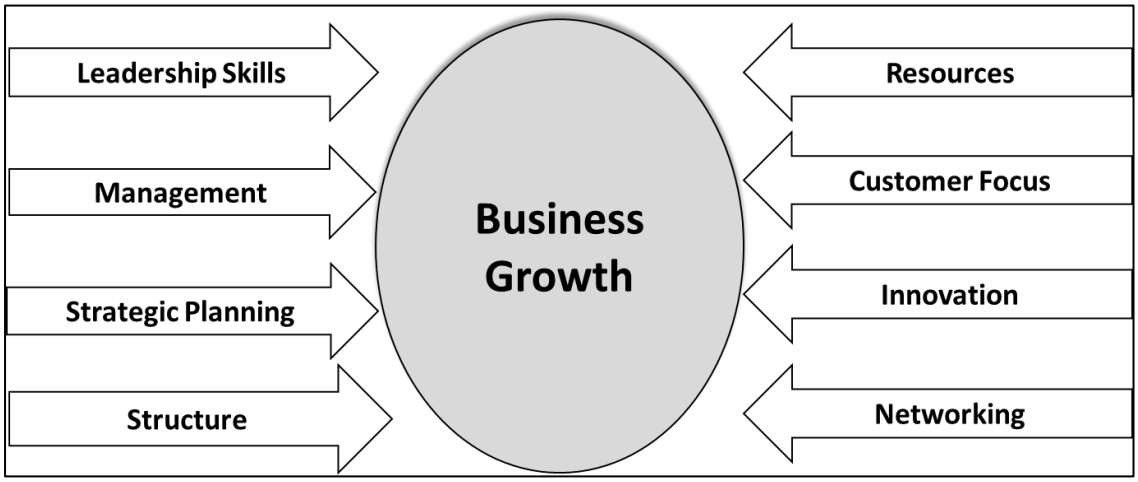
According to findings from the report by the Scottish Government 2016(b), SMEs make up for 99% of registered enterprises in Scotland. This accounts for more than half the employment within the private sector and almost 40% of the turnover. SMEs are key components of the diversification and growth of the Scottish economy.

There is no doubt that SMEs play a vital role in the Scottish and the UK economy as a whole. They are highly significant to the economy by providing employment and contributing to the gross domestic product (GDP) of the economy and are also noted to be creators of innovative products and processes (DTI 2012; Scottish Enterprise 2013). An overview of the relevance of SMEs to the economy has been covered in Chapter 1. As such, this section will not reiterate the details but move on to identify some of the key characteristics associated with SMEs from existing studies in the following section.

2.3 Characteristics of SMEs

The key findings from the literature on factors identified as critical in the growth of small and medium sized businesses are: leadership, management, strategic planning, structure, resources, customer focus, innovation and networking. While the first six factors seemed to be commonly cited within the literature, the last two factors were not. However, these two factors; innovation and networking are noted by some authors to be just as important as the first six factors, and play a vital role in the growth of SMEs especially in the 21st century and given the nature of the global era that is highly competitive, requiring businesses to be more flexible and innovative in adapting their products to meet customer demand, while networking fosters the growth and sustainability of the business. These factors that influence the growth and success of SMEs are summarized in figure 2.1.

Figure 2.2: Characteristics and factors critical to SME business growth



Source: Author generated from literature

Figure 2.2 highlights factors crucial to the business growth of small businesses. SMEs are noted to have very distinct characteristics that play critical roles in the survival and success of the businesses. These attributes will be discussed in the following sub-sections 2.3.1 to 2.3.8.

2.3.1 Leadership Skills

Having strong leadership skills in the owner/manager is of crucial importance to the success of an SME. There should be total commitment to the business, ownership, risk and opportunity driven Laforet and Tann 2006; Penrose 2009; Burns 2016). (However, a number of studies have found the reverse to be the case with many SMEs, notably issues and challenges identified as; poor administrative skills, limited resources, ownership and management style focused on operational activities (Ghobadian and Gallear 1996; Wessel and Burcher 2004; Garengo et al. 2005a). The responsibility of the ownership and management of daily activities makes it difficult for the leader to deal with other strategic plans for the future of the business.

Nonetheless, despite the issues faced by SMEs when running their business, the success and growth of an SME often hinges on the owner's strong leadership skills and the ability of the leader to focus on longer term plans and the strategic management of the business.

2.3.2 Management

Management refers to the first line or direct supervision by the owner or manager of a business. This has the advantage of equipping the owner with a good understanding of the business, the customer needs, business operations and processes (Cagliano et al. 2001; Youssef et al. 2002; Deros et al. 2006), though such autonomy and control is also likely to slow the growth of the business (Beaver and Prince 2004). SMEs are also noted to have a good understanding of processes, operational problems, customer needs, and are more likely to be involved with the customers (Cagliano et al. 2001; Youssef et al. 2002; Deros et al. 2006).

SMEs' management style emanates from the owner manager; this renders the SME inconsistent, incoherent, and simple and straightforward in its approach (Hankinson 1997). There is not much to separate the owner manager of SMEs from the SME itself. The owner manager of the SME tends to be involved in all aspects of the operations of their firm. The sum total of expertise resides in the owner manager. Therefore, the degree of expertise can vary enormously (Stasch and Ward, 1987; Hurmerinta-Peltomaki and Nummela 1998).

No one SME is the same as another but they do have certain commonalities such as; owner's style and growth goals but this depends upon the industry sector (Ahmadi and Helms, 1997; Dobbs and Hamilton, 2007). There is often a prioritisation of immediate concerns with a fire-fighting mentality according to Storey and Sykes (1996) and a predominance on 'doing' through experience or intuition (Matthews and Scott 1995; Corbett 2005).

The expertise of management plays a major role in implementing or adopting change in the organization and this includes incorporating eco-innovation. Eco-innovations require a management drive to implement and support the organization to deal with change. This could sometimes involve direct implementation of a clear pathway to become green or gradual adoption of a stepwise road map to sustainable green growth.

2.3.3 Strategy Planning

A review of the strategic planning literature suggests that most of the planning in SMEs is largely informal, hidden and intuitive, the decisions in were frequently based on imprecise information and subject to fluctuation (Barnes 2002; Sum et al. 2004; Beaver and Prince 2004). This may be due to the volatile and short-term nature of contemporary markets encompassing the SME. In such firms, the strategic process was emergent and instinctive rather than fixed and regulated as in many large firms. This approach was more appropriate and efficient for SMEs to deploy when integrating their business activities with the competitive environment (Beaver and Prince 2004). This is mainly due to the uncertainty and volatile environment of SMEs where innovation, flexibility and responsiveness may be vital for survival.

SMEs are often driven by survival and independence than by growth and business development (Burns 2010; Storey 2016) and as a result strategic planning is often lacking or considered unnecessary. For most SMEs, a focus on niche strategies was considered to be more realistic, owing to their inherent resource disadvantages (Curran and Blackburn, 1994; Tolentino, 2000). The strategic planning employed by a firm was contingent upon its stage of development and this activity may evolve and become more formal and sophisticated over the life-cycle of the business (Berry 1998; Phelps et al. 2007; Storey 2016).

Setting a clear pathway to implementing environmental activities and inculcating this into the long-term business plan is a key strategy to success in adopting eco-innovations.

2.3.4 Structure

SMEs are noted to have a flat organizational structure, i.e. fewer levels of management, and fewer departmental interfaces promoting a flexible work environment (Shea and Gobeli 1995; Ghobadian and Gallear 1997). Some advantages of the flat structure of SMEs when compared to large firms are less resistance to change, faster communication process, faster decision-making process, and faster implementation. Large organizations on the other hand are very formal and have a higher degree of standardization and specialization compared to the organic nature of small firms, i.e. absence of standardization and the prevalence of loose and informal working relationships (Youssef et al. 2002; Garengo et al. 2005; Deros et al. 2006). Tidd et al. (2005) posit that the flat organizational structure and streamlined business processes of SMEs were advantageous in the short-term to achieve an efficient and productive business, but might have a negative impact in the long-term, inhibiting the development of innovative products or services, and thereby was side-lined to respond to the ever-changing market and technology.

Managing eco- innovations and the changes that follow is faster for SMEs than larger corporations since decision making and therefore implementation is faster in a flat structure. Much depends on the experience and knowledge of the business owners or managers.

2.3.5 Resources

The availability of training and staff development in SMEs is more likely to be adhoc and small scale compared to the planned and large-scale training in larger firms. Due to the smaller workforce of SMEs it is easier for small businesses to educate and train employees when compared to large firms. However, due to the scarcity of resources such as; human

resources, infrastructure and financial capability (Thomas and Webb 2003; Wessel and Burcher 2004), SMEs struggled to allocate sufficient funds for training despite the training needs of employees being identified (Ghobadian and Gallear 1996; McAdam et al. 2000). High personal authority, commitment and responsibility of the owners in SMEs encourage and enhance for a common purpose among the workforce to ensure the job gets done (Youssef et al. 2002; Deros et al. 2006) and for SMEs the evaluation, reporting and reward system is much simpler and straightforward, unlike the larger firms.

In order to successfully adopt eco-innovations, identified resources i.e. human need to be trained to become competent in eco-innovation and its adoption.

2.3.6 Customer Focus

SMEs tend to be more responsive to market needs, adaptable to change, and more innovative in their ability to meet customer needs (Haksever 1996; McAdam and Armstrong 2001; Deros et al. 2006). SMEs are very close to their products and customers that allow faster information flow between customers and the company, creating an increased sense of responsibility. Many successful SMEs deliberately choose to exploit a particular market segment where they can either specialize in quality improvements not offered by large firms or attain a cost advantage by offering a particular expertise or specialized knowledge (Beaver and Prince 2004). SMEs are highly dependent on a small customer base (local or regional market) with limited external contacts, this often results in a close interactive relationship between SMEs and the customers (Lindman 2004), other benefits that arise from such engagements are long-term relationships, customer loyalty, and customer satisfaction (Jones and Rowley 2011).

SMEs have customers who are well informed about the importance of eco-innovation and many customers pay attention to companies that are going green with their products or

services. In fact, customers encourage SMEs to go green by selective buying of products that bear a green label as a way of contributing to the environment (Williams and Schaefer 2013). For example; many people will rather procure recycled paper and other recycled items that have been manufactured through energy efficient means thereby contributing to reduction in the carbon foot print.

2.3.7 Innovation

Innovation is the process of translating ideas into products or services of value. As cited in several research studies, innovation has been identified as a key source of competitive advantage for organizations. A study by Hallberg (2000) suggests that SMEs have an edge over large firms with respect to innovation and conduct R&D more efficiently than large firms.

Findings from past research identified the following factors as critical to SMEs innovative performance; entrepreneurial dynamism, commitment of CEOs or owners (Birchall et al. 1996; Vossen 1998; McAdam et al. 2000; Humphreys et al. 2005); corporate culture (Laforet and Tann 2006); innovation linked to strategic business plan (Laforet and Tann 2006); efficient network co-operation (Mitra, 2000 North et al. 2001; Terziovski 2003); organizational structure, flexibility, short communication, proximity to market demands and motivation (Vossen 1998; Karlsson and Olsson 1998; Chandler et al. 2000; McAdam et al. 2000; Humphreys et al. 2005; Laforet and Tann 2006).

Humphreys et al. (2005) stress that for innovation to be effective it must involve all areas of an SME, every discipline and process. Notable factors inhibiting innovation from the literature were; training, skills and networking, knowledge acquisition, resources and customer dependency (McAdam et al. 2000; Humphreys et al. 2005; Laforet and Tann 2006).

SMEs need to adapt to the changing environment through innovation by re-inventing themselves to continue to be sustainable and competitive in the business environment. The ever-changing requirement of sustainability helps drive the introduction and growth of eco-innovation for products or processes to align with current or anticipated green regulations and achieve continued growth.

2.3.8 Networking

Networking is interaction with bodies or group of bodies for the purpose of exchange of information and experience. For SMEs networking plays an important role in the development of skills and provides the owner/manager with an opportunity to build strategic market positions that offer enhanced competitive advantage. Some studies suggest that SMEs become more innovative when they are part of clusters (Mitra 2000, North et al. 2001). Academic institutions also play a key role in disseminating the latest technical knowledge to small firms through collaborative programmes such as Scottish Executive Expertise, Knowledge & Innovation Transfer Programme (SEEKIT) and Scottish Enterprise etc (Carbon Trust 2016). However, very few SMEs were aware of the existence of such support available from Government bodies or Universities (North et al. 2001; Thomas 2007).

Thus, to strengthen the innovative capability of SMEs, a more strategic and co-ordinated approach to providing innovation support is needed. Some notable benefits of networking in SMEs include; increase in sales channels, creating new market value, widening the range of customers or the reach of products, better understanding of emerging technologies, and sharing best-in-class practices (Barbosa and Fuller 2007).

In summary, the key characteristics of SMEs reveal they have very small market shares in any given sector (Deakins and Freel 2009). SMEs tend to be more creative and innovative than larger firms (O'Shea 1998; Susman 2007). They work hard at keeping close to their

markets, according to Moutinho and Evans (1999), respond rapidly to market changes, and have an ability to adapt and make quick decisions. They tend to plan less and live for the moment (Deakins and Freel, 2009). They have highly personalised management styles with few decision makers (Stokes et al. 1997). What is to be done is usually decided by the owner manager who is the lead influencer (Carson et al. 1995).

Networking can support eco-innovation drive as a great deal of information can be received from organizations that have already implemented eco-innovation, especially where the nature of business activity is similar. This provides cross learning experience and helps to ensure organizations get it right the first time.

Given that this research is focused on the adoption of eco-innovations by SMEs, the researcher deems it necessary to identify from literature traits and characteristics associated with SMEs which are also considered relevant to the growth and success of small businesses. This is important as the success of adopting eco-innovation depends on how successful the SME is as a business and frequently eco-innovations are implemented by businesses as part of a future growth plan as a sustainability measure. The next section will now focus on eco-innovations, its related concepts and how it relates to SMEs.

2.4 Eco-Innovation

The terms eco-innovation and environmental innovation are commonly used within the literature to refer to similar contexts of products or processes aimed at minimizing negative impacts on the environment. For this study, the term eco-innovation is used because it is most commonly cited within the literature. This section will introduce eco-innovation as a concept and summarize the findings from the relevant literature on eco-innovation.

Eco-innovation refers to ‘‘the production, assimilation or exploitation of a product, production

process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives'' (Kemp and Foxon 2007, p. 4). Therefore, the concept of environmental innovation includes any kind of innovations such us technical, economic, legal, institutional, organizational and behavioural, that contribute to avoiding or reducing environmental harm (Huber 2008).

The OECD defines eco-innovation as "the implementation of new, or significantly improved products (goods or services), or processes, marketing methods, organisational structures and new or improved institutional arrangements that contribute to environmental improvements or a reduction of environmental impacts when compared to other alternative practices" (OECD 2009 p. 2). This definition distinguishes eco-innovation from other innovation types based on its environmental impact whether deliberate or not.

A further report by the OECD states that while eco-innovation is closely tied to the development and use of environmental technologies, there are also non-technological aspects of eco-innovation. The report distinguishes between two types of eco-innovation namely Technological and Non-technological Eco Innovation.

2.4.1 Technological Eco-Innovation

Technological eco-innovation is based on the re-engineering of an existing process or a product.

a. **Product** innovation is a new product whose technological characteristics or intended uses differ significantly from those of previously produced products. A technologically improved product is an existing product whose performance has been significantly enhanced or upgraded (Dangelico and Pujari 2010). A novel example of a product

eco-innovation is the waterless urinal, developed in Germany, which results in lower water use and no need for acid-based toilet cleaners.

b. **Process** innovation is the adoption of technologically new or significantly improved production methods, including methods of product delivery. One example of a process eco-innovation is 'Bio-booster', a solution rolled-out in Denmark to clean and reuse water, based on membrane biological reactors. (Dangelico and Pujari 2010)

2.4.2 Non-technological Eco-Innovation

This is split into three groups.

a. **Organisational** innovation includes the introduction of significantly changed structures, the implementation of advanced management techniques or the implementation of new or substantially changed corporate strategic orientations (OECD 2009). Some of the most novel and successful examples of eco-innovation take existing technologies and combine them with an innovative business model. For example, the adoption of electric cars.

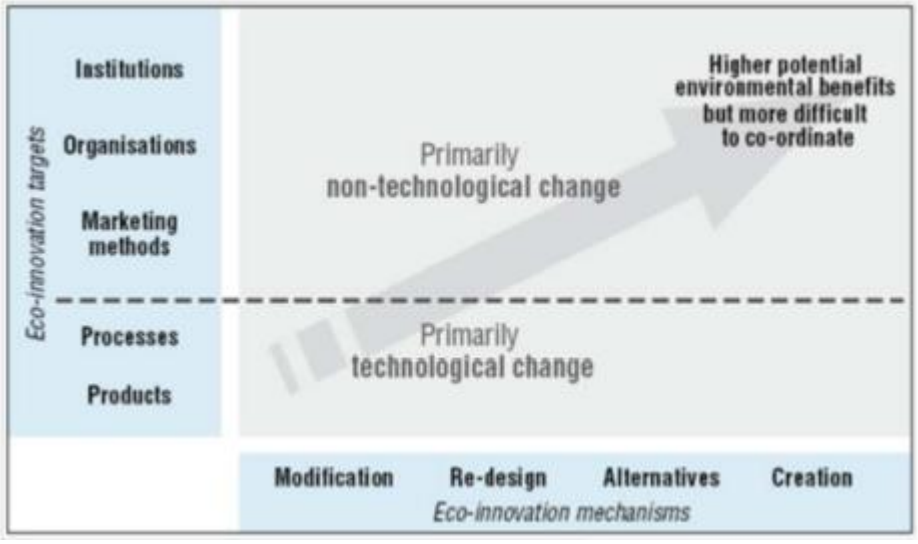
b. **Marketing** innovation concerns the aesthetic or other subjective qualities of a product, rather than its use, objective performance characteristics, or the way it is produced or delivered (OECD 2009). Marketing eco- innovation is implemented for instance through packaging, as firms adopt more environmentally-friendly materials and reduce the amount of packaging for a product.

c. **Institutional** innovations in informal institutions are changes in social norms, value patterns and beliefs, which lead to improvements in environmental conditions through social behaviour and practices (OECD 2009; Aguilera-Caracuel et al. 2013). Examples are community action to clean-up the environment, or changes in the choice of transport modes. Innovations in formal institutions are changes in roles and relations that typically rely on legal-enforcement, formal agreements or voluntary but formal multi-stakeholder

arrangement (Aguilera-Caracuel et al. 2013), for example, the establishment of eco- industrial parks or the development of environmental reporting frameworks.

Figure 2.3. Illustrates the Dynamics of Eco-Innovation adapted from the OECD report on Sustainable Manufacturing and Eco-innovation (2009).

Figure 2.3: Facets of Eco-Innovation



Source: OECD, 2009

Eco-innovations differ in terms of the mechanisms by which the novelty is introduced to the market through modification of practices, re-design of practices, alternatives to existing practices, or the creation of new practices and can also be differentiated in terms of degree of novelty and the impact on existing artefacts, processes, organisational practices or technological regimes. Findings from existing reports such as; OECD 2009 and 2011 show that more radical changes in methods usually result in higher environmental benefits (OECD 2009; OECD 2011). Other categorization of eco-innovations has been made by a number of studies and the key typologies generated are listed below:

- Rennings (2000) classed eco-innovation into: technological, organizational, social and institutional types.

- Kemp and Pearson (2007) classification of eco-innovation consists of: disruptive innovation, sustainable innovation and system innovation.
- Reid and Miedzinski (2008) categorised eco-innovation into four types: life-cycle innovation, product and process innovation, organizational innovation and marketing innovation.
- Oltra and Saint Jean (2009) distinguished eco-innovation by product innovation, process innovation and organizational innovation types.
- The study by OECD (2009) differentiated four types of eco-innovation: pollution management, clean technologies and products, natural resource management and eco- friendly products.

Horbach (2008) argues that eco- innovations are conditioned by both the technological possibilities of the firm and its ability to appropriate the benefits of innovative activity, this view is well described by Rennings (2000), who describes environmental innovations as the measures of relevant actors in the development, application, or introduction of new ideas, as well as the behaviours, products, and processes that contribute to a reduction of environmental burdens or to achieving ecologically specified sustainability targets. However, other scholars view environmental innovations differently, they refer to products, processes, or management initiatives and practices aimed at the reduction of environmental impacts (Kemp and Pearson 2007; Amores-Salvado et al. 2014), this view is broader and taken as the preferred position and view used for the context of this study. To this end, this study posits that “eco- innovations are the improvement of products or processes about energy-saving, pollution-prevention, waste recycling, green product designs and corporate environmental management in the field of environmental management”. Eco- innovations are the best way to improve the performance of environmental management to satisfy the requirement of environmental regulations (Chen et al. 2006).

By identifying the interdependence of innovation types in SMEs, this research seeks to

acknowledge and evidence the relevance of eco-innovation research. By conducting empirical research in the field of study, this research adds to the limited and dated research on eco- innovation in food sector SMEs. Having looked at the definition and types of eco-innovation, the study will now focus on drivers of eco-innovation in the next section.

2.4.3 Drivers of Eco-Innovation

According to Cassells and Lewis (2011), drivers of eco-initiatives are often considered to be regulatory and voluntary standards, industry-led strategy and government-led programmes. They suggest that many businesses are personally motivated to act on green issues but lack the business resource to implement long-term changes. They also found that medium sized businesses were much more likely to have environmental policies and management systems, specialist staff and pass on their values and expectations to their suppliers. Literature highlights the key drivers to the adoption of eco-innovations as:

- Regulations are considered a strong influence towards the adoption of eco-innovation, firms often must comply with regulations as they strive to meet eco-innovation principles using material efficiency, reducing greenhouse gas emissions, improving recycling or reducing water and soil emissions (Horbach et al. 2012; Khanna et al. 2009; Beise and Rennings 2005).

- Technology used at the developmental eco-innovation phase of a new product is considered an essential driver to the success of eco-innovation adoption (Horbach 2008). Green practices like green sourcing and procurement, pollution control or efficient energy use lead to eco- innovation success when the innovation capacities of the firm are highly developed (Doran and Ryan 2012).

- Market focus enables the firm to gain a better understanding of its users' needs and desires to launch successful new products such as establishing specific target

markets for greener products and assessing market needs is necessary (Carrillo-Hermosilla et al. 2010; Pujari 2006).

- Supplier involvement- Suppliers are a critical part of the supply chain with respect to smooth operations strategy (Fernando et al. 2016). In order to successfully adopt eco-innovation, businesses need to monitor, assess and audit suppliers in value chain management to practice eco-innovation activities (Rao and Holt 2005). Firms that have collaborated with suppliers emphasizing environmental concerns have enjoyed environmental and productivity gains (Georgiadis and Besiou 2008).

Maddock and Vitn (2010), suggest that companies that adopt eco- innovations also gain other unexpected benefits from what is otherwise a relatively low cost and easy to implement intervention. Scholars posit that eco-innovation leads to overall improved environmental performance (Andersen 2008) and the continued adoption of eco-innovations will enable businesses to move towards environmental sustainability (Pujari 2006).

The business environment is very dynamic and a business adapts to change through re-inventing itself by developing new products and a process that allows it to remain competitive is termed Innovation. innovation plays a highly important role in value creation, in achieving competitive advantage for businesses, and is central to improving business performance in dynamic marketplaces (Damanpour et al. 2009). However, the effort to reduce and prevent negative environmental effects, has led to the rise of eco-innovation, which has attracted significant attention among industrial practitioners, academic researchers, and government policy makers in the past decades, all of whom act as intermediaries or agents of change in the adoption of eco-innovations. The next section will consider the intermediaries of eco-innovation as important agents of change.

2.4.4 Intermediaries of Eco-Innovation

Intermediaries are third-party organizations that help to achieve desired objectives (Perset 2010) they provide necessary motivation, and advice to initiate or adopt an initiative. Howells (2006 p.721) defines innovation intermediaries as "an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties". They can be grouped into various types: governments and local authorities, NGOs, universities, consultancies etc. Literature identifies three distinct groups: public, non-profit and private (Howells 2006; Zeng et al. 2010) Public intermediaries are governments and (publicly funded) science partners or universities, as well as other publicly funded bodies (Klewitz et al. 2012). NGOs belong to the non-profit group whereas consultancies and industry associations fall into the private group.

Clarke and Roome (1999), propose intermediaries as a possible solution for SMEs looking to adopt eco-innovation, as this will help them acquire knowledge outside their own organizational boundaries and in return they gain access to and exchange relevant ecology and sustainability-related information. By using intermediaries SMEs can collaborate or seek network contacts to reduce time and knowledge constraints and increase their absorptive capacity (Klewitz at al. 2012). Thus, collaborative approaches are crucial as they diffuse practices and policies (Battaglia et al. 2010) and can, hence, support the adoption of eco-innovations.

Collaboration with external organizations can take different forms like partnerships, cooperation and networking (Murillo and Lozano 2009; Torri 2010). Howells (2006) outlined the processes and functionalities of intermediation to the eco-innovation summarized in table 2.2.

Table 2. 2. Types of Intermediation to Eco-Innovation Process.

Type of Intermediation	**Functions**
Foresight and diagnostics	Enables SMEs gain a more comprehensive view of environmental challenges, what sustainability entails, access external expertise and benefit from resource exchanges
Knowledge processing and combination	Combined knowledge of two or more partners
Gatekeeping and brokerage	Intermediaries can be negotiators or support others in understanding and translating contractual agreements
Testing, validating, and training	Involves actions such as prototyping, inspection or scaling of innovations undertaken by a business.
Accreditation and standards	Intermediaries can also assist in selecting, implementing or certifying various standards, e.g. ISO 14001, EMAS
Regulation and arbitration	Refers to policy regulation and to informal arbitration, for example, between consumers and producers.
Intellectual property	Intermediaries can help SMEs to protect their intellectual property through patents or other regulations.
Commercialization	The identification of potential markets and consequent strategies for serving these markets.
Assessment and evaluation	Intermediaries conduct an assessment of respective technologies in terms of performance.

Source: Howells 2006 p.721-722. cited in Klewitz et al. 2012

The functionalities identified in table 2.2 show that collaboration between an SME and innovation intermediaries can lead to an enhancement of an SME's capacity for eco-innovation, through collaboration with intermediaries. SMEs are, on the one hand, able to locate, acquire, and utilize external knowledge necessary for eco-innovation, and, on the other, have access to direct assistance and can consequently supplement their scarce resources (e.g. time, financial, human) as well as accreditation and standards e.g. ISO standards, eco-adoption initiatives etc. (Klewitz at al. 2012). By identifying the types of

intermediation to the eco-innovation process the study will seek to explore how intermediaries impact and influence eco-innovation adoption by the Scottish food and drink SMEs.

2.4.4.1 Stakeholders in Eco-innovation

Stakeholders of eco-innovation play a major role in influencing the success of adoption of eco-innovation because they act as agents of change and can influence the adoption decision process of the business. Therefore, the researcher felt it relevant to consider the literature on stakeholders. From the perspective of corporate stakeholders, the importance of businesses managing their environmental impacts is growing in significance. For investors, the shareholder value will drop if companies have to pay fines and clean-up costs and damage their reputation. Whilst, for consumers, there is a growing number who are showing a preference for greener eco-products from green companies (Ilinitch et al. 1999). Henriques & Sadorsky (1999) identify four critical environmental stakeholders as:

1) Regulatory stakeholders – include governments, trade associations, informal networks (sources of technological information) and competitors (potential environmental technology leaders that may set industry norms and/ or influence legislation), they set regulations or have ability to make governments set standards.

2) Organisational stakeholders – These include customers, suppliers, employees and shareholders. Organisational stakeholders can have direct financial impact on the company or are directly related to an organisation.

3) Community groups –are environmental organisations and other potential lobbies who can influence public opinions “towards” or “against” environmental policies.

4) The media – similar to community groups, also has the ability to influence the public's perception of a company using social media outlets generally used by the public.

Given the significant role played by stakeholders, it is vital that businesses be able to identify what their stakeholders" expectations are and they should strive to meet their demands. The study will also consider the forms of support available to businesses towards their adoption of eco-innovations i.e. through the collaborative association with their stakeholders and intermediaries of eco-innovation, the availability and ease of access to support can influence the rate at which businesses adopt eco-innovations.

2.4.4.2 Environmental Agencies and External support towards Adoption of Eco-innovation in Scotland

This section looks at some key forms of external support in Scotland and identifies the purpose and role they play in fostering the adoption of eco-innovation by businesses. There are five main external agencies to be considered namely; SEPA, Zero Waste Scotland, WRAP, Netregs and the Carbon Trust. Details of the various agencies are discussed below;

1. **Scottish Environment Protection Agency (SEPA)**

   SEPA was established in 1996 by the Environmental Act of 1995 and is Scotland's environmental regulator and flood warning authority (SEPA 2017). The aim of SEPA is to provide a system of environmental protection for Scotland that seeks to improve the environment and help deliver the Scottish government's environmental objectives.

   It is tasked with the responsibility of protecting and improving the environment in Scotland. SEPA helps businesses in industry to understand their environmental responsibilities, to enable them to comply with legislation and realize the benefits of adopting environmental practice (Poustie 2004). SEPA further protects communities

by regulating and monitoring activities that cause harmful pollution to the environment. The key areas of activities covered by SEPA include:

- **Flood warning**- Scotland's flood warning service is operated by SEPA as a 24 hour, 7 days a week information service, providing direct warnings and flood updates (SEPA 2017).
- **Air Quality**- Industrial activities and processes in Scotland are regulated and monitored by SEPA in order to protect Scotland's air quality. Activities such as transport emissions, energy production, waste, agriculture and industrial processes can generate emissions that result in the depletion of the ozone layer and damage air quality, therefore SEPA and the Scottish government work in partnership with the Department for Environment, Food and Rural Affairs (Defra) to achieve the objectives set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland.
- **Climate change**- SEPA produced a climate change plan to help with the reduction of carbon emissions in Scotland; this was a five-year plan with a specific role in climate change mitigation (SEPA 2017).
- **Land Quality**- SEPA aims to protect and enhance the quality of Scotland's land through provision of guidance on good land use practice and a variety of regulatory measures.
- **Planning**- SEPA helps deliver the Scottish government's commitment to providing a more effective and efficient planning system (SEPA 2017). It also provides a formal environmental advice on development plans and proposals across Scotland, while also protecting Scotland's environment.
- **Radioactive substances**- SEPA has responsibility for protecting Scotland's environment and human health, it also has responsibility for regulating the storage, and use of, radioactive substances and the accumulation and disposal of radioactive waste in Scotland, including functions under the Radioactive Substances Act 1993 (SEPA 2017).

- **Waste**- one of SEPA's statutory duties is to protect the environment and human health in Scotland from the effects of waste management and disposal, this could be through waste minimization and prevention, and also putting existing waste to use through reuse, recycling, composting and thermal treatments. SEPA reports on waste data and is also involved in enforcing European compliance schemes. (SEPA 2017)
- **Water Quality**- SEPA helps protect and improve Scotland's water environment through regulation, monitoring and planning. They provide annual reports on the quality of Scotland's waters and work closely with other organisations to reduce the risk of urban and rural pollution in Scotland's coastal and inland bathing waters (Poustie 2004).

2. Zero Waste Scotland

Zero Waste Scotland is funded by the Scottish government to support the delivery of the Scottish government's Zero Waste Plan and other low carbon policy priorities. The company's mission is to influence and enable change: from gathering evidence and informing policy, to motivating practical behavioural change in individuals and organisations (Zero Waste Scotland 2018). They also make direct intervention to affect change, commonly in the form of finance, business support, technical advice, training and competence development or communications support (Cole et al. 2014). Working partners includes SEPA, the Enterprise Agencies, Scottish Futures Trust and Skills Development Scotland.

3. Waste and Resources Action Programme (WRAP) formerly Envirowise

WRAP is a government-funded programme that provides free advice and practical guidance to help businesses of all sizes and sector, boost resource efficiency and

ultimately save money (WRAP 2018). WRAP's mission is to accelerate the move to a sustainable resource-efficient economy through:

- Re-inventing design, produce and selling products
- Re-thinking how to use, consume products and
- Re-defining what is possible through re-use and recycling (WRAP 2018).

WRAP places particular focus on three main resource intensive sectors namely: Food and Drink, Clothing and Textiles and Electricals and Electronics. Efforts taken by WRAP have yielded some progress in cutting down food waste in the UK, noted for its active campaign on promoting waste consciousness among households, food manufacturers and retailers labelled "**Love Food Hate Waste**" (Lipinski et al. 2013). WRAP reports significant improvements in food waste management for instance, in 2015, household food waste was estimated at 7.3 million tonnes, when compared to the 2007 figures this showed a 12% food waste reduction, with 960,000 tonnes less of household food waste calculated (WRAP 2017). Another active effort by WRAP taken to promote reduction in food and drink waste is the Courtauld 2025, launched as a voluntary agreement in the UK offering support from producers of food and drink to the consumers with a target to achieve the UN sustainable development goal 12.3 by 2030. The Courtauld actively campaigns and encourages its member participants to cut food and drink waste, minimise and produce lower impact products, reduce greenhouse gas emissions associated with the production and consumption of food and drink and promote food and drink sustainability (WRAP 2018).

4. Netregs

Is a collaborative partnership set-up between Northern Ireland Environmental Agency (NIEA) and SEPA based in Scotland. They provide free environmental guidance for SMEs in both regions on issues that relate to; environmental legislation, permits and licenses, pollution, carbon reduction and efficiency (Netregs 2017). The agency

offers a variety of support on their website to assist businesses understand and manage their environmental impacts for example; the self-assessment tool offers guidance on environmental compliance with guides to enable SMEs start an environmental assessment. Other available resources include the e-learning tools; offering environmental courses online with certificates awarded on completion, the savings calculator; focused on helping businesses manage their resources more efficiently and save money, and a mobile app for easy access to environmental information (Netregs 2017).

5. Carbon Trust

Carbon Trust is an independent support company created in 2001 that focuses on helping businesses benefit from a more sustainable future through carbon reduction, resource efficiency strategies and commercialising low carbon technologies (Carbon Trust 2017). Some of the services rendered by the company includes:

- Advising businesses, governments and the public sector on their opportunities in a sustainable, low carbon world.
- Measure and certify the environmental footprint of organisations, supply chains and products.
- Develop and deploy low carbon technologies and solutions, from energy efficiency to renewable power.

Similar to Netregs, the Carbon trust website is well-equipped with guides, case-studies, reports and tools to assist businesses with carbon reductions measures and they also offer advice on carbon efficient technologies (Carbon Trust 2017).

Having discussed the characteristics of SMEs, the developments in eco-innovation, intermediaries and support agencies of eco-innovation, the study will now bring the two main concepts together and discuss the literature on eco-innovation in SMEs in the next section.

2.5 SMEs and Eco-innovation

Due to the significant role played by SMEs and the significance of eco-innovation in the global economy, this section will focus on SMEs and eco-innovation, the awareness and attitudes of SMEs towards eco-innovations, the findings from literature on what motivates or halts the adoption of eco-innovations by SMEs and forms of eco-innovation strategies applied by SMEs. These themes will be covered within section 2.5 and sub-sections 2.5.1 to 2.5.3.

As noted earlier, small and medium sized enterprises (SMEs) are vital to all economies; they are a source of innovation and competition and foster a dynamic, healthy market economy to preserve a stable economy (Morris and Brennan 2000). According to Hillary (2000 p140) "SMEs are strongly customer- oriented and they are a source of innovation and entrepreneurial spirit, as they create competition and are the seed for future businesses".

However, SMEs have been noted to carry a huge environmental impact (Ammenberg et al 2002), findings from the Marshall Report (1998), which originally endorsed proposals for a climate change levy, estimated that as much as 60 per cent carbon dioxide emissions from businesses result from the activities of SMEs. In addition to this the Environment Agency (2006) estimates that UK SMEs are responsible for 60% of commercial waste and 80% of pollution accidents. Studies find that SMEs are often neglected in research as to how and to what extent they affect the environment (Michelsen and Fet 2010; Klewitz and Hansen 2014). Due to this collective impact, academics and policymakers are increasingly stressing the need to reduce such environmental impacts, resulting in the adoption of green practices in SMEs.

The last decade has shown an increasing concern for the natural environment, and the activities that affect it; by governments, scientists and businesses and the general public. The growing support for urgent action to mitigate climate change has resulted in a new spate

of green rhetoric from business leaders, who seem increasingly willing to accept that the benefits of acting now to reduce polluting emissions may outweigh the costs to their firm in the long term (Revell et al 2010). As a result, environmental management remains an important issue for businesses including SMEs in the dynamic global environment. As such more businesses are willing to put more efforts into developing eco- innovations and green designs (Haden et al. 2009; Molina-Azorin et al. 2009).

Having identified from the literature that SMEs collectively generate a huge environmental impact, and as such should be doing their best to minimise negative impacts generated by their businesses, the next section will consider the findings from the literature on the awareness and attitudes by SMEs on eco-innovations and related environmental green issues.

2.5.1 Awareness of SMEs and Attitudes to Green Issues

With the impact generated by SMEs, some businesses have taken steps towards managing their environmental and social impacts in a well-structured way, however a majority of SMEs are still characterized by a lack of awareness of their environmental and social impacts and the management of such issues (Merritt 1998; Biondi et al. 2000; de Bruijn & Hofman 2000; Friedman et al. 2000; Kassinis 2001).

A study by Holland and Gibbon (1997) indicated that most SMEs consider their environmental impact to be small and minimal, and they found that SMEs responded quickly to environmental issues with relatively small environmental impacts but not to greater impacts. The study identified a substantial gap between the environmental awareness of SMEs and the business benefits they can gain. Another study by Hillary (2000) on the environmental practices of SMEs found most of the business owners to be ignorant and difficult to engage with on issues relating to their business environmental impact. The study also found the SMEs lacking in the use of tools and resources required to tackle environmental issues, and also unwilling to act due to time, cost and resources required to

deal with such environmental issues. However, a survey by Taylor et al. (2003) of business managers from the manufacturing and service sector found that most of the managers believed that environmental issues affected their business. This indicates the existence of some degree of awareness on environmental impact among SMEs since Hillary's (2000) and Holland and Gibbon's (1997) studies. Other studies (Del Brio and Junquera 2003; Williamson et al 2006; Brammer et al 2012) also found growing importance and relevance by SME owner-managers towards environmental concerns.

A UK study by Barr (2007), explores environmental values and psychological factors in relation to waste management attitudes and behaviours. The study found that recycling is characterized as highly normative behaviour and can be influenced by growing awareness; while reduction and re-use are more difficult to influence due to predicted underlying inertia. Tikka et al. (2000), posits that an individual's attitudes, the extent of nature-related activities, and knowledge about the environment are correlated with one another but the educational backgrounds of individuals also appear to affect responses. A study by Hume (2010) looks at the environmental attitudes of the younger generation and found that while young adults are considered to generally be more socially, economically and environmentally conscious, some contradictions exist between their knowledge and behaviour regarding sustainability efforts.

Focusing on SME attitudes, a study by Hillary (2000 p.18) describes the smaller firm's management style as "reactive" and further goes on to describe small firms as: *"ignorant of their environmental impact, oblivious of the importance of sustainability, cynical of the benefits of self-regulation and difficult to reach, mobilise or engage in any improvements to do with the environment".* However, a study by Revell and Blackburn (2007) view SME owner-managers as not perceiving themselves to have the necessary abilities to improve their environmental performance and therefore they were seen to act in a reactive way rather than with a proactive approach. The difference in the level of pro-activeness of SMEs seen

by Revell and Blackburn and Hillary may be down to the seven years between their researches. This study looks at whether the SMEs in Scotland are ignorant of their impacts and this perception of their abilities to deal with them.

Literature suggests (Hillary 1995; Holland and Gibbon 1997; Rutherford and Spence 1998; Smith and Kemp 1998; Gadenne et al 2009; Cassells et al 2011; Lewis et al 2015) that the efforts and initiatives taken by government to inform SMEs of the economic benefits of positively managing their environmental performance and investing in eco-innovation have not been very successful, as most SMEs do not consider the environmental aspects of their businesses to be an issue. They feel a limited responsibility towards the environment, due to their belief that their contribution towards environmental impact is negligible. and some SMEs perceive environmental impacts to be more of a global issue and beyond their ability to resolve (Johannson 1997). In addition, SMEs lack the time and money to investigate their environmental performance or access the high cost consultancy support network (Hillary 2000, p. 140). They also lack the management capability to engage in issues beyond the core business of their companies (Gonzalez-Benito & Gonzalez-Benito 2005; Cassells et al. 2011). While SMEs are often described as hard to reach and slow to adopt eco-innovations (Rutherfoord et al. 2000; Cassells et al 2011) their actions do not always reflect the personal attitudes and perceptions of SME owner-managers, as they sometimes positive attitudes and concern towards environmental issues (Cassells et al. 2011).

As such this research also investigates the awareness and importance Scottish food and drink SMEs associate to eco issues. The level of awareness and degree of importance are considered relevant towards the successful adoption of eco-innovation as it translates into whether or not the SMEs consider it necessary to implement within their business or not. However, while some research has the been conducted taking the position of SMEs, it is worth noting that a number of these studies are dated (e.g. Hillary 2000; Redmond et al. 2008) and so the study will be taking the issues of awareness and attitudes into its

investigation to unveil new findings on the position of SMEs in comparison to the existing literature. The next section will now look at the adoption of environmental management practices by SMEs.

2.5.2 Eco-innovation adoption practices

Cassells et al (2011) examines the environmental practices of 148 manufacturing SMEs in New Zealand using questionnaires, their study investigates the implementation efforts taken by the businesses and these were labelled under; operational practices, waste management practices, design for the environment practices, and environmental management practices. The study found most the majority of the SMEs were negligent and did not consider the environmental impacts of their businesses. Waste management practices such as; recycling, reducing fuel and energy usage were found to be the most prevalent practices adopted by the SMEs and this was largely due to the potential cost benefits to the businesses rather than their motivation to protect the environment. The least adopted practices were related to environmental management practices e.g. environmental policies, audits and environmental management systems.

A study by Brammer et al (2012) analyses the environmental management initiatives of 100 UK SMEs from five industry sectors and compare the activities undertaken by small and medium sized businesses. They identified 25 managerial practices related to environmental management grouped into four namely; employee focused, manufacturing focused, corporate focused and marketing focused and explored the extent of engagements of the sample companies based on these groups. Their findings suggest medium sized businesses were more actively involved in environmental practices than smaller one, this was evidenced by the fact that most of the medium sized businesses had more formalized environmental management activities, with mission statements, conducted regular audits and had cross functional teams with a focus on improving the company's environmental performance. They noted that small businesses did not recognize the strategic importance of environmental

management and their practices lagged in implementation. Brammer et al study findings corroborate the earlier study of Tilley (1999) who noted small businesses were significantly challenged in the implementation of environmental practices mostly as a result of low environmental awareness, financial barriers, and limited support.

Few studies on environmental research take note of the actual environmental activities and initiatives adopted by businesses (Gadenne et al 2009; Brammer et al 2012), they often tend to see environmental management practices in very narrow terms limiting their focus to the adoption of formal processes (Biondi et al 2000; Hillary 2004) or the adoption of ISO certifications, thereby ignoring the complexity and broad range of environmental activities that exist.

The food and drink industry is considered a low-tech industry noted for its eco-innovation activities such as cleaner and more efficient processes, materials recycling, composting, water management processes and eco-products that reduce environmental impact and maximize resource efficiency (Cuerva et al. 2014). Eco-innovation is important and underpins how many of the SME's implement eco-innovations through process or product change. Table 2.3 highlights some of the notable trends of eco-innovations being adopted within the food and drink sector and the targets set within the sector to further adoption and minimise overall negative business impact on the environment.

Table 2.3: Eco Trends in Food and Drink Sector

Summary of Eco Trends in the food and drink sector		
Process / Activity	**Types of eco-innovation**	**Targets / Achievements**
Packaging	▪ Reducing packaging. ▪ Light weighting.	Contribute to WRAP's Courtauld Commitment 2025 target to reduce packaging waste in the supply

	▪ Use of more recycled materials as secondary packaging. ▪ Recycled plastic in bottles. ▪ Using waste from other products in packaging.	chain.
Zero waste to landfill	Reuse of waste on site	Contribute towards the 2015 zero manufacturing waste to landfill target.
Reducing water use	▪ Less water usage in line, especially cleaning of packaging and lines. ▪ Water efficiency at farms and for irrigation. ▪ Rainwater harvesting and suppliers.	Reduce waste water volumes to contribute to the F&D industry target to reduce water usage by 20% by 2020 compared to 2007.
Reducing carbon	▪ Energy efficiency at manufacturing sites, e.g. decreasing the	Aligned with the Climate Change Act, the F&D sector's ambition is to achieve a 35% reduction in carbon dioxide emissions from

	pressure needed to blow bottles, new equipment and better insulation. ▪ Use of bio-energy. ▪ Automating processes to turn off if not in use. ▪ Wind turbines and other energy generation on site. ▪ Light emitting diode lighting and light bulbs. ▪ Reduction in refrigeration energy usage.	manufacturing by 2020 compared to 2002 levels.
Reducing the impact of transportation		Contribute to the F&D overall objective to reduce the external impacts of transport

Source: BSDA 2015

The eco-activities and processes identified within table 2.3 indicate some types of eco-innovations adopted within the food and drink industry, though the list is not detailed and comprehensive and lacks information on how these eco-innovations are embedded within the businesses. This research seeks to further the limited availability of empirical research

on the various environmental management practices adopted by SMEs with particular reference to food and drink businesses. These variety of eco-innovations are grouped and sorted into categories to provide a holistic view and understanding of the forms of eco-innovations adopted by businesses.

The following section will highlight some of the prevalent factors that influence the decision of businesses to adopt or reject eco-innovations.

2.5.3 Eco-innovation: Motivators and Barriers to Adoption

SMEs have been noted to have significantly different behavioural characteristics when compared to larger companies particularly in terms of environmental management (Aragon-Corea et al. 2008; Gadenne et al. 2009; Brammer et al. 2012). As such some studies investigate the factors that serve as enablers or barriers for businesses to adopt environmental innovations aimed at reducing the negative impact of business activity. This section highlights some of the key findings of the existing literature.

2.5.3.1 Motivators

Regulation is considered an important driver towards the adoption of green by businesses. Drake et al. (2004) found that businesses are driven to reduce their environment impacts through regulatory compliance and that regulation also improved the awareness of environment issues. They also noted that for SMEs regulatory compliance is mostly considered to be a matter of business survival rather than an opportunity to improve their environmental impact (Patton and Worthington 2003). This is further evidenced by the Environment Agency (2007) report which found that, while SMEs saw the main benefit of addressing environmental issues as reduced risk of prosecution and good customer relations, the most important driver of reform was in fact owner-managers' concern for the state of the environment, with approximately two-thirds of respondents claiming to be

motivated by this factor (up 10% from 2003's findings). In contrast, 30% of businesses were driven by the need to comply with regulations, and just 13% by the prospect of reduced costs. Interestingly, it was the smallest firms that were most likely to be motivated by environmental concern; they were far less motivated by commercial benefits or legislative pressure.

Regulations are going to become more stringent as seen from recent developments in changes to environmental laws around the globe. As a result, the decision to adopt eco-innovations have mostly been driven by a response to legislative and regulatory pressures rather than positively seeking new opportunities from environmental management (Gerstenfeld and Roberts 2000 p. 112; Hutchinson and Hutchinson 1997 p. 16). This can partly be explained by the fact that SMEs are unreceptive or unable to interpret the relevance of the legislation to their business (Hutchinson and Chaston 1994; Hillary 1995; Gerstenfeld and Roberts 2000 p. 113). However, environmental regulations facilitate reactive and non-strategic adhoc adoption by SMEs (Revell and Blackburn 2007).

SMEs perceive that legislative compliance is expensive (Petts et al. 1999) and therefore regulation is resisted due to its impact on profits. Moreover, owners of small businesses tend to favour economic interests over social or environmental considerations (Tilley 2000). This idea is reinforced by Revell and Blackburns (2007) who studied UK SMEs in the construction and restaurant industries and found that managers of SMEs prefer regulation to voluntary initiatives as this creates a level playing field. Though SMEs also consider legislation to be burdensome due to its systems and certifications that tend to put a strain on the little resources of their business (Hillary 2004; Brammer et al. 2012).

Another enabling factor is cost. The literature suggests that cost seems to play a dual role and is seen as a motivator or a barrier depending on the perspective of the SME. A survey by the Environmental Agency (2007) of 4489 UK SMEs found that 13% were driven to adopt

environmental measures to reduce their costs. Typically, financial environmental motivators by SMEs tend to be consistent and in most cases, are driven by the cost reduction benefit while the environmental benefit achieved is simply a by-product (Williamson et al. 2006; Cassells et al 2011) for instance; energy reduction or waste minimization.

In addition, firms may also decide to undertake eco-innovations due to several forces which include stakeholder environmentalism, competitive pressures, and environmental regulations. Triguero et al (2013) note the growing demand for environmental products by consumers. Such businesses are noted to also introduce eco-innovations to differentiate themselves from other firms and gain competitive advantage (Pujari 2006), the exploitation of a green image by businesses is used to target green consumers and increase competitiveness and has led to the use of eco-labels as a marketing strategy to heighten the awareness of green consumers and stakeholders (Rennings 2000), yielding an expected increase in the market demand of such businesses (Kammerer 2009).

The next section will consider the barriers to eco-innovation adoption identified within the literature.

2.5.3.2 Barriers

A questionnaire based study of SMEs in South Yorkshire by Simpson et al. (2004) sought to assess the competitive advantage gained through the adoption of environmental practices, the findings confirms that 75% of the study participants considered environmental innovations to be a cost, and that there was little competitive advantage to be gained by adopting environmental good practice, as product or process differentiation could too easily be copied by competitors. The study also found that many UK SMEs were investing substantial resources in environmental improvements without an expectation of return. However, over three-quarters of the participants saw the environment as a key business issue and just under two-thirds were proactively involved in improving their firm's environmental performance, but overall the majority of the study participants viewed

environmental measures to be a cost which could not be passed on to customers. The issue of cost as a barrier is further evidenced in Revell et al. (2010) cross sector survey of 220 UK SMEs which found that 63% of the respondents considered increased costs a major barrier to their adoption of environmental practices.

Prior research has also identified the lack of time and resources to be a major barrier to eco-innovation adoption. The findings from Revell's (2007) study of 40 SMEs in the UK construction and restaurant industries found that respondents did not consider the benefits derived from eco-efficiency measures to be worth the required investment in time and resources. The SMEs felt that the extra labour involved in setting up recycling systems and ensuring employees separated waste properly would cost the firm more than the compensation gained from reduced waste fees. Tilley (2000) notes that a general problem most SMEs face is limited resources, available manpower and time to deal with environmental issues. Another study by Revell et al. (2010) confirmed that while 80% of the participants thought that environmental reform should be a top management priority, they still found it difficult to translate such good intention into practical action within their businesses with 53% of the participants stating they lacked the time and resources to devote to environmental management adoption.

SMEs don't often integrate environmental practices due to the initial burden of time, resources and cost (Brammer et al. 2012). However, competitive advantages can also be achieved through the adoption of environmental practices (Simpson et al. 2004). To achieve environmental sustainability SMEs will need to allocate time and resources to the adoption of eco-innovation as part of their future growth plan. One way to start is to identify a focal point for environmental considerations in its operations and develop a plan that allows for inclusion of eco-innovation as it develops.

Drake et al. (2004) investigates the perception of the UK baking and refrigeration industries environmental demand and change. The study confirms that a lack of consumer demand for environmental products and services is a key barrier for businesses, this is further backed up by Hillary's (2004) investigation of EMS (environmental management system) adoption by SMEs which found the absence of interest and pressure from consumers to be a barrier to the adoption of environmental practices by SMEs. Other studies that confirm this lack of pressure include Rowe and Hollingsworth 1996; Bianchi and Noci 1998; Merritt 1998; Verheul 1999; Drake et al. 2004; Revell 2007. Contrary to this is the study by Simpson et al. (2004) which identifies how SMEs consider the changing demands of important customers to resulting in greater demand for environmental management adoption in the future. This was also noted in a study by McKeiver and Gadenne (2005), where 40% of respondents revealed that the growing trend towards 'clean and green' was beginning to have an impact on their business though this was predominantly influenced by legislative pressure. Consumer behaviour is increasingly changing and becoming friendlier to products and services that consider the environment (McKeiver and Gadenne 2005). This behaviour is on the rise and SME's can benefit from this as they align their services and products for the future.

Lacking access to knowledge and information was identified as a barrier within the literature. Previous studies have found that small firm owners tend to be ignorant of their firms' environmental impact (Environment Agency 2002, 2003, 2005). According to Hillary (2000 p.18), SMEs were: *"ignorant of [their] environmental impacts, oblivious of the importance of sustainability, cynical of the benefits of self-regulation and difficult to reach, mobilise or engage in any improvements to do with the environment"*. Despite the identification of this barrier from previous studies, a decade on the study by Revell et al. (2010) confirmed this to still be an issue as 57% of the SMEs indicated they needed more information on how to be more environmentally friendly and reduce their business impact, they therefore considered their lack of knowledge and the lack of information about environmental practices to be a barrier to their adoption.

In addition, there is the lack of support and infrastructure. Revell et al (2010) further reported the issue of poor infrastructure to be a major barrier to adoption by SMEs. 53% of the respondents considered the lack of recycling facilities at the business sites to be a hindrance towards their participation in environmental activities. A problem for many SMEs is their limited resources in terms of available manpower, time and finances to deal with environmental management and performance issues. They are less likely to have the processes in place to be able to accurately measure their impact on the environment compared to larger businesses and therefore, not being able to accurately measure their impacts may mean they have less motivation to change and try to reduce them (Tilley 2000). Compounding this is the fact that the environmental agenda has become crowded by various environmental issues and many of these have not been defined with sufficient clarity to enable larger firms with a sophisticated environmental management system to deal with them, let alone SMEs (Hutchinson and Hutchinson 1997).

The findings from the literature suggest SMEs are more focused on the barriers than the motivators and this is likely to influence the rate at which the businesses will adopt eco-innovations. To succeed in the adoption of eco-innovation, it is important to integrate sustainability as an explicit goal in the design process (Arnold and Hockerts 2011).

Having considered the key motivators and barriers to eco-adoption from the literature, the next section will look at the findings on the eco-innovation strategies adopted by businesses as an environmental innovation strategy was found to be associated with firms' positive business performance since it can ensure internal efficiency (Eiadat et al. 2008; Tseng et al. 2013).

2.5.4 Eco Innovation Adoption Strategies

In a bid to remain sustainable many businesses are adopting greener innovations. It is important for these businesses to be able to measure their level of success in their green journey to enable them to benchmark, set targets and improve their environmental performance. Therefore, this section will look at the existing literature on eco-innovation strategies and approaches and the application by SMEs.

Tilley's (1999) study identifies with the resistant, reactive, proactive and adds a fourth strategy to the existing strategies called sustainable/ ecological behaviour. Tilley (1999) notes that while most SMEs may not have a formal strategy for dealing with environmental issues they still have an environmental strategy, as doing nothing is also considered a strategy. Tilley identifies four strategies that small businesses may adopt with regard to environmental management:

1. Resistant strategy – there is either little awareness of an SME‟s impact or it sees no need to improve its environmental performance, therefore no action is taken and any pressure to change is ignored.
2. Reactive strategy – an SME responds to any pressures exerted on it to improves its environmental performance, which often leads to ad-hoc and piecemeal solutions .
3. Proactive strategy – there is a positive and deliberate effort for a business to improve its environmental performance. These improvements are ongoing and permanent, but not always fully integrated into the management of the business.
4. Sustainable or ecological strategy – there is a fundamental rethink of all aspects of the business with a holistic integration of the environment into the structure and management of the business.

Tilley (1999) further conducted a survey of 60 SMEs (29 engineering and 31 business services). The study found the overall level of environmental activity amongst the SMEs to be relatively low with 40% failing to do anything to reduce their environmental impact and

that most behaviour to improve environmental performance was individual ad-hoc initiatives and activities rather than a strategic and more holistic approach.

Another study by Noci and Verganti (1999) identified three behaviours which they classed as; reactive, anticipatory and innovation-based. They found that the reactive and anticipatory types mainly respond to external changes such as new environmental legislation and regulations which leads to incremental innovations for such SMEs. The innovation based strategies are sought as a solution to competitive strategy, they involve the introduction of solutions that radically improve environmental performance of the business through its new environmental friendly product.

A study by Aragon-Correa et al. (2008) on SMEs in the automotive sector in Spain identified the proactive, reactive and environmental strategies. They found SME strategy can be proactively driven and not necessarily reactive to laws and legislations, the adoption of such proactive strategies would lead to reduced material use, eco-efficient practices, reduced waste and pollution prevention measures. However, the success of such a proactive approach is hugely dependent on the SMEs capabilities, competencies and resources and strategic traits, for example; owner vision, management style, flat structure and flexibility. They noted that proactive sustainability behaviour is demonstrated in SMEs that are capable of identifying sustainability issues and markets to realize competitive advantage. Reactive SME's only respond to external pressures on environmental regulations, while SMEs with environmental leadership behaviour tend to re-design products, processes, and even business models from a product life cycle perspective. The findings of the Aragon-Correa study change the traditional perception about SMEs being less likely to adopt proactive strategies to gain competitive advantage.

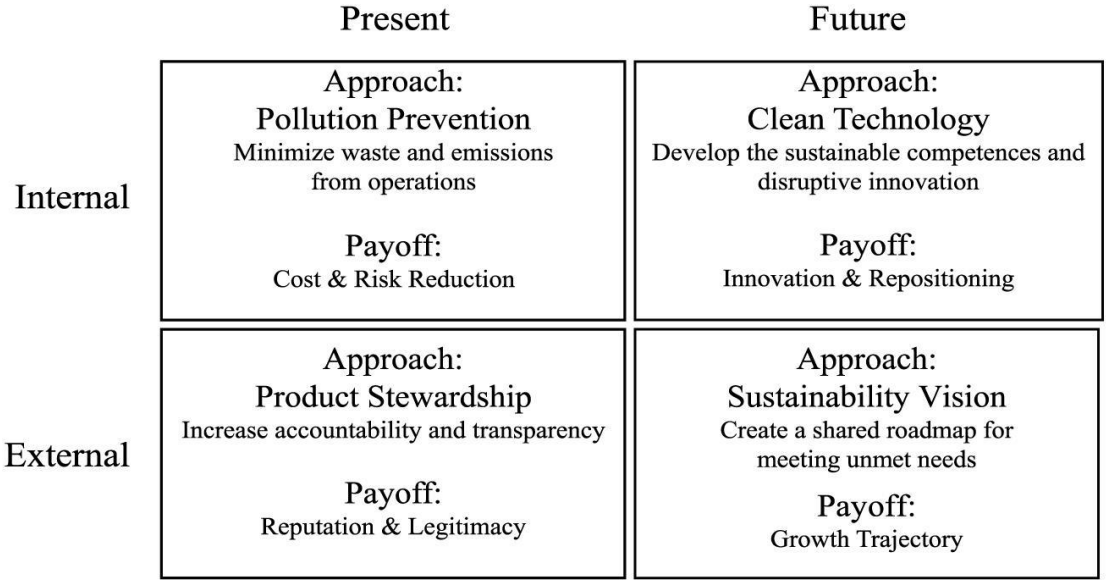
Overall, the existing typologies of environmental strategies show that for most businesses, environmental strategies fall within the reactive strategies that merely aim to meet legal

requirements and implement pollution controls, to more proactive strategies that include voluntary eco-efficient practices for reducing energy and waste and pollution prevention practices that require innovation in processes, products and operations to reduce energy and material use at the source, to environmental leadership strategies where products, processes, and even business models are re-designed to minimise the ecological footprint along the entire product life cycle (Hart, 1995; Noci and Verganti, 1999; Buysse and Verbeke 2003; Aragon-Correa et al. 2008).

Hart (2005), developed a green sustainability strategy matrix that highlights how businesses can invest in sustainable innovation and still increase value and profitability through stimulating increase of a corporate green sustainability. The matrix consists of four quadrants; the first quadrant is “pollution prevention strategy” which focuses on those aspects of performance that are primarily internal and near-term in nature: cost and risk reduction. The second quadrant is “product stewardship strategy” which focuses on performance dimensions that are near-term in nature but extend to include salient stakeholders’ external to the firm. The third quadrant is “clean technology strategy” which focuses on generating the products and services of the future and developing internal skills, competencies, and technologies that reposition the firm for future growth. The fourth quadrant is “sustainability vision” which focuses on acquiring external skills, competencies and technologies associated with future performance.

All four quadrants are instrumental in generating and maximising shareholder value, therefore businesses will have to develop a vision of sustainability that goes beyond today’s internal and operational focus on greening to tomorrow’s external and strategic focus on sustainable development. The goal in the “sustainability value portfolio” is to balance near-term and future-term issues and to manage both internal and external challenges (Hart, 2005).

Figure 2.4: Sustainability Strategy Matrix



Source: Hart (2005, p.23).

Hart's matrix depicted in figure 2.4 identifies cost savings from eco-efficiency; improved relations with the local environment and community, competitive advantage through green corporate image and access to green markets, thereby yielding present and future value in sustainable investments on the business internal and external operations. Integrating green sustainability into business strategies leads firms to seek greater profitability through adoption of deliberate sustainable strategies (Garzella and Fiorentino 2014). However, some scholars argue that these benefits are relevant to larger companies only, not to SMEs (Noci and Verganti 1999; Alberti et al. 2000).

Several authors recognize the importance of eco-innovation and there is a growing body of theoretical and empirical contributions the study of eco- innovation (for example; the linkage between eco-innovation and firm performance Cainelli et al. 2012; determinants of eco-innovation at the firm-level, especially paying attention to the role of internal factors (technology push), external factors (market pull) and/or environmental regulation (regulation push/pull), the effects of environmental innovation on the competitive advantages of firms (Chiou et al. 2011; Eiadat et al. 2008; Shrivastava 1995) and environmental innovation

management in SMEs (Cuerva et al. 2014; Klewitz et al. 2012; Klewitz and Hansen 2014). However, contributions that narrow eco-innovations by SME sectors and geographical location are more limited.

Due to the vital role that SMEs play in economic development there has been a number of government initiatives focused on encouraging eco- innovation in SMEs (Oke et al. 2007). This also applies to the food and drink sector, where innovation is considered an important factor in enhancing its competitiveness (Grunert et al. 1997; Rama 2008; Capitanio et al. 2010). Despite the relevance of SMEs and their importance to economic development, there is still a notable limitation of research on eco-innovations in low-tech SMEs, particularly within the food and drink industry (Menrad 2004; European Commission 2012; Baregheh et al. 2014; Cuerva et al. 2014), when compared to the number of studies focused on specific industries, but in high-tech industries such as the USA chemical industry (Theyel 2000), Taiwan electronic industries (Chen et al. 2006), the German electronic industry (Kammerer, 2009) and also highly polluting industries such as mining, steel, cement, pulp and paper and chemicals.

In addition, Tilley (1999) identified a significant gap in the literature exploring the response of small firms to the environmental challenge as she noted the gap between the aspiration of SMEs to become more sustainable and their action towards sustainability, influenced by a number of drivers, such as knowledge and training. While relatively few studies have explored the issue, years have gone by and the gap still appears to remain, findings from studies indicate SMEs still carry a growing negative impact upon the environment (Cassells and Lewis 2011; Oxborrow and Brindley 2013 Dibra 2015). Other notable limitations within the literature on eco-innovations include the need for further empirical research to foster the understanding of the factors affecting the adoption of eco-innovations by SMEs (Cuerva et al. 2014), and it would also be useful to analyse patterns of eco-innovation according to specific geographical locations, for example Scotland and by sectors, as is the focus of this

study.

The Scottish food and drink sector was chosen as the context of this study due to its economic significance. The European Commission (2012) identifies the food sector as one of the largest manufacturing sectors within the European Union. The food and drink industry is considered to be low-tech and less innovative when compared to other industries (Fontana and Guerzoni, 2008). However, this sector has been driven by a variety of different types of innovation, including product, process and service innovations (Avermaete 2004; Menrad 2004; Rama 2008; Capitanio et al. 2010) and innovation is deemed to be one of the most important factors in enhancing competitiveness within the food sector (Rama 2008; Capitanio et al, 2010).

There is no doubt that the food and drink sector is a high performer in the manufacturing industry and will have some environmental impact on the industry, as a result it has to take all the necessary steps to mitigate such negative impacts and it is the focus of this research to investigate the adoption of such eco-innovations being undertaken by SMEs and issues faced with adoption within the sector in Scotland.

2.6 Environmental Regulations, Policy, Standards and Incentive Schemes in Scotland

This section will look at the some of the environmental regulations and forms of external support, schemes and incentives available to businesses within the food and drink industry. Changing regulations is affecting businesses in many ways and firms need to prepare for more stringent changes in the coming years as governments across the globe focus on the environmental impacts of human activities today.

2.6.1 5p Bag Charge

In 2010, UK supermarkets provided 7.57 billion single-use plastic bags to shoppers, accounting for approximately 65,000 tonnes of plastic polymer (WRAP 2013). The

environmental impacts of plastic bags are can be seen from the litter in public places, damage to land and marine life, oil and energy consumption, and non-biodegradable plastic bag wastage, all of which pose a problem to the environment (DEFRA 2013).

On the 20th October 2014 legislation was passed by the Scottish Parliament that requires all retailers (food and non-food) to charge a minimum of 5p for each new single-use carrier bag (including paper, those made from some plant based materials and plastic). The introduction of the plastic bag charge has now become increasingly popular leading to the creation of new alternatives for shoppers looking for longer stronger lasting bags known as “Bags for life”, with offers of free replacements once they have worn out. The aim is to encourage bag re-use, reduce the visible impact of litter and also the negative impact on the environment.

2.6.2 Policy and Legislation

Revell and Blackburn (2007) describe the main methods of the UK government delivering environmental policies as being by either regulatory means (e.g. “Duty of Care”); fiscal means (e.g. the landfill tax) or by voluntary initiatives (e.g. ISO 14001). UK environmental policy has in the past relied heavily on voluntary action through an emphasis on the business benefits of environmental improvement. The government’s role in encouraging business down this path has predominantly concentrated in awareness raising activities and dialogue with industries. One of the core pieces of environmental legislation in the UK that affects all businesses is the 1990 Environmental Protection Act which introduced the regime of Integrated Pollution Control. Certain processes which are deemed to be a risk to the environment by the environmental agency now require licences, which focus on standard setting. For some businesses, this has meant a considerable investment has been necessary to meet the statutory standards (Chapple et al. 2001). Due to the continually changing regulations and guidelines, organizations are forced to continually review their procedures, targets and objectives and update them accordingly (Zutshi and Sohal 2005). All

companies have to comply with applicable environmental requirements and must make significant efforts to reduce their environmental impact to a level that the law considers acceptable (Ormazabal et al 2015).

There have been some significant developments in UK environmental legislation including the Waste Electrical and Electronic Equipment (WEEE) regulations which aim to reduce the amount of electronic goods being sent to landfill and this affects businesses of all sizes, it became law in the UK on January 1st 2014. Also, the introduction in April 2010 of the Carbon Reduction Commitment (CRC) which is a mandatory carbon emissions reporting and pricing scheme that covers large public and private sector organisations in the UK (SEPA 2017). This legislation requires larger businesses with annual energy bills of over £500,000 to be part of a mandatory carbon trading scheme. Each year businesses will purchase allowances and then at the end of the year based on their carbon reduction performance they will be put in a league table with other businesses within their sector and will either receive a bonus or penalty depending on their position. This legislation along with regulations like WEEE can be seen as a shift away from the voluntary initiatives of the past. However, it must be noted that CRC regulations are unlikely to affect many smaller businesses and even the WEEE legislation will only affect certain businesses in specific sectors. The Scheme is currently in its second phase (from April 2014- March 2019), however, the UK government recently announced the intent to abolish the scheme by 2019 (Carbon Trust 2016).

Regulation is a strong influencer of eco-innovation (Horbach et al. 2012; Fernando et al 2016). They provide informative and normative content, such as issue-specific policies and strict guidelines so that businesses understand what is expected and acceptable (Doran and Ryan, 2012). In some instances, the mere anticipation of stringent environmental regulations is enough to induce innovation (Khanna et al. 2009) by businesses proactively adopting their processes.

2.6.3 Green Schemes and Incentives

There are a number of government supported loans and schemes aimed at supporting SMEs looking to adopt eco-innovations but hindered by financial barriers these include:

- **Resource Efficient Scotland-** Funded by the Scottish government and delivered by Zero Waste Scotland, the Resource Efficient Scotland offers an SME Loans scheme that aims to overcome environmental barriers and support businesses that are looking to reduce costs through improved energy, material resource and water efficiency by providing an unsecured, interest free loan from £1,000 to £100,000. In addition, the scheme offers free advice to interested businesses along with technical support on best practices and eco-innovations that can be adopted and how to implement these (Resource Efficient Scotland 2017).

- **Green Deal**- was launched in 2013 and is a financing mechanism that enables organisations and individuals to pay for energy-efficiency improvements to their buildings through savings on their energy bills. Authorisation and management of assessors, installers and finance providers is carried out by The Green Deal Oversight and Registration Body (Energy Saving Trust 2017a).

- **Low carbon Transport**- Funded by Transport Scotland, this scheme is set up to assist organisations across Scotland, including businesses and the public sector, meet the costs of a wide range of measures that help lower the carbon footprints of transport and travel these include; Video and teleconference facilities, Cycle facilities, including bicycles, storage racks and lockers, fleet management software, vehicle efficiency devices and electric and plugged-in hybrid vehicles (Energy Saving Trust 2017b).

2.6.4 Environmental Management Systems

Environmental Management Systems (EMSs) encourage firms to adopt voluntary policies dedicated to continual improvements in environmental performance. The adoption of "eco-innovation" is enhanced by EMS implementation (Wagner 2008). The improvement of environmental performance can be carried out using a range of environmental tools these are identified and summarized in Table 2.4.

Table 2.4 Environmental Management Tools

Tools	Examples
Environmental policy	▪ Company policy ▪ Environmental statements
Consultants	▪ Environmental experts
Environmental audits	▪ Compliance audits ▪ Management systems audits
Environmental KPI's	▪ Emissions ▪ Transport ▪ Waste ▪ Water ▪ Supply chains
Packaging waste management	▪ Elimination ▪ Reduce ▪ Re-use ▪ Recycle ▪ Recovery
Environmental management systems	▪ Global standard ISO 14001 ▪ The European Regulation EMAS (the EU Eco Management and Audit Scheme) ▪ BS8555 process (British Standard for the phased implementation of an Environmental Management Systems)
Others	▪ Product life cycle assessment ▪ Eco-mapping

Source: Author generated

EMS enable businesses to establish environmental goals and programmes to achieve them (Cuerva et al. 2014). For instance, having an environmental policy or statement, announces to the public that the business considers its environmental impact and is taking steps to minimise this and improve its environmental performance. This could be in the form of setting key performance indicators that highlight areas where the business is looking to improve. The use of these environmental management tools can be carried out internally or with the aid of external consultants in the form of audits, or through the implementation of environmental management systems such as ISO standards and certification or EMAS etc. discussed in the following section.

2.6.5 Environmental Certification and Standards

Environmental certification and standards can be seen as guidelines and checklists that businesses must follow as a requirement of environmental regulations. By adhering to such guidelines, a business can continually improve and design innovative ways for the production process and the improvement of environmental performance. This section identifies and discusses three prominent environmental management systems namely; ISO, EMAS and BS855, that can be applied within SMEs and enable the further adoption of eco-innovations within their business products and processes.

2.6.5.1 ISO

The International Standards Organisation (ISO) is located in Switzerland and was created in 1947 to write technological standards for industrial processes and products. ISO was formed by 25 countries, deciding to merge the International Federation of the National Standardising Association (IFNSA) and the United Nations Standards Coordination Committee (UNSCC). The central mission of the ISO is to “facilitate international trade and commerce by

developing common international standards for products, materials and processes" (Potoski and Prakash 2005: p. 83). The ISO 9000 series was the first series of standards developed which certified management practices, this series related to quality management systems and there was widespread uptake of these in the late 1980s. The first environmental management system to be developed was BS 7750 developed by the British Standards Institute (BSI), (Kolln and Prakash, 2002).

The overall goal of ISO 14001 is to improve businesses environmental and regulatory performance by having participating firms adopt an EMS (Potoski and Prakash, 2005). To obtain ISO 14001 a business must undertake an initial review of its environmental practices, formulate and implement an action plan for environmental management with on-going performance targets, clearly identify internal governance responsibility for environmental issues and make necessary corrections to address any environmental problems that have been identified. To receive certification, firms are required to annually undergo third party audits. External audit teams can interview anybody at the company, from managers to line workers to assess whether employees understand the requirements of ISO 14001. Auditors perform surveillance audits of the business at least once a year and complete reassessment of certified businesses every three years. The on-going auditing is aimed at making managers think of ISO 14001 as an on-going process to improving environmental performance (Potoski and Prakash 2005).

ISO is a well-known environment management system for SMEs, particularly the 9000 series and the 14000 noted to integrate energy management systems within the overall business efforts to improve quality, environmental management and other challenges (Cuerva et al. 2014). To this end Stevens et al. (2012 p.210) state "the use of ISO standards in the field of energy management may be both applicable and beneficial in avoiding wasted effort through the "reinvention of the wheel", in research into the uptake of EMS".

2.6.5.2 EU Eco-Management and Audit Scheme (EMAS)

EMAS is a management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance. It is a voluntary tool for companies that aim to improve their environmental and financial performance and also companies looking to communicate their environmental achievements to the public and stakeholders (Merli et al. 2018). EMAS is only binding for companies who wish to implement the scheme, however in order to successfully register a company must meet the following criteria (European Commission 2017):

- Environmental review- includes a comprehensive analysis of the organization's activities, products and services and their environmental impact.
- Environmental policy and programme (objectives, responsibilities, targets).
- Environmental management system (structure, planning activities, practices and procedures).
- Environmental audit
- Environmental reports
- EMAS verification

2.6.5.3 BS 8555

BS 8555 is a British Standard which provides guidance on the phased implementation of an EMS, including the management of environmental performance evaluation, within a framework of six easily manageable phases (WRAP 2015). These phases are tackled incrementally at a pace that suits the organisation and implementation of all phases can lead to having an EMS in place that is ready for assessment against the requirements of ISO 14001 or EMAS. The six phases include:

- Commitment and establishing the baseline
- Identifying and ensuring compliance with legal and other requirements

- Developing objectives, targets and programmes
- Implementation and operation of the EMS
- Checking, audit and review
- EMS acknowledgement (getting ISO 14001 and/or EMAS)

Given the relevance associated with environmental management systems and standards, and its noted ability to further the adoption of eco-innovations by businesses, this research takes the implementation of EMS into consideration during the investigation to see how many SMEs within the Scottish food and drink sector have their business certified by such environmental standards and certifications as this also re-enforces their commitments to adopt eco-innovations and go green.

2.7 Food and Drink SMEs and Eco-innovation

Environmental management is increasingly growing important for businesses in the dynamic global environment, and more businesses are willing to put more effort into developing eco-innovations, green designs, and integrating green processes within their business (Haden et al. 2009; Molina-Azorın et al. 2009). Research on eco-innovation adoption has mainly been devoted to different perspectives such as motivations for adopting environmental management systems (EMSs) in hotels (Bohdanowicz 2006; Chan and Wong, 2006), barriers to EMS implementation (Chan 2011; Chan 2013), energy consumption and water use management (Lee 2009; Bunse et al. 2011), environmental management practices (Enz and Siguaw 1999; Kassinis and Soteriou 2003; Mensah 2006), the application of environmental management in facilities management (Wan 2007), hotel green marketing (Chan 2013; Dief and Font 2010), the relationship between environmental management and hotel performance (Rodriguez and Cruz 2007), managerial views on environmental management (Chan et al. 2013; Jones et al. 2016), customer views on green hotels (Han et al. 2010; Teng et al. 2014), customer perceptions on “green” restaurants and their purchase

intentions (DiPietro et al. 2013), customer willingness to pay more for the “green” restaurant experience (Dewald et al. 2014), and the Generation Y consumer segments’ selection attributes and behavioural intentions toward green restaurants (Jang et al. 2011).

However, there is not much academic research conducted into the food and drink industry particularly for Scotland, despite the level of importance this sector holds to the economy and the global market. The economic relevance held by this sector also sits in tension with the negative impact generated by the activities carried on by the diverse businesses within the sector and this makes eco-innovation more important for the sector to mitigate against this collective negative impact and adopt more eco-innovations to minimise and reduce environmental harm.

More recently, associations like the Scottish food and drink federation is making commitments to ensure the sector does what it can to greatly reduce its negative impact, to this end, the study will be investigating the adoption of on-going eco-innovations and associated issues in the context of the food and drink SMEs in Scotland to fill the limited research gap in sector and location.

2.8 Summary

SMEs are well recognized for their vital role nationally and worldwide, as they are significant contributors to economic development and employment creation. In a nutshell, SMEs are the very foundation upon which the Scottish economy sits but SMEs also collectively make a huge environmental impact, particularly when looking at the collective ‘footprint’ and the waste generated by their business activities. The last two decades have shown a shift from business as usual to a focus on doing business and keeping the environment safe. This is as a result of growing concern about business environmental impacts and the need to reduce the negative environmental impacts, giving rise to the need for more sustainable environmental measures and the adoption of eco-innovations.

This chapter identified the key characteristics associated with SMEs, factors critical to the growth of small businesses, reviewed the relevant literature on eco-innovation, and the strategies associated with SMEs towards their adoption of eco-innovations, in doing this the study highlights from the literature the key drivers of eco-innovation, the awareness and attitudes of SMEs towards environmental impacts, and the factors motivating or inhibiting the adoption of eco-innovations by SMEs.

The key capabilities associated with SMEs from the literature were identified as leadership skills, style of management, strategy planning, flat structure, resources, customer focus, innovation and networking. The literature suggests that each of these traits are critical and important to the successful business growth and survival of an SME.

In reviewing the literature on eco-innovation, the study found the key drivers of eco-innovation to be regulation, technology, market focus and supplier involvement. While these drivers all influence the adoption of eco-innovation, it would seem regulation is considered the most predominant driver as it enforces adoption and leaves the businesses with little or no choice but to adhere to the changes introduced through policy.

With regulations on the environment becoming more stringent, businesses need to align their development plans and respond by understanding these regulations, allocating time and resources towards adoption. This has led to the literature associating four strategic behaviours with SMEs namely; resistant, reactive, proactive and sustainable or environmental strategies. The findings suggest that at the initial stage most SMEs were associated with the resistant and reactive strategies where in the former; they showed little interest in their environmental impact and in the reactive they only responded to adopting certain eco-innovations based on pressure from legislation. However, with the growing changes and emphasis in the business world on reducing environmental impact, more businesses are now associated with taking proactive measures even before the enforcement of policy and some highly innovative businesses take the sustainable approach and re-

design the business to integrate environmental thinking within their products and processes. However, this usually requires strong leadership, management and flexibility by the businesses.

Despite the growing attention given towards the adoption of eco-innovation, the literature suggests that a number of factors exist that act as motivators or barriers to adopting eco-innovations by SMEs. The key motivators were identified as regulation and cost savings. The findings from literature suggest that some businesses are inclined to adopt eco-innovations as a cost saving measure, as certain eco-innovations are noted to reduce the cost for the business and increase their profitability especially energy related eco-innovations and also as a means to gain competitive advantage. However, the barriers to adoption seemed to be more prominent within the literature and considered to be a hindrance with many studies citing issues like cost, lack of time and resources, a lack of consumer demand, limited knowledge and information, and insufficient support and infrastructure as barriers to the adoption of eco-innovation.

In highlighting these issues and challenges, the researcher acknowledges that while there is a growing interest in the field and body of knowledge on eco-innovation, there is a scarcity of literature focused on high income generating sectors like food and drink. Given the relevance held by the industry along with the negative impact of waste generated, there is very little evidence on the adoption of eco-innovation being carried out within the sector, as a result this study aims to fill this gap and contribute to the existing research by investigating the adoption of eco-innovations by food and drink SMEs in Scotland.

CHAPTER THREE- THEORETICAL UNDERPINNING

3.1 Introduction

The previous chapter reviewed the literature on SMEs and their adoption of eco-innovations. It was identified from the literature that a limited number of studies focus on low-tech SMEs such as the food and drink sector. It was also noted that despite the economic and social relevance of the sector to the Scottish economy, there is very limited literature on what the small and medium sized enterprises within the sector are doing in relation to their adoption of eco-innovations. Therefore, the aim of this study is to explore the adoption of eco-innovation by Scottish food and drink SMEs.

The purpose of this chapter is to identify a theory best suited to provide the appropriate theoretical guidelines in exploring the factors that influence the rate of adoption of eco-innovations by businesses within the food and drink sector. The sections within this chapter are split into four. Section 3.1, introduces and discusses five theories considered for their theoretical underpinnings and suitability for the study, out of the five theories the diffusion of innovation theory (DOI) emerged as the most suitable for the study. Section 3.2, describes elements of the DOI theory and relates this in terms of relevance to the study. Section 3.3, presents the research framework applying the relevant components of the DOI theory and discusses how the research applies these factors in its investigation to the adoption of eco-innovations. The last section 3.4, summarises the main points and concludes the chapter.

3.2 Framework for studying adoption of eco-innovations

In order to understand how opinions on eco-innovations are formed and how innovation adoption decisions are made, a number of existing perspectives and theories relevant to eco-innovation adoption are considered. These include; a resource based view, institutional, stakeholder, ecological modernisation and diffusion of innovation theory. These five main theories are considered for their relevance to this study in the following sections.

3.2.1 The Resource-based view theory (RBV)

The RBV developed as a complement to the industrial organization (IO) view with Barney (1986) and Wernerfelt (1984) as some of its main proponents. The RBV theory focuses on the importance of organisational resources to a firm that are valuable, rare, inimitable and non-substitutable (Barney, 1991) and proposes that a firm's competitive advantage depend on these resources. The main tenet of the resource-based view theory is the link between competitive advantage and the internal resources of the firms. The effectiveness of this link is often measured through customer perceptions of product improvement based on the adoption of new business practices (Srivastava, Fahey and Christensen 2001). The RBV relies on the internal sources of sustained competitive advantage (SCA) and aims to explain why businesses in the same sector might differ in performance (Kraaijenbrink et al. 2010). It assumes businesses are profit maximizing entities directed by boundedly rational managers operating in distinctive markets that are to a reasonable extent predictable and moving towards equilibrium (Bromiley and James-Wade 2003; Leiblein 2003). Given its focus on the resource as the business significant component and its uncomplicated view of firms as a bundle of these resources, the RBV is explicitly reductionist and stands against emergent theories that liken firms to organisms with complex feedback controlled mechanisms focused on boundary maintenance (Kraaijenbrink et al. 2010).

From the resource-based view perspective, businesses are willing to comply with environmental protection practices because they perceive the benefits of doing so, such as sustaining competitive advantage (Esty and Porter 1998; Vazquez, Santos and Alvarez 2001; Veliyath and Fitzgerald 2000). This is a major departure from classical economic theory which views environmental protection as a high cost activity that companies try to avoid.

Following its development, RBV has been widely applied in a number of study areas such as information systems (Wade and Hulland 2004), organizational networks (Lavie 2006) and also within environmental management studies particularly in the areas of environmental performance (Russo and Fouts 1997) and the applicability of RBV as an environmental strategy (Aragón-Correa and Sharma 2003; Martín-Tapia et al. 2010; Kim et al. 2015). The literature on RBV has further developed into scholars integrating RBV with relational theory, social network theory and environmental issues into the NRBV known as the natural resource based view (Hart 1995).

The key proponents of NRBV focus on three strategic capabilities namely; pollution prevention, product stewardship and sustainable development. Pollution prevention involves tactical knowledge through skill development and the use of green champions working in teams to prevent waste and emissions. While product stewardship technologies provide knowledge of "the product life cycle", which can easily be converted into the potential for competitive advantage through stakeholder engagement and integrate environmental concerns into the product design and development process to add value. Lastly, sustainable development, seeks to do less damage to the environment, while also incorporating and addressing economic and social concerns that reduce not only the environmental burdens but increase economic benefits (Hart and Dowell 2011). All three proponents of NRBV are significant for gaining competitiveness and performance.

However, since its development, RBV has been heavily criticized. Due to its deep roots in economic theory, the resource- based view theory is criticized for heavily focusing on economic benefits and not on other factors such as socio-political exchanges (Lockett and Thompson 2001) and organizational and institutional motivations (Lux 2003). It is noted for over-emphasis on the possession of individual resources, and insufficient acknowledgement of the importance of human involvement in assessing and creating value (Kraaijenbrink

2010). RBV does not sufficiently capture the essence of competitive advantage (Lockett et al. 2009).

RBV has also being critiqued for its lack of managerial implications, as it appears to be seen as mostly descriptive in its approach, and seems to tell the managers to develop and maintain resources and a business, without any suggestions of how this should be done (Connor 2002; Miller 2003). As such the RBV has been accused of offering prescriptive measures and creating the illusion of control (Lado et al. 2006). However, proponents of the theory such as Barney (2005) argue that RBV was never intended to provide managerial implications but aspires to explain the sustained competitive advantage (SCA) of some businesses over others.

Following the identified criticism of this theory, the application of RBV is noted to be limited and somewhat restricted to mainly those businesses looking to gain SCA, which suggests that a firm already satisfied with its current competitive stand will have no added value with the RBV. It is also heavily dependent on existing resources owned by a business to gain further resources and competitive advantage, making its application even more restricted. Taking these factors and the weaknesses identified from the literature into consideration, this model is not robust enough to form the basis of developing a conceptual framework for this study as it is limited to a perception of existing economic benefit only to the firms themselves and does not support the growth of eco-innovations in a holistic manner from a social or environmental point of view.

3.2.2 Institutional Theory

Institutional theory is concerned with the role of institutions and the process by which systems become institutionalised within society (Scott 1987). This theory focuses on the identification and examination of influences that promote the survival and legitimization of

organizational activities such as culture, social environment, regulation and economic incentives (Hirsch 1975; Bruton et al. 2010; Glover et al. 2014). Institutional theory is predominantly interested in ways that groups and organizations are able to secure their legitimacy by conforming to rules like; regulatory structures, government policies, laws (legislation), and forms of societal and cultural practices associated with the institutional environment (DiMaggio and Powell 1983; Scott 2008; Glover et al. 2014).

According to institutional theory, social pressures from other actors in the market, such as government and the general public, are important in determining a firm's intention to adopt or even over-comply with environmentally friendly programmes (Rivera 2004). External social, economic and political pressures are noted to influence the organisational strategy of businesses, influencing their decisions to adopt and legitimise their activities in favour of stakeholder's perspectives (Jennings and Zandbergen 1995).

Institutional theory has been applied in environmental studies to explain sustainability measures and the greening of the supply chain (Etzion 2007; Sarkis et al. 2011) and exploring environmental management in organisations (Delmas 2002; Bansal 2005; Tate et al. 2010). The theory has also been applied in studies to explain how changes in social values, innovations and regulations affect decisions concerning green practices and measures (Rivera 2004; Ball and Craig 2010). For example, Glover et al. (2014) apply institution theory in their study of the dairy supply chain to explore the role of supermarkets in the development of sustainable practices, focusing on factors that affect the development of sustainable practices by stakeholders across the supply chain such as energy efficiency and reduction measures.

There are three principal forms of drivers identified within institutional theory that create isomorphism in organisational strategies, structures and processes namely; coercive, normative and mimetic. Coercive drivers come from pressures exerted by those in powerful

positions (Glover et al. 2014). These could be formal or informal pressures e.g. organisations exerting pressure on other organisations which are dependent on them, or manufacturers adopting eco-innovations in order to conform to environmental regulations (DiMaggio and Powell 1983); these forces are crucial to drive environmental management and hence sustainability (Kilbourne et al. 2002). Normative drivers according to DiMaggio and Powell (1983) stem from professionalism where members of an organization try to define methods and conditions of their work using influences to ensure organisations conform in order to be perceived as partaking in legitimate action (Sarkis et al. 2011). Normative drivers therefore exert influence because of a social obligation to comply, rooted in social necessity or what an organization or individual should be doing (March and Olsen 1989) and drive enterprises to be more environmentally aware (Ball and Craig 2010) An example of normative drivers within the context of eco-innovation and institutionalization will be the development of ISO14001, here normative standards are set by a certified organization in the form of guidance and rules on environmental management that other organisations must adhere to. Mimetic drivers do not employ the use of force of pressure like the coercive and normative, rather is occurs as a result of imitation i.e. when organisations replicate the models of successful competitors in the industry, in an attempt to be successful and hence lead to legitimacy (DiMaggio and Powell 1983; Sarkis et al. 2011).

The notable strengths of institutional theory lie in its usefulness in offering explanations on why certain practices are implemented by organisations even without offering economic benefits (DiMaggio and Powell 1983; Meyer and Rowan 1977; Berrone et al. 2010). Institutional theory is useful for describing how organisational activities may come to contribute to sustainability (Jennings and Zanbergen 1995). Furthermore, it can be used to back-cast from such an outcome to current practice in order for people to consider what might be done to encourage this institutionalization process (Scott and Meyer 1994). Overall research on institutional theory and its application within the literature has generated insights into the drivers for change in organisations and their processes.

The literature identifies some weaknesses associated with the use of institutional theory, Oliver (1988) identifies some challenges relating to the principles and implications of isomorphism by comparing institutional theory with strategic choice and population ecology theories and asserts that institutions have a great deal of latitude in determining their internal structures and activities while other aspects of institutions may prove more or less resistant to these pressures. The study concludes that institutional theory does not sufficiently explain isomorphism within organizational fields.

Another such criticism of the theory is based on the study of organisations and falls short of distinguishing differences across various organisations (Greenwood et al. 2014) which makes it rather ambiguous in its definition. Greenwood et al. (2014) further criticize institutional theory for its ability to generalize as it tends to treat organizations as if they were all the same and tends to ignore the obvious heterogeneity of organizations which by itself is a weakness.

The limitations of the theory also lie within its uses, as it mostly relates to descriptions of how forces can influence or force change within society, but does not necessarily do more than this. Therefore the application of institutional theory is more appropriate for studies mainly focusing on understanding drivers or influential factors for eco-innovation, and while this study acknowledges the investigation towards drivers and barriers of eco-innovation in the research questions, it is however not the main focus of this study and as such institutional theory is deemed insufficient for the complete investigation set out by this study which includes not only influential factors to the adoption of eco-innovation but also the extent to which the innovation is diffused and as a result it will not be applied.

3.2.3 Stakeholder Theory

Stakeholders are defined as “any group or individual who can affect or is affected by the organization’s objectives” (Freeman and Reed 1983 p. 91). While conventional theories of the firm focus on its responsibilities toward its shareholders, a stakeholder perspective takes a broader view and implies that a company should consider the needs of all its stakeholders (Banerjee 2002) and focuses on what actions a company should take to fulfil its societal obligations. From a stakeholder theory perspective, a successful company is one that satisfies and adds value for all its stakeholders and not just the shareholders of the company (Benn et al. 2009).

The stakeholder perspective is considered relevant to analysing and evaluating an organisation’s social performance in relation to societal views (Clarkson 1995) which could also yield better organisational performance, since the normative core of stakeholder theory is said to be a driver of corporate social performance. As a result, once managers accept their obligations to stakeholders and recognize their legitimacy, the organisation is well on its way to achieving its moral principles (Clarkson 1995; Donaldson and Preston 1995). According to Freeman et al. (2010), stakeholder theory proposes to address and improve the understanding of value creation and how it is traded, connecting ethics and capitalism, and helping managers deal with these matters.

Stakeholder theory conceptualizes the managing of stakeholder relations and theorises their importance to an organization and has been increasingly applied in environmental studies, green marketing literature and environmental strategies (Garrod 1997; Henriques and Sadorsky 1999; Rivera-Camino 2007; Horisch et al. 2014) to investigate the influence of stakeholders over the organisations. Its application has been used to expand further on the range of motivations that stimulate a firm’s adoption of environmental practices from a cost-benefit decision to a moral choice.

Weiss (1995) argues that the stakeholder theory is based on the idea that the enterprise exists to serve its stakeholders, which are interested in it and that in different ways may damage or benefit from it. This model stresses on this the idea that the enterprise exists first of all to serve its owners interests. These interests are the maximization of its wealth or other causes for its being a business.

Stakeholder theory is noted to be limited in its ability to inform governance systems and lacks the ability to offer a system of governance that integrates the concerns of both humans and non-humans as stakeholders (Benn et al. 2009), since stakeholders are not limited to humans but also include the natural environment (Phillips 2003). Despite its prospects and applications, it does not provide a framework for implementing an integrated perspective on governance on social and environmental issues and remains conceptually limited in scope (Benn et al. 2009).

Other criticisms of stakeholder theory relate to its unclear views about the power relations among the stakeholder groups, which include the narrow and broad stakeholders and its failure to address the needs of indigenous stakeholders that are classed as marginalised groups (Barnerjee 2002). Narrow stakeholder theory is based on concepts of agency theory and individualism while the broad version is based on stewardship theory and the obligations of the collective (Sundaramurthy and Lewis 2003). To further stress the point, Bergkamp (2002 p. 147) notes; measuring performance against a profit maximisation objective is relatively easy but measuring performance against the objective of balanced stakeholder benefits is fraught with difficulty.

In addition, the fact that different stakeholders have different stakes and play different roles, balancing the needs of competing stakeholders is not an easy task, unfortunately stakeholder theory offers no constructive guidelines for the creation of effective governance

systems that will produce equitable outcomes among the diverse stakeholders and disparities of power and remains limited to the notion that all stakeholders can compete equally in the decision-making process.

Taking into consideration the above strengths and weaknesses of the stakeholder theory, this study considers it relevant to identify the stakeholders with the SMEs in the food and drink sector and highlights their role in influencing the eco-innovation adoption process. This is however an aspect considered within the study and applying a theory like the stakeholder theory will require the use of other applicable theories to complement and offer guidance in the other aspects investigated within this study, as such the limitations of stakeholder theory make it unsuitable for the current study and it will not be applied.

3.2.4 Ecological Modernization Theory (EMT)

The concept of EMT was introduced in the 1980s through the works of Huber (1982) and Janicke (1985). The theory proposes that the central institutions of modern society can be transformed to avoid ecological crisis. Huber (1982) stressed the need for an “ecological switchover”, a transition from industrial society to an ecologically rational organization of production, based upon the theory of a changed relationship between the economy and ecology. EMT is a theory for environmental innovation, it has been offered as a possible solution to the conflict between industrial development and environmental protection (Murphy and Gouldson 2000).

EMT posits that environmental problems may be mitigated by increasing resource efficiency, improving sustainability, while retaining the basic system of capitalist production and consumption. Within this situation, environmental protection is not a ‘problem’ but an ‘opportunity’. EMT suggests that manufacturers can overcome barriers to innovation that: prevent them from going beyond control technologies to consider clean technologies; from

complementing technological change with organizational change; and from exploring the strategic as well as the operational opportunities for improvement (Murphy and Gouldson 2000).

EMT has been applied in studies focused on environmental management. For instance; Zhu, Sarkis and Lai (2012) carried out an investigation of the green supply chain management practices of chinese manufacturers and applied concepts of EMT in insights into the environmental, financial and operational performance of the firms. Other management studies include; Huber (2008); Horlings and Marsden (2011) etc. The application of EMT is not widely used within environmental management studies.

At the core of EMT is an emphasis on 'ecologizing economy' and 'economizing ecology'. Ecological modernisation specifically argues that economic development and ecological crisis can be reconciled to form a new model of development for capitalist economies; to this end the concept of ecological modernisation can be used at two levels. First, as a theoretical concept for analysing the changes required to solve the ecological crisis in society. Secondly, to aid the description of political programmes aimed at environmental policy making (Gibbs 1998). The focus of ecological modernisation is to achieve major transformation and an ecological switchover the society.

Gouldson and Murphy (1996) identify three aspects required for the process of ecological change (switch-over):

- Restructuring of production and consumption towards ecological goals. This involves the development and diffusion of clean production technologies and decoupling economic development from the relevant resource inputs, resource use and emissions (Gibbs 1998).
- Economising ecology by placing an economic value on nature and introducing structural tax reform.

- Integrating environmental policy goals into other policy areas.

However, these aspects over-emphasise the industrial and technological aspects and neglect the social context within which these occur. The basic tenet of ecological modernisation proposes that it will be supported by businesses since it includes financial benefits. These will be achieved through the reduction of pollution and waste production leading to greater business efficiency, the avoidance of financial liabilities like the cost associated with clearing up contaminated land, the creation of a better environment for the business environment, introducing greener products for sale and the development and sale of pollution prevention technologies (Dryzek 1998) yet within these premises lies liabilities that could lead to greater dominance of global resources by transnational industry, national governments and "big science" in the name of sustainability (Gibbs 1998).

Given its bold and ambitious proposal, ecological modernisation theory has been criticised for its highly technical position, Mol and Spaargaren (1993) criticise this overly technical view and argue that it is difficult to imagine an ecological switchover without state intervention at various levels as proposed by Huber (1982) as he suggests the state should be excluded from the switch over to ecological modernisation. There is no doubt that in order to progress, ecological modernisation will require some form of political commitment and support. It also fails to consider the social processes at work and relies on the narrow technocratic and instrumental approach as opposed to integrating and using communication channels, as such ecological modernisation theory marginalizes people and projects who depart from that vision by conceptualizing them as "deviant, backward, or irrational" (McLaughlin 2012). This approach cannot achieve the necessary cultural transformation that results in sustained environmental improvements, reduced consumption and greater equity.

Other shortcomings of the theory relate to its limited attempt to address issues of equity or democratic involvement, which are key to sustainable development. It offers very little

towards institutional adaptation and the change process required to implement sustainable development. Ecological modernisation largely ignores the major institutional changes needed, despite being based on the notion that the necessary changes to institutions can be made (Christoff 1996) and sustainability can only be built around value and institutional shifts in society. Besides, securing an alignment between industrial growth and environmental protection is often difficult as the two almost always conflict especially where the main consideration is economic. The centrality of growth and profit imperatives in the capitalist world system means that firms generally have to prioritize growth and profit, regardless of environmental cost (Magdoff and Foster 2011; Lowy 2015).

Mol (2002) criticizes EMT for its emphasis on conventional environmental problems like pollution and waste and its lack of consideration of other ecological problems like climate change, ozone depletion, global warming, bio-diversity etc. Its prioritising of issues that affect mostly developed nations rather than global issues affecting both developed, developing and under developed nations such as climate change, makes its narrow-minded and lacking in depth for application to a global scale environmental crisis. Ewing (2017 p 134) asserts that "ecological modernisation theory provides little guidance as to how ecological rationality can reliably be incorporated, further undermining the practical viability of their approach to ecological rationality".

Furthermore, the theory's presumption of the capitalist world system further undermines its suggestions for economic, political, or social change. It proposes that ecological rationality should be subordinate to economic rationalities, yet it also acknowledges that "economic mechanisms, institutions and dynamics will always first follow economic logics and rationalities" (Mol 2002). The contradictions that arise from ecological modernisation theory make the theory incoherent and difficult to comprehend (Ewing 2017).

While the theory has been offered as a useful tool for gaining insights into the adoption of eco-innovations, its proposal appears too broad and as identified from the literature to be a contradiction of guidelines and somewhat too good to be true. While this study is concerned with the adoption of eco-innovations, it also takes into consideration the challenges that may exist to the adoption of these innovations by the SMEs within the industry. EMT does not consider the possibility of barriers to eco-innovation but mostly prescribes a guide to transitional change into an ecological oriented society, this makes it un-suitable for this study.

3.2.5 Diffusion of Innovation (DOI) Theory

The diffusion of innovation theory was first discussed historically in 1903 by the French sociologist Gabriel Tarde (Toews, 2003) who plotted the original S-shaped diffusion curve as a measure of speed for adoption, followed by Ryan and Gross (1943) who introduced the adopter categories that were later popularized by Rogers. Diffusion is defined as the process by which an innovation is communicated through channels over time among the members of a social system (Rogers 2003).

Since the onset of the early studies, research into the diffusion of innovation theories has gained attention and broadened its scope across various interdisciplinary fields of studies including; health care (Van den Bulte and Lilien 2001; Thakur et al. 2012), accounting and economics (Rennings 2000; Ax and Bjornenak 2005), marketing (Peres et al. 2010), information technology (Attewell 1992), and management studies, particularly environmental management research (Srivastava 2007; Sarkis et al. 2011). The existing literature on diffusions of innovation show a wide range of applications and a different perspective with many contributions resulting from the various disciplines of application. For instance, economists have used different econo-metric models to explain new products and technology diffusion based on cost and the past behaviour of consumers. Marketing

research has applied different tools associated with the adopter behaviour. Its application within healthcare, information technology and education has been towards examining the diffusion of innovation. More recently, within environmental management studies, the theory has been applied to identify factors influencing the rate of adoption of environmental management systems like ISO14001, and other environmental management practices. The diffusion of innovations theory offers great generalizability of overall findings over time, and has emerged as one of the most multidisciplinary research topics in social science research settings (Prescott 1995; Rogers 2003).

Rogers (2003) diffusion of innovations model is one of the most popularly cited theories (Sherry and Gibson 2002; Sahin 2006). In his book, Rogers identifies five sequential stages in innovation adoption, in this process an individual or business gains knowledge of an innovation through social networks or other means, forms an attitude or opinion towards it, decides to adopt or reject it, implements it and, lastly confirms the decision to adopt the innovation. However, prior to the potential adopter's innovation-decision process, there exists a range of factors that brings adopters into the process in the first place, these include; prior experiences, needs or problems that require solving, innovativeness and social norms.

Rogers contends that innovation diffuses through certain communication channels over time among the members of a social system. This suggests the importance of the social network of the potential adopter (e.g. the influence of opinion leaders, peer groups and agents of change). Other diffusion literature suggests that network effects (Bikhchandani et al. 1992) and herd behaviour (Banerjee 1992) play a significant role in accelerating adoption. Bandura (1986) argues that social interaction and learning motivates people to adopt innovations. According to Rogers (2003), once 10–25 per cent of the population adopt an innovation there is relatively rapid adoption by the remainder of the population, forming an S-shaped curve.

Roger's theory of theory of diffusion captures four elements that are relevant to the diffusion of innovation process. The four elements are:

(1) Innovation: by Rogers definition this is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. Here, Rogers maintains that while an innovation may have come into existence a while back, the newness of an innovation is determined by when the potential adopter becomes aware of it, thereby making it new to them. The perception of the innovation is associated with the knowledge of the innovation, the persuasion to adopt the innovation and the decision to adopt the innovation.

(2) Communication channels: are the forms or means through which information on the innovation passes from one individual to another, the communication occurs through channels between sources, he further describes a source as an individual or institution that generates the information, while the channel is the means through which the information gets from the source to the receiver (potential adopter). Within the diffusion communication process, there typically exists an innovation, individuals or groups as the units of adoption and the communication channels which could include the media or interpersonal forms of communication. These modes of communication are powerful tools and serve as agents of change towards the adoption of an innovation, and play an important role at the knowledge stage as well as the persuasion stage of the innovation decision making process (Rogers 2003).

(3) Time: The time factors depend on the decision process, the relative time with which an innovation is adopted by an individual or group. Rogers uses the time element within the adopter categorization process to capture the rate of adoption of innovations. He notes however that most behavioural studies tend to ignore the time element in the adoption of innovations. Time is a useful element to capture the spread of the innovation among its

adopters and also within the innovation-decision process since the five steps identified by Rogers (Knowledge, Persuasion, Decision, Implementation and Confirmation) occur in a time-ordered sequence.

(4) Social system: is the fourth element identified within the diffusion process. The social system is a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal (Rogers 2003 p.23). Diffusion of an innovation occurs within a social system, and is therefore influenced by the social structure, and the social system can affect the extent of the innovativeness of the individuals or groups that exist in the social system. He uses the extent of innovativeness associated with the individuals or members in the social system for categorising adopters.

DOI theory is a useful systemic framework to describe the adoption or non-adoption of an innovation (MacVaugh and Schiavone 2010). It is useful for gaining understanding of contextual factors that influence the adoption decision model using the elements identified by Rogers, why these factors might influence the perception or notion towards an innovation, and why these factors which could be internal or external can lead to the successful adoption or the rejection of an innovation. It also serves as a useful framework for understanding the benefits, consequences and challenges associated with adopting an innovation, and provides a guide for evaluating the success rate of an innovation and the rate of its diffusion in an environment.

Despite its relevance and popular application within various areas of research, the DOI theory like most theories is not without its criticisms. Lambkin and Day (1989) accuse the diffusion theory of being too aligned with the demand side of economics. They contend that DOI ignores important factors such as marketing mix variables, competitive advantage, resource allocation, and how they might influence the speed and pattern of diffusion in

innovation leading to the "issue of equality". However, the basic models of diffusion have since been extended with consideration of more than just economics (Rogers 2003).

Waterman (2004) criticizes the theory for not considering the possibility of potential adopters rejecting an innovation despite having a good understanding of the innovation and for being too technology driven making it "pro-innovation bias", implying that all members within a society should adopt an innovation (Kole 2000; Botha and Atkins 2005) and does not take into account the reinvention or rejection of an innovation by members of the society. This criticism does not necessarily portray Rogers (2003) guide for diffusion, for it is important to note that while Rogers identifies the key stages relevant to the innovation decision process, he also takes note of the possibility of rejection or re-invention, and offers attributes that could influence the decision to adopt or reject an innovation depending on how the potential adopter perceives the innovation.

Another criticism of DOI is the "individual blame bias" this suggests the tendency to blame the individual for their problems rather than holding the system the individual exists in responsible, as such DOI supports change agents who promote and market innovations as opposed to the actual potential-adopter of the innovation. Rogers (1995) notes variables applied in diffusion research to predict innovativeness tend to focus on the success or failure of the individual within the system rather than serve as indications of success or failure of the system. To tackle this criticism, Rogers (1995) suggests the use of an approach that considered system-blame, thereby holding the agents of change also accountable for the success or failure of the adoption of an innovation.

The Recall problem is often cited as a weakness of the Diffusion research (Haider and Kreps, 2004). This criticism posits that the time variable is an element which is heavily relied on by the theory and make the model dependent on the respondent's ability to recall

information e.g. the date of adoption. This require the respondent to recall back in time and recollect past events relating to their adoption of an innovation, which may not be accurate especially if a long time has elapsed. To mitigate against this criticism Rogers (2003) suggested the use of use of archives, case studies, field experiments and longitudinal panel studies. Taking note of the diffusion of an innovation from multiple respondents is considered a useful and appropriate measure to guard against the recall problem and account for accuracy. Despite these noted limitations, the overall theoretical concept of diffusion theory has held up well, and continues to be used in diverse research fields.

In comparison with the RBV, Institutional theory, Stakeholder theory and EMT, the DOI has emerged as a more applicable framework to be used in this study. This decision is driven by the fact that the innovation considered by this study is eco-innovations and the extent to which these have successfully been adopted by SMEs in the Scottish food and drink sector and the DOI theory based on its usefulness provide a useful framework to investigate this. While the first four theories are useful for identifying and examining the motivators and barriers to adoption, this study is interested in not only identifying the factors influencing the adoption of eco-innovations in the Scottish food and drink industry, but it is also interested in exploring understanding the perception the businesses hold towards “green” by considering the awareness- knowledge and importance they place on eco-adoption, examining the factors influencing the adoption rate of eco-innovations, identifying the forms of eco-innovations adopted by the sector and using this to generate a scale of greenness reflecting the extent of adoption by the businesses within the industry. Rogers 5 stages applicable to the innovation adoption process which end with the potential adopter adopting or rejecting the innovation, serve as a useful and practical tool in understanding SMEs and their decision to adopt any innovation particularly environmental innovations. As such, applying the DOI theory, aligns with helping the study answer its research questions and provides for a broad understanding on the eco-innovations adoption by Scottish food and drink SMEs.

It is also relevant to note that its wide application across geographical regions as well as multiple disciplines further enhances the suitability for application to this study. Since Rogers' first publication of the DOI theory in 1962, its consistency has been proven in over 10,000 studies across a variety of different disciplines, including the study of environmentally friendly innovations. (Le et al. 2006). Furthermore, literature in the study of green environmental management is still evolving and not fully developed and the implications regarding the adoption and diffusion of various green practices and innovations are not well understood (Srivastava 2007). As such, Sarkis et al. (2011) posit that diffusion of innovation may provide an appropriate theoretical basis for additional understanding of green management research.

Rogers diffusion of innovation theory holds four main elements to the diffusion of innovation process, these were identified earlier in the above section. However, this study applies 3 aspects namely; **Innovation;** which in the case of this study has been identified as eco-adoption, here the perceived attributes (Relative advantage, Compatibility, Complexity, Trialability, and Observability) to an innovation are considered and how they influence the adoption process. **Communication channels**; the forms of communication considered within this study are the associations and green agencies, government institutions, the mass media and the consumers, are stakeholders of eco-innovations who act as agents of change and can influence the eco-innovation adoption decision process. The third element considered within this study is the **Social system;** which represents the units or members engaged to accomplish a common goal. The units of a social system may be individuals, groups, businesses or sub-systems (Rogers 2003). Networks are considered very important for SMEs, when compared to large enterprises because they use network as a basis for initiating environmental practices (Halila 2007). Therefore, the social system analysed within this study consists of food and drink SMEs in Scotland, the common goal identified that binds the members of this social system together is their adoption of eco-innovations, thus the Scottish food and drink SMEs constitute the boundaries for this study within which the

adoption and diffusion of eco-innovation takes place. **Time;** is an element used by Rogers, however it is not considered as a variable within this study due to the difficulty associated with establishing when the businesses first became aware of the eco-innovation and when they decided to adopt it, Rogers (2003 p.20) notes that the measurement of the time dimension is mostly dependent on the respondent's ability to recall and can easily be criticized. The time element is also relevant to the innovation decision process that accounts for the five stages from the knowledge of an innovation to the confirmation of adopting the innovation. Rogers (2003 p. 113) however notes that alternative research can explore other means of gathering data to reflect the several points in time during the diffusion process, without needing to rely on respondents recalling the several points (stages) in the diffusion process. Therefore, this study excludes the time element within the five stages but uses other methods of engagement with the respondents to determine how these aspects of the five stages relate to the respondents and after establishing confirmation of the forms of eco-innovations adopted by the respondents, the study is able to represent the extent of diffusion among businesses within the sector. Aspects relating to the four elements of Rogers diffusion of innovation theory are discussed further within the following sections of this chapter.

The focus of this thesis is on the adoption of eco-innovations by Scottish food and drink SMEs and an area of interest is to understand how these eco-innovations have diffused within the sector and the challenges or issues relating to the adoption of these innovations by the businesses. The next section describes some the general models associated with Rogers diffusion of innovation theory; these include the attributes determining the rate of adoption, the stages in the diffusion-decision process and the adopter category established by Rogers based on their level of innovativeness.

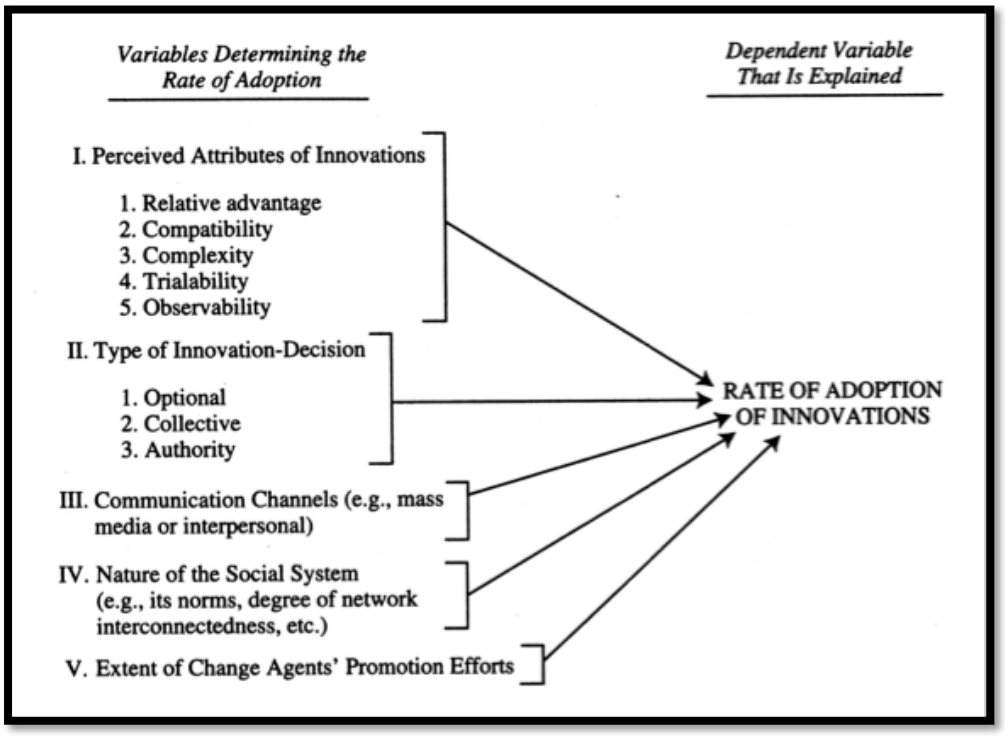
3.3 Attributes of Diffusion of Innovation (DOI)

Diffusion is “the process in which an innovation is communicated through certain channels over time among the members of a social system” (Rogers, 2003 p. 5). DOI is considered a more applicable theory to be applied for the study because it provides a holistic framework to investigate how eco- innovations are adopted and have diffused within the Scottish food and drink sector.

One of the objectives set in this study is to examine the motivator and barriers to the adoption of eco-innovations, Rogers attributes of innovation identify key traits that are associated with innovation adoption success or failure and as such this study considers it important to use the guidelines stipulated within Rogers theory to identify the factors relevant to the adoption-diffusion process, particularly because this factors can influence the decision of the potential adopter to adopt or reject the innovation in question, in this case the adoption of eco-innovations.

Figure 3.1. identifies the factors that influence the rate of adoption for an innovation as set out by Rogers (2003), these factors relate to the challenges or consequences associated with adopting an innovation, the perception and opinion which the potential adopter might relate to the innovation; and consideration is also given towards the means by which the potential adopter gains knowledge and gets to know about the innovation. This could be through personal channels of communication like a business associate or more formal routes like the government agencies, or memberships and associations of the social system to which the business belongs. The roles played by these channels of communication are deemed vital by this study because they also influence the rate of adoption and the respondents within this study are asked about the nature of relationship that exists between them and notable agents of change.

Figure 3.1. Variables Determining the Adoption of Innovation



Source: Rogers 2003

As shown in Figure 3.1, the DOI theoretical framework includes a variety of motivations that cover some of the main tenets of the resource- based view, stakeholder and institutional theory. These relate to the characteristics of the innovation, the characteristics of the business looking to adopt the innovation and the characteristics of the environment in which the business exists. Furthermore, the decision to adopt an innovation can be optional, collective or authority driven. **Optional innovation decision**s are driven by personal choice, where an individual or business decides to adopt an innovation independent of the decisions made by other members within its social system. In the context of this study an example of such would be the decision to adopt solar panels by a business within the food and drink sector. **Collective innovation decisions** as the name implies are made by collective choice, the members within the group or social system agree to adopt an innovation and members are expected to comply with the decision once made. For instance, if members of the Scottish food and drink association decide to reduce their waste by recycling and

reducing waste to landfill, members are expected to comply and engage in active recycling of their waste. The third type of innovation decision is **Authority innovation decision,** in this case the individual or business has little or no say in the decision to adopt the innovation but to implement it once the decision is made. It is usually driven by an authority figure, and Rogers (2003) notes that the fastest rate of innovation adoption usually stems from an authority type innovation decision, though it also depends on how innovative the authorities are. An example of such within the context of this study is enforced legislation by SEPA for Scotland's food businesses that mandates the separation of food waste over 5kg per week (Zero Waste Scotland 2017). Kammerer (2009) confirms that a high level of regulatory stringency incentivises companies to adopt and implement eco- innovations.

As stated earlier, the main elements of Rogers model are; innovation, communication channels, time and the social system. However, in his breakdown of these elements, Rogers (2003) identifies that there are five main factors that influence the motivation to adopt innovations: The attributes to the innovation include; complexity, trialability, compatibility, observability and relative advantage. These attributes help to understand why some innovations are successfully adopted and why some innovations get rejected or never fully become widely accepted, as such these attributes identified by Rogers are applied within the research to understand the adoption of eco-innovations by Scottish food and drink SMEs. These key attributes to adoption are examined within this research and are briefly described below.

Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes or replaces. The higher the perceived relative advantage of an innovation, the more likely it will be adopted. Innovations can have economic, social and environmental advantages, and the characteristics of the potential adopters will most likely determine what sort of relative advantages of an innovation are most important to them and will most likely influence their decision to adopt or reject an innovation. Rogers associates status as a

motivation for innovators, early adopters and the early majority adopter categories and notes that the late majority and laggards are less inclined to adopt an innovation on the advantages of status seeking. The relative advantage of an innovation has been found within diffusion research to be one of the strongest determinants of an innovation rate of adoption (Rogers 2003).

Relative advantages attributed with the adoption of environmental innovations are cost savings, improvement of the business reputation, and increased profitability or market share (Karagozoglu and Lindell 2000; Triguero et al. 2013). Rennings (2000), notes the adoption of eco-labels by businesses as a marketing strategy that enhances their environmental performance and differentiates their products from other businesses in order to gain competitive advantage. The relative advantage associated with adopting eco-innovation and then labelling the product to draw the attention of the consumers will result in a rise in sales of the product (Kammerer 2009).

Compatibility is the degree to which an innovation is perceived as being consistent with existing values, experience, and the needs of potential adopters (Rogers 2003). The more compatible an innovation is with the values, beliefs and needs of the potential adopter, the more likely that the innovation be adopted. Applying this attribute to the context of eco-innovations, if the businesses places values on issues that relate to environmental sustainability, then the adoption of innovations that align with enabling the business to run its operations in an eco-friendly way will be more likely since the innovations are compatible with not only the business beliefs but its needs as well. These could be in the form of adopting renewable sources of energy, cost-efficient transportation measures or the adoption of an environmental management system like ISO 14001 or EMAS. Roger further notes that the compatibility of an innovation and the way it is perceived by members of its social system can have effects on its rate of adoption.

Complexity is the degree to which an innovation is perceived as difficult to understand and use. The more complex an innovation, the less likely it will be adopted (Rogers 2003). While some innovations are clearly understood in their meaning and application to potential adopters, other innovations tend to be more complex and can hinder the potential adopter from implementing the innovation. To this end, Rogers (2003 p. 257) notes that "the complexity of an innovation as perceived by members of its social system, is negatively related to its rate of adoption".

Rogers generalisation of this attribute makes it a notable barrier to adoption. However, it could also be argued that there are two sides to this attribute, i.e. the meaning ascribed to the innovation could be complex or simple, so this study takes into consideration the influence of complexity as an attribute that can positively influence the adoption of eco-innovation (when the potential adopters have a clear meaning and understanding of what the innovation means, does and how it can be used within their business) or negatively hinder the adoption of eco-innovations (in which case the potential adopter is unable to understand the innovation and perceives it to be complex to adopt within their business).

Trialability is the degree to which an innovation may be experimented with on a limited basis. This attribute allows the potential adopters to get a feel and experience of the innovation to be adopted without fully committing to it if found to be unsuitable. Trialability reduces the uncertainty associated with the innovation by providing a trial experience of the relative advantages associated with the adoption of the innovation. Rogers asserts that innovations that allow for trialability are more likely to have an increased rate of adoption. He however points out that not all innovations can be adopted on a trial basis, as some innovations are more difficult to allow for trial experiments than others. Another advantage to trial innovations is they also allow for flexibility, customisation, testing and adjustments where necessary to suit the potential adopters needs if the initial idea is considered unsuitable (Rogers 2003).

While some eco-innovations can be subject to trial projects to increase certainty, others require outright commitment to adoption from the moment the decision has been made to adopt. In relation to trial environmental innovations. It might be possible to phase the adoption of recycling within a business and start off with one aspect of recycling e.g. food, which can later be expanded to other aspects of the business that generate waste. This also allows for customisation and adjustments to ensure that when full adoption is applied it is easily adopted within the business operations.

Observability is the degree to which the results of an innovation are visible to the firm. Observability is generally understood as the ability to foresee the overall effect of adopting the innovations. The easier it is for individuals or organizations to see the results of an innovation, the more likely they are to adopt it (Rogers 2003). Like trialability, Rogers notes that some innovations are easily observable and the results of observing the innovation in use can be seen and easily communicated to potential adopters which in turn can increase its rate of adoption by members of a social system. However, some innovations are not easily observable and the results of adopting the innovations less visible to communicate to potential adopters. The ability to familiarise and observe the drawbacks and benefits to an innovation, reduces the uncertainty of adoption.

The degree to which food and drink SMEs consider observability necessary when adopting environmental innovations will be examined to see if this is a notable motivator or barrier to their adoption of eco-innovations or not. One notable eco-innovation that might be applicable will be the adoption of smart-meters which enables businesses track and measure their energy use, this is a useful innovation that enhances the business ability to manage their energy use more efficiently and also saves the business money.

Having identified and described the attributes from Rogers theory of innovation diffusion and how they can influence the rate of innovation adoption, the study will now look at the five stages identified by Rogers that are relevant to the innovation- diffusion process.

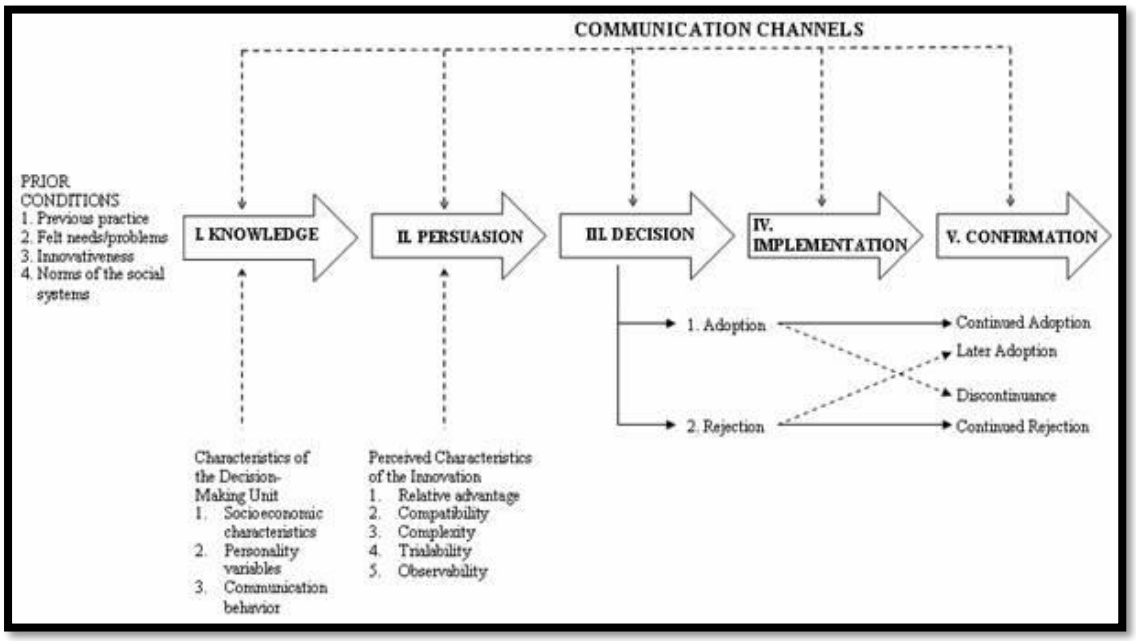
3.3.1 Stages in the Innovation-Decision Process

This section presents the five stages conceptualized by Rogers that are instrumental to the innovation-diffusion process, and concludes by relating the relevance of the stages to the research questions and how they are investigated by this study. The five stages to be discussed within this section are; Knowledge, Persuasion, Decision, Implementation and Confirmation.

According to Rogers (2003), an innovation is an idea, practice or object that is perceived as new by the individual. Depending on how this innovation is received, the key attributes to the innovation tend to influence the adoption process. Rogers posits that members within the social system will experience the innovation-decision which is likely to follow a process, which occurs over time and follows a 5-step process identified by Rogers known as the 'Innovation-decision process'. The decision to adopt an innovation occurs over time after some consideration and action and may not instant or immediate. Rogers further offers a model to capture the innovation-decision making process which consists of the five stages depicted in Figure 3.2.

The innovation-decision process is described as "the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (Rogers 2003 p.37).

Figure 3.2. A Model of Five Stages in the Innovation Decision Process



Source: Rogers 2003 p.170.

Through these stages the individual is actively seeking and processing information about the attributes of the innovation (relative advantage, compatibility, complexity, trialability and observability). i.e. thereby increasing certainty on the benefits and decreasing uncertainty on the challenges associated with the innovation, all information received and processed during the innovation decision stage is processed and this then informs the decision to either adopt or reject the innovation.

Knowledge occurs when a person becomes aware of an innovation and has some idea of how it functions. Types of knowledge range from awareness about the innovation, how-to use an innovation properly, and principles-knowledge dealing with the functioning principles underlying how the innovation works. According to Hassinger (1959 cited in Rogers 2003 p.171), when an individual comes into contact with information about an innovation, the effect can be minimal or of no use except when the person considers the innovation to be relevant to their need or is consistent with the individual's attitudes and beliefs, a process

known as selective perception. The three critical questions to ask in the knowledge stage are "What? How? and Why?", for it is at the stage that the individual tries to determine "what the innovation is, how the innovation works and why it works" (Rogers 2003 p.172).

The awareness-knowledge stage is associated with the member of the social unit getting to know what the innovation is, this could also influence the decision to seek further knowledge in the second type of knowledge i.e. how to knowledge, at which stage the potential adopter gets information on how the innovation works in detail, the third type of knowledge known as the principles-knowledge goes into further detail on the functionalities associated with the innovation, Roger notes that it is possible for potential adopters to adopt an innovation without passing through the principles knowledge stage, though the adopter might be at the risk of misuse, but this depends on their level of competency in the application and understanding of the innovation and also the type of innovation being adopted.

The Knowledge stage is relevant to this study because the research seeks to understand how much information and understanding the adopters of eco-innovation have on the innovation they have adopted. It considers, what do they know of the eco-innovations? How do they know of eco-innovations? and why do they know of eco-innovations?

Persuasion, this stage occurs with the individual following the perceived attributes of an innovation (e.g. relative advantage, compatibility, complexity, trialability and observability). The person forms an un-favourable opinion of the innovation due to its complexity or a favourable attitude based on the relative advantage of the innovation; however, a positive or negative opinion of an innovation does does not always lead directly or indirectly to an adoption or rejection" (Rogers 2003 p. 176). Persuasion is also influenced by information sought from near-peers whose subjective opinion of the innovation can be most convincing.

At the persuasion stage, the potential adopter seeks information that will be used to reduce uncertainty and evaluates consequences of the innovation. This makes the main outcome of this stage the forming of a favourable or unfavourable attitude towards the innovation. Therefore, the persuasion stage is more centered on perceptions, feelings and attitudes unlike the knowledge stage which is more centered on cognition and knowing (Sahin 2006).

This study has an interest in the perceptions and attitude formed by the food and drink SMEs in their adoption of eco-innovations and will draw on this stage by seeking information from the respondents within the study on what their opinions are of eco- innovations.

Decision occurs once the individual chooses to adopt i.e. “full use of an innovation as the best course of action available” or reject “not to adopt an innovation” (Rogers 2003 p. 177). Rogers identified two types of rejection: active rejection and passive rejection. In an active rejection, the individual may try out an innovation on a trial basis with the intent of adopting it, but later he or she decide not to adopt it. Another form of active rejection is called the discontinuance decision; this is when a rejection of an innovation occurs after adopting it earlier. However, in a passive rejection (also known as non-adoption), the individual does not consider adopting the innovation at all.

The decision stage reflects the intention to seek additional information about the innovation and the commitment to try the innovation if the decision made is in favour of adoption.

This study relates this stage within its investigation towards understanding what prompted the respondents within the food and drink sector to adopting eco-innovations.

Implementation is when the person puts the innovation into use. Prior to this stage all process encounter has been a mental phase of consideration, processing of information and forming an opinion. Implementation entails putting the innovation into practice, that is the

actual adoption of the innovation. However, Rogers (2003 p. 6) points out that due to the newness that comes with an innovation, this also generates some degree of uncertainty as to how the innovation will diffuse. At this stage, the adopter may need technical assistance from change agents and others to combat the degree of uncertainty about the consequences that may occur in implementation.

The implementation stage may continue for a reasonable time until the innovation-decision process comes to an end, when it becomes a regular part of the adopter's operations or activities, at which point *"the innovation loses its distinctive quality of being a new idea"* (Rogers 2003 p. 180), this could be the end of the implementation stage and in some cases the end of the innovation-decision process, but in some cases some innovations at this stage may lead to reinvention. Reinvention is *"the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation"* (Rogers 2003 p. 180). Rogers further discussed that the more reinvention takes place, the more rapidly an innovation is adopted and becomes institutionalized. For innovations that do not end at the implementation stage, a fifth stage exists which is known as the confirmation stage discussed below.

For this study, the implementation stage is an actual acknowledgement by the adopter of the eco-innovation on how the innovation is being institutionalized as an ongoing effort within their business activities. Therefore, the study uses this stage to get a better understanding of how the forms of eco-innovations are adopted by the respondents of the study.

Confirmation occurs as the individual evaluates the results of an innovation and seeks support of an innovation-decision already made, or to reverse a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation (Rogers 2003). Depending on the support for the adoption of the innovation and the attitude of the individual, later adoption or discontinuance could also occur during this stage.

Discontinuance may occur during this stage in two ways. First, the adopter may reject the innovation to adopt a more suitable innovation by replacing it, known as replacement discontinuance. While the second type happens when the adopter rejects the innovation because it does not meet their needs, this is known as disenchantment discontinuance.

The confirmation stage is centered on the adopter seeking re-enforcement of the decision to adopt the innovation. At this stage, there is a recognition of the benefits to adopting the innovation, as it has presumably been integrated into the adopters ongoing activities and regular routine. There is also the likelihood of promotion and recommendation of the innovation to others within the social system especially when the adopter is pleased by the relative advantages associated with the innovation.

The study applies the confirmation stage by engaging the respondents in the study on the benefits they associate with the adoption of their eco-innovations. This also helps the research get a better sense of the relevance and importance respondents attribute to the adoption of eco-innovations.

While this study does not take in the time sequence relating to these stages because this is reliant on the respondent's ability to establish timelines within the stages which might be difficult to do. However, to be more specific it applies the stages in the investigation of research objectives 1 and 2 as detailed below.

Objective 1, of this research assesses the awareness-knowledge of eco-innovations in Scottish food and drink SMEs, in doing this stage 1 (knowledge) is considered relevant and applied to meet the research objective. This is used to establish what the respondents think of eco-innovations, how they perceive eco-innovations and what they know of eco-innovations. In examining these aspects of the attitudes and beliefs formed towards eco-innovations, the study is also able to consider the channels of communications (persuasion

agents) informing the businesses about eco-innovations and how they became aware of eco-innovation.

Objective 2, of the research tries to examine the level of importance placed on eco-innovation adoption placed by the businesses within the food and drink sector. In trying to establish this, stages 3, 4 and 5 are deemed useful ways to establish if the businesses are actually keen towards adoption. Stage 3 (Decision), which is the decision to adopt comes into focus, which is also linked to the motivation or barrier to adopt or reject an innovation. Once the respondent acknowledges they were persuaded and convinced by the attributes of eco-innovation enough to adopt, this establishes the business as an adopter of eco-innovation. The study also applies stages 4 (Implementation), by establishing what forms of eco-innovation are being implemented by the businesses and how the business implements eco-innovation within their processes or activities. The last stage 5 (Confirmation), is applied within this study to examine the business level of support for the innovations it has adopted and consideration is given to the challenges the business may associate with adoption of eco-innovation.

Having looked at the relevance of these stages and how they are applied within the study to achieve the set objectives and answer the research questions, the next section will introduce another aspect of the diffusion theory that rates the adopters into different types and discusses how these categories will be used by the study.

3.3.2 Adopter Categories

The purpose of this section is to consider another aspect to the diffusion of innovation theory applied by Rogers known as the adopter categories. This section introduces the concepts of adopter categories and innovativeness as defined by Rogers, and distinguishes the five different categories of adopters classified by Rogers namely; Innovators, Early adopter, Early majority, Late majority and Laggards, highlighting the unique traits and behaviour

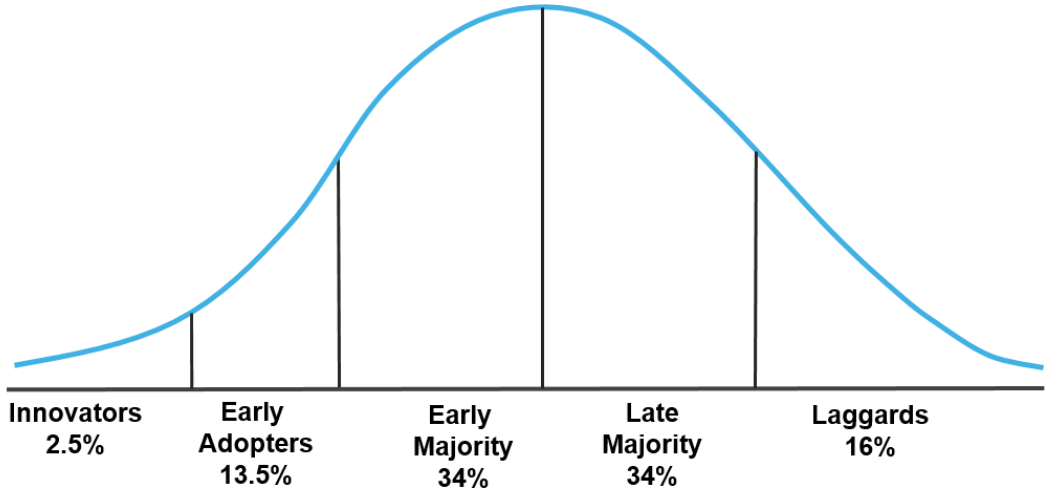
associated with these groups and their attitudes and values towards innovation adoption. The last part of the section discusses how the study applies elements of the concept of adopter categories to establishing the scale of greenness within the Scottish food and drink sector.

In his study of adopters, Rogers notes that the individuals within a social system do not adopt an innovation at the same time, instead the adoption of the innovation occurs over a time sequence, that allows for the adopters to be classified into categories based on when they began to adopt the innovation. To this end, Rogers (2003 p.22) defined the adopter categories as "*the classifications of members of a social system on the basis of innovativeness*". In establishing the adopter categorisation, Rogers (2003 p.279) explained that a researcher must first, decide on the number of adopter categories; second, the portion of members of a system to be included in each category; third, the method to be applied in defining the adopter categories, this could be statistical or non-statistical.

The criteria applied by Rogers in establishing the adopter categorisation is innovativeness. Braak (2001 p. 144). described innovativeness as "*a relatively-stable, socially-constructed, innovation-dependent characteristic that indicates an individual's willingness to change his or her familiar practices".* However, Rogers (2003 p. 22) defines innovativeness as "the degree to which an individual or other unit of adoption is relatively earlier in adopting an idea than other members within its social system". He came up with a classification of five adopter groups known as; innovators, early adopters, early majority, late majority and laggards.

Figure 3.3 shows the frequency distribution of adopters based on their adoption of an innovation in a social system. Rogers categorizes the adopters based on innovativeness because it aided in understanding the influential factors and behaviours in the innovation-decision process.

Figure 3.3. Adopter Categorization on the Basis of Innovativeness



Source: Rogers, 2003 p.281.

In distinguishing between the various adopter categories, Rogers takes account of the characteristics associated with the adopters which are based on observations from empirical studies. This allows for a description of the adopters based on values, attitudes and personality traits in relation to innovation adoption. A brief overview of the five adopter categories is presented below:

Innovators are the pioneers, they are a venturesome group who identify and explore new frontiers without map or guide and are eager to experience new ideas. This sets them at the front of their local peer networks. Communication patterns and friendships among a clique of Innovators are common even if they are geographically separated. Innovators usually have control of substantial financial resources and have an ability to understand and apply complex technical knowledge in their field. Rogers (2003) notes that innovators are the gatekeepers bringing the innovation in from outside of the system.

Early Adopters compared to the innovators are a more integrated part of the local social system than innovators. Early adopters have the greatest degree of opinion leadership in

most systems, and potential adopters look to them for advice and information about the innovation (Rogers 2003). The early adopters are role models and the "individual to check with" before using a new idea, and are generally sought by change agents to serve as local evangelists for speeding the diffusion process. A change agent is an individual who influences potential adopters' in a direction deemed desirable by a change agency (Rogers, 1995). The early adopter is respected by peers, embodies successful, discrete uses of new ideas, and makes judicious innovation-decisions. As a result, their attitude towards innovations is very important. According to Rogers (2003 p. 283), they put their stamp of approval on a new idea by adopting it.

Early Majority have a good interaction with society but lack the leadership of the early adopters. However, their interpersonal networks are vital to the innovation diffusion process as depicted in figure 3.3. They adopt new ideas just before the other one-third of the members of a system. They interact frequently with their peers, but seldom hold positions of leadership in a system. The early majority unique position between the very early and relatively late to adopt makes them an important link in the diffusion process. The early majority may deliberate for some time before completely adopting a new idea. Their innovation-decision period is relatively longer than that of the innovator and early adopter (Rogers 2003).

Late Majority are the other sceptical one-third of a social system, and adopt new ideas after the early majority. Adoption may be triggered as economic necessity and as a result of increasing network pressure from peers. They generally approach innovation with caution and scepticism and will not adopt until most others have adopted the innovation, and the system norms must be in favour of an innovation before they are convinced to adopt (Rogers 2003).

Laggards The last group in the category to adopt an innovation are referred to as laggards. They generally tend to be suspicious of innovation and change agents and are noted as being traditionalist. Due to their limited resources and the lack of awareness-knowledge of innovation, they first want to make sure that an innovation works before they adopt it as a result their innovation-decision process is relatively lengthy (Rogers 2003). Resistance to innovation on the part of laggards may be entirely rational as they must be sure that a new idea will not fail before they adopt.

Having looked at the adopter categories and the various distinctions between each group, it is worth reiterating that while Rogers makes use of the time element in distinguishing what makes an innovator different from a laggard, given that the innovator is always at the forefront of adoption, while the laggard is the last to adopt the innovation. However, due to the inability of this study to capture the time-order sequence in which the respondents of the research have adopted eco-innovations, the study reflects the innovativeness of the respondents by an alternative means.

First, the study considers innovativeness as the extent / degree to which green/eco-innovations are adopted by businesses within the Scottish food and drink sector. Rather than applying the time-order sequence to determine the extent of innovativeness as done by Rogers, this determines innovativeness on the basis of eco-innovations being adopted by the individual businesses, these innovations will reflect the most adoption of eco-innovations to the least adoption of eco-innovations and is used to represent the scale of greenness for eco-innovation adoption.

A category of eco-innovation has been established within the study taking into consideration Rogers guidelines which state that a set of categories should be exhaustive, mutually exclusive (making sure a unit that appears in one category is not replicated in another), and lastly, it must be derived from a single classification principle. In line with this, an extensive

list of eco-innovations was classified into five main categories to establish what is referred to as categories of eco-innovations namely; Waste, Energy, GSCM, Carbon-footprint and Embedding green. The defining principles for classification were eco-innovations aimed at reducing environmental impact.

Furthermore, given the empirical nature of this study, the research is able to take in observations and draw on the attitudes and values associated with the food and drink business respondents to identify ideal adopter category types as exemplified by Rogers and relate this to its study of the adoption of eco-innovations. This enables the study to identify and distinguish between the personality traits applicable to the adopters of eco-innovation.

The next section will look at the application of diffusion theory within eco-adoption management research.

3.3.3 Diffusion Theory and Related Research

This section aims to highlight the application of DOI theory in environmental management studies, taking note of how the theory is applied within the studies and in some cases combined with other theories to investigate some aspect of green management adoption and its diffusion. The section concludes with a summary of studies considered relevant to this research, which also supports the precedence for applying this theory within the research.

As stated earlier, the use of Rogers theory is widespread in the literature among various discipline and ranges from science based to technology- based studies to business management and social studies. The application of Rogers theory within eco-innovation studies has grown significantly, with most focusing on (GSCM) green supply chain management (Zhu et al. 2010; Chou et al. 2012; Zhu et al. 2012; Tian et al. 2014) or Green logistics (Hazen et al. 2011; Lai et al. 2011).

Chou et al. (2012), combine the use of the theory of planned behaviour (TPB) and innovation adoption theory to investigate the attitudes and behavioural decision in adopting green practices in the restaurant and hospitality (hotel) industry in Taiwan. The findings suggest that attitudes and perceived behavioural control have positive effects on behavioural intentions while social influence is not significant. Perceived innovation characteristics have direct positive effects on attitude and indirect positive impacts on behavioural intention to adopt green practices.

A study by Zhu et al. (2012) examines differing levels of the adoption of GSCM practices. The authors identify three types of industrial manufacturers namely: early adopters, followers and laggards among Chinese manufacturers. Early adopters have initiated proactive investment recovery as well as planned to implement eco-design and external GSCM under the high level of internal environmental management. Followers only consider internal environmental management, and replicate the path of early adopters with partial initiation of eco-design and investment recovery. Laggards fail to initiate or even plan any GSCM practices. Their findings reveal differences between the three types of GSCM adopters on their environmental, operational and economic performance.

Zhu et al. (2012) evaluate the relative roles of innovation and imitation drivers for diffusion of GSCM practices, they find that though innovation is not insignificant, imitation however, plays a much larger role in contributing to the diffusion of GSCM practices among Chinese firms. They conclude that while potential industry leaders will always be pace setters, imitators on the other hand will need to see value in these innovations for the diffusion to be extensive.

Table 3.1 summarizes the most relevant literature within green management based research and highlights the areas of the application of Rogers theory. The application of DOI within

these green management research studies supports the suitability of DOI as the underpinning theory since other studies have successfully applied it within their research. However, a number of the study applications of Rogers theory within eco-adoption management studies relate to green supply chain management (GSCM) literature, this study is concerned with applying Rogers theory within the context of the adoption of eco-innovations by Scottish food and drink SMEs.

Table 3.1. Related literature to DOI theory in Green management research

Authors	**Topics**	**Context**	**Focus**
Padel 2001	Conversion to Organic Farming: A Typical Example of the Diffusion of an Innovation	Reviews the motivations to organic conversion as it relates to DOI	Organic farms
Le et al. 2006	Environmental management: A study of Vietnamese Hotels	Factors influencing perception to adoption of eco-friendly practices	Vietnam (hotels)
Zhu et al. 2010	Green supply chain management in leading manufacturers: case studies in Japanese large companies	GSCM practices and solid waste management	Japanese firms
Hazen et al. 2011	Diffusion of green supply chain management: examining perceived quality of green reverse logistics (GRL)	Relationship between GSCM adoption and competitive advantage.	GSCM/ Reverse Logistics
Lai et al.	Green shipping practices in the	Environmental	shipping

2011	shipping industry: Conceptualization, adoption, and implications	awareness and measures	industry
Marimon et al. 2011	Comparative analysis of diffusion of the ISO 14001 standard by sector of activity	Examines patterns of diffusion of the ISO 14001 standard	ISO 14001 standard
Chou et al. 2012	Green practices in the restaurant industry from an innovation adoption perspective: Evidence from Taiwan	Links theory of planned behaviour (TPB) and innovation adoption theory to investigate attitudes and behavior to eco-adoption	Restaurant and hospitality (hotel) industry in Taiwan
Zhu et al. 2012	Green supply chain management innovation diffusion and its relationship to organizational improvement: An ecological modernization perspective	Links ecological modernization theory (EMT) and diffusion of innovation theory (DOI) to determine performance improvements in the adoption	GSCM among Chinese manufacturers
Zhu et al. 2012	Diffusion of selected green supply chain management practices: an assessment of	Investigates roles of innovation and imitation drivers for	GSCM practices among

	Chinese enterprises	diffusion of GSCM practices	Chinese firms
Tian et al. 2014	A system dynamics model based on evolutionary game theory for Green supply chain management diffusion among Chinese manufacturers	Process of GSCM diffusion among manufacturers	Manufacturing China
Dibra 2015	Rogers Theory on Diffusion of Innovation - The Most Appropriate Theoretical Model in the Study of Factors Influencing the Integration of Sustainability in Tourism Businesses	Factors influencing the adoption of sustainable practices in tourism businesses	Tourism businesses

Source: Author generated

While table 3.1 highlights the relevance of Rogers theory within eco-adoption related studies, it also identifies the limitations within which the theory has been applied. This study uses Rogers framework with a more holistic approach to address the issues impacting the adoption of eco- innovations, as it takes into consideration the awareness of “green”, knowledge of eco-innovation, importance of eco-innovation, the motivators and barriers to adoption of eco-innovation and then generates a scale of greenness, as it relates to the eco-innovations currently adopted by businesses within the food and drink sector.

3.4 Conceptual Framework Applying DOI

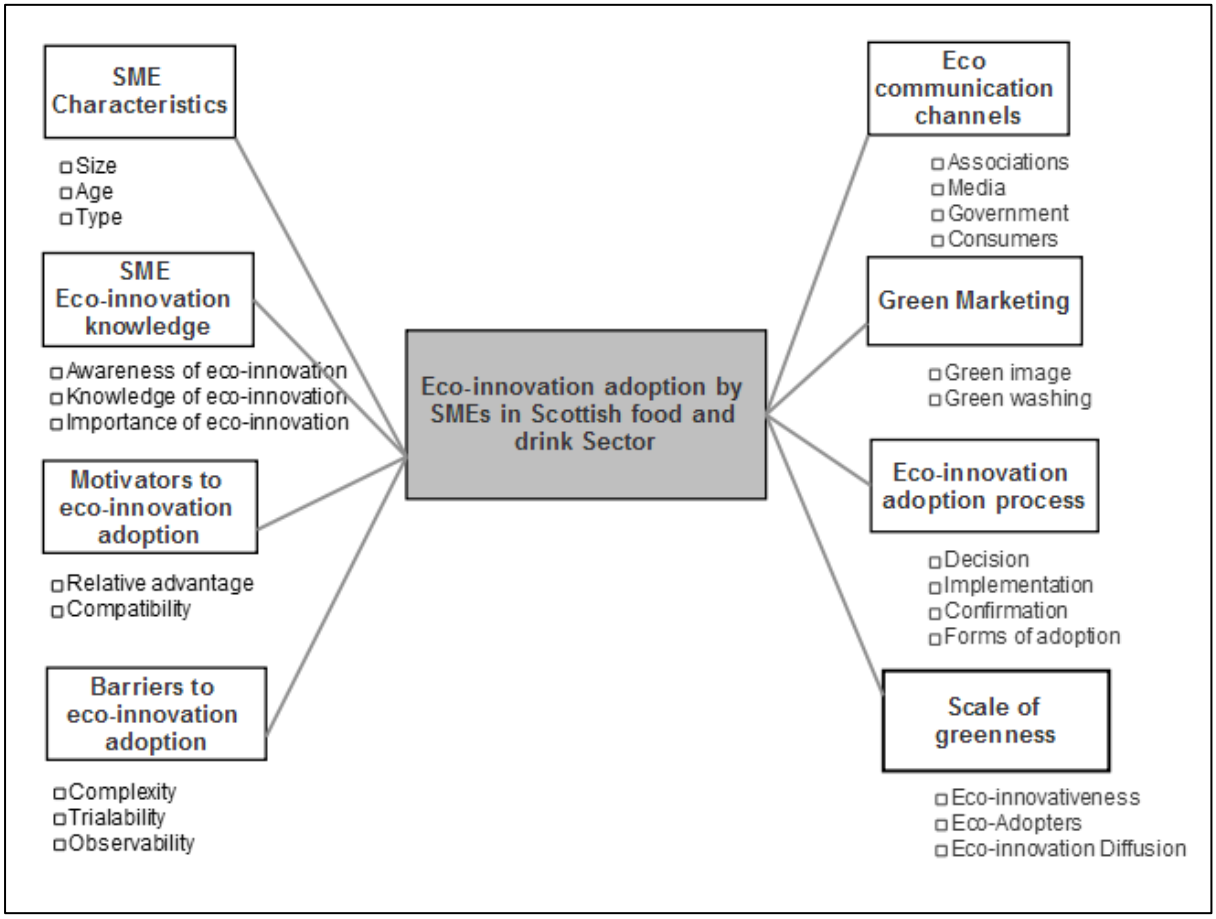
The study of the adoption of eco-innovations requires a broad and flexible theory, that allows for the incorporation of green management, eco-innovation strategies and an understanding of the challenges businesses face in adopting eco-innovations. This study considers DOI theory well suited to support the research aim and objectives and the purpose of this section is to create a conceptual framework that can capture the adoption and diffusion of eco-innovation by Scottish food and drink SMEs.

The study conducts an empirical assessment of on-going eco-innovations adopted by Scottish food and drink SMEs, evaluating the extent to which these SMEs are involved in incorporating green environmental management innovations into their businesses as well as assessing the motivators and barriers to adopting these eco- innovations and set the following objectives for the study:

1. Assess the awareness of eco-innovations in Scottish food and drink sector SMEs.
2. Investigate the importance Scottish SMEs in the food and drink sector place on eco-innovations.
3. Identify the forms of eco-innovation adopted by the SMEs.
4. Identify and examine the motivators and barriers to eco-innovation adoption efforts by SMEs in the Scottish food and drink sector.
5. Generate a scale of greenness based on the forms of eco-innovations adopted by the SMEs.

In order to meet the above objectives, three components relating to Rogers diffusion of innovation theory are applied and discussed as follows in relation to figure 3.4. As discussed in the previous section above, the 3 components utilized from DOI theory are; Innovation, Communication channels and the Social system. There are two variables relating to the time element which is also modified and adapted to suit the study objectives, these are innovativeness and the adopter category.

Figure: 3.4. Research Conceptual framework (applying Rogers adoption theory)



Source: Author generated

The key concepts of the framework in relation to the DOI theory are discussed below:

SME Characteristics: Using the variables associated with Rogers social system, the study establishes the boundaries and specific focus of the study. This is important as the study is particularly concerned with the adoption of a specific industry which is the food and drink, a particular group which are classed under small and medium sized enterprises (SMEs), within a particular location, which is Scotland. Therefore, the variables relating to these members within the social system are captured in the SME characteristics depicted in figure 3.4; these consider the respondents size, age of business, and type of business. These characteristics of the respondent's profile are presented within the findings in chapter six of this study.

Eco-communication channels: The variable considered within the communication channels are green agents which relate to stakeholders and agents of change in the forms of green

agencies and associations, food and drink association, government institutions, mass media and consumers.

Green marketing: is also underpinned within the communication channels, is captured by the study in the form of green image advertising and publicity and is used to explore the possibility of green washing which has been noted to exist when companies are pressured to adopt policies against their wishes, therefore leading to pretend-adoption without actual implementation in practice. Green marketing within this study relates to the means by which the businesses publicise their green efforts.

The eco-communication channels are seen by this study as a means by which the food and drink SMEs gain information on eco-innovation. These channels are advocates and pillars of support for businesses to adopt environmentally-friendly innovations. The study considers what affiliations and memberships the respondents have in relation to associations and organisations that serve as sources and intermediaries of eco-innovation adoption.

SME Eco-Innovation Knowledge: Applying the components of innovation, the study tries to understand and portray the views and perceptions of the food and drink SMEs in relation to eco-innovation adoption. The study tries to understand their awareness of eco-innovation and what it means to their business, gaining a sense of importance and relevance to both the businesses and the industry as a whole.

Motivators to eco-innovation adoption: Attributes of an innovation are used to draw out the key motivators to eco-adoption by the businesses. The study applies the variables of relative advantages and compatibility as elements of eco-innovations and tries to highlight the notable motivators to adopting eco-innovations by the respondents.

Barriers to eco-innovation adoption - Similar to motivators, the study uses the variables associated with complexity to capture the challenges and issues that respondents might experience in relation to adopting certain eco-innovations, also the challenges of trialability

and observability are also considered and whether the respondents relate these as notable barriers to their adoption of eco-innovation.

Eco-innovation adoption process- Having identified through the attributed factors influencing adoption i.e. what the respondents consider to be motivators to eco-adoption or barriers depending on the factors which influence the most and is considered more suitable by the business, based on the most influential factor they make a decision and are persuaded to adopt or reject the eco-innovation. If persuaded to adopt and the decision to adopt is confirmed, the study seeks to establish how the eco-innovations are implemented by the business and this is confirmed by understanding areas within which the business has fully integrated the forms of eco-innovation adopted.

At the confirmation stage, the study is interested in establishing from the respondents' experience and adoption if there are any issues / challenges associated with the innovation adopted or in some cases establish what results and benefits the respondents associate with the adoption of their eco-innovations. Within these stages applied the forms of eco-innovations adopted by the respondents is established through the acknowledgement of the implementation and confirmation stages to the adoption process, these forms of eco-innovation are used by the study to generate the scale of greenness, which is based on the extent and degree of innovativeness associated with the adopters of eco-innovation within the Scottish food and drink sector.

Scale of greenness- As mentioned earlier in section 3.2.2, when discussing the adopter categories, the method applied to establishing the scale of greenness by this study does not take in the time element to determine the adopter category. This is not feasible for a short-term study and is heavily reliant on the participants ability to recollect the different stages associated with the innovation decision process, as when they first heard of the innovation, and when they decided to adopt the innovation which could have a gap between that may be difficult for some respondents to recollect, therefore this study decided not to take this factor

into account. This was however substituted, with the study modifying innovativeness from the time element to focus on the forms of adoption, which then enables the study to generate a classification of greenness based on the range of eco-innovations adopted by each respondent within the study, this is presented in the study discussions in chapter seven.

3.5. Summary

This Chapter identified five theories that could be applied within the study namely; Resource based-view, Institution theory, Stakeholder theory, Ecological Modernization theory and the Diffusion of innovation theory. Their relevance, strengths and criticisms have been reviewed from the literature and in view of these the diffusion of innovation emerged as the theory most suited for this study. The application of the DOI theory by Rogers (2003) to the research framework informs research discussions on understanding the adoption of eco-innovations by businesses. This theory supports the objectives set out by the research in the following ways;

Innovations as defined by Rogers (2003) can be an idea or practice. This study does not limit the forms of eco-innovation examined within the study as there are bound to be a range of green ideas, practices and activities adopted across the food and drink sector as a means of reducing the negative environmental impact generated by the businesses within the sector. Therefore, Rogers theory is useful in studying the wide range of eco-innovations adopted across the Scottish food and drink sector.

The spread of innovation theory is a well-developed theory, broadly accepted and widely applied. Since its publication in 1962, the model has been continually improved through empirical research from 1971, 1983, 1995 to 2003. Furthermore, this theory has been used in studies of various disciplines; scientific, business, and social studies (Rogers 2003). Robinson (2009) noted that "the diffusion of innovations theory" has been tested through more than 10,000 research studies and various tests, which make it very reliable. It has also

been applied in different research studies related to green management as summarized in table 3.1, which supports the precedence for applying its components within this research.

The framework illustrated in figure 3.5, shows how this research applies Rogers model to understand the adoption of eco-innovation, as it also takes into consideration relevant stages identified within Rogers framework applicable to the adoption and diffusion of innovations. The variables and influential factors identified by Rogers in his stages to the innovation adoption process to assess the SME awareness and knowledge of eco-innovations, identify and examine the motivators and barriers to SME eco-innovation adoption efforts, and enables the study to generate a scale of greenness based on the forms of eco-innovation adopted by the SMEs.

The following chapter presents and discusses the research methods and methodology.

CHAPTER FOUR- RESEARCH METHODOLOGY

This Chapter describes in detail the choice of methodology applied in this research to achieve the stated objectives of assessing, investigating, identifying and generating a model for eco-innovation adoption for SME's in Scotland. The methodology was briefly stated in section 1.6 of chapter one; however, this is elaborated within this chapter. The Chapter also includes a discussion of the following: nature of the research design, philosophical stance, research methods previously used in this area of study; and an identification of the methods applied in the study that enable the questions set out in this research to be answered; the sampling strategy; data collection techniques; tools and techniques used for data management; data analysis and interpretation; and the presentation of the findings. The next section will provide a general overview of the research background and factors that influenced the selection of the research topic and the overall process taken by the study.

4.1 Research Overview and Process

Several options were taken into consideration when narrowing the research down to its area of focus. It was important to cover a topic that was of interest to the researcher, but also one with relevance to policy and business environment. At the initial stage, the focus of the study was quite broad and was to capture the UK and multiple industries within it, however the researcher realised this would not be feasible due to limitations such as the ease of accessibility, additional costs and time constraints. After exploring several possibilities and considering viable options the study was eventually narrowed to focus on the food and drink industry, which while noted to be viable and highly significant to the economy as discussed in preceding chapters 1 and 2, it is also noted to have very limited literature on green issues, and therefore is likely to benefit from this research.

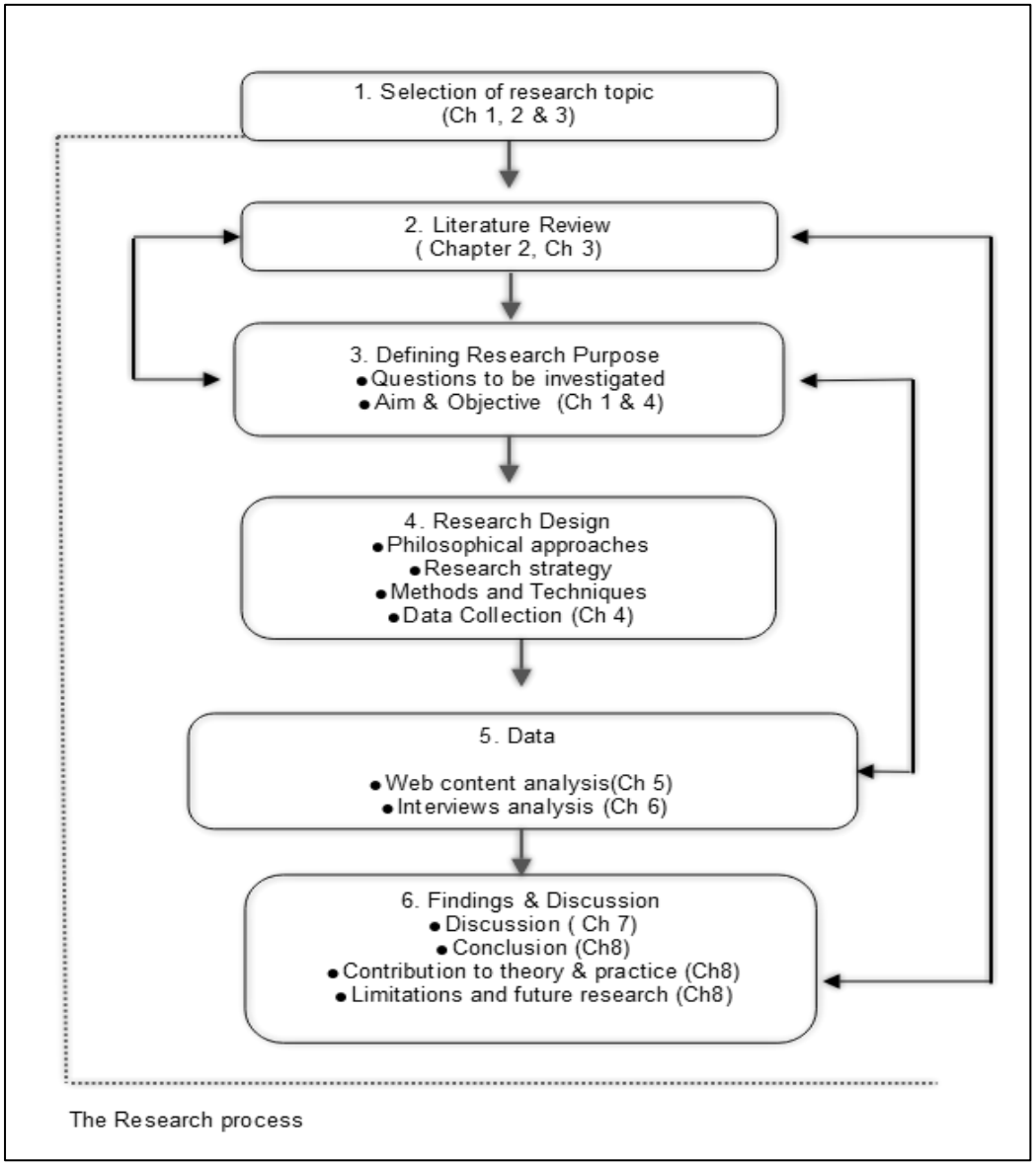
Scotland is noted for its progressive status (Keane 2017) particularly where issues that relate to the environment are concerned, with goals and targets set to achieve a low carbon

economy (for example, banning fossil fuel cars by 2032, eight years earlier than other UK counter parts set for 2040) and deliver a greener Scotland with zero-waste. The objectives set at the heart of the Scottish government are aimed at achieving a natural environment, reducing local and global environmental impact and designing sustainable places for the future (Scottish Government 2018). Therefore, the field of sustainability and green issues remains a topical issue for the Scottish government and is worth researching.

In addition, the increasing concerns (Cuerva et al. 2014) aimed at the negative impact on the environment generated by businesses, the adoption of eco-innovations is considered an effective way for businesses to improve their environmental performance and still conduct their business in a safe, healthier environment (Diaz- Garcia et al. 2015). While eco-adoption may be gaining attention, there is limited evidence of the impact of its adoption among SMEs particularly the food and drink sector. The gap is identified from the reviewed literature and with the growing interest in the field of business sustainability, the on-going environmental green agenda and changes in policy and regulation, the researcher thought it might be more feasible to narrow the focus to the case of Scotland and assess how well the food and drink businesses within this geographical location were adopting eco-innovations. This seemed to make sense since the researcher would have better access to businesses around the location where the study was conducted, a location no less important than any other in the UK given the vital role played by Scottish food and drink businesses to the UK economy and globally.

Figure 4.1 illustrates the road map established for the research, the steps are: to select the topic to be investigated, conduct an extensive review of the literature to identify what has been covered within the research scope and areas pending, then clearly set out the research purpose, the aim and questions as this is linked to the choice of the design, then the choice of methodology as discussed within this chapter.

Figure 4.1: Research process map



Source: Author generated

The research questions were set based on a review of the literature (discussed in chapter 2, and 3) on SMEs characteristics, and eco-innovation models proposed for environmental management adoption and the challenges impacting implementation in SMEs. The next section will now discuss considerations used to define the purpose and questions set out by the research.

4.2. Research Purpose and Questions

Rowlands (2005) emphasized that the starting point in any research project is to understand the nature of the research problem that leads to the choice of an appropriate methodology. The researcher should be clear in their intent to conduct the research, i.e. its aim or purpose. The purpose of all research differs but generally research may seek to; describe (discover), explain (develop), explore (understand), or take action as part of the intention of the proposed study. There are three distinctive types of research namely: Descriptive Research, this focuses on "What? Who? and Where? questions. Explanatory Research, focuses on 'How and Why questions. Lastly, Exploratory Research focuses on 'What' questions (Yin 2003).

Descriptive research is undertaken for the purpose of producing accurate representation of persons, events, or situations (Saunders et al. 2009). It emphasizes the reporting and recording elements of situations and events. The explanatory research focuses on studying a situation in order to explain the causal relationship among variables existing within the object of study. Exploratory research aims to seek a new insight into phenomena, ask for more detailed levels of description with respect to the object of study, ask questions and assess the phenomena in a new light. This study draws mostly on elements of an Exploratory Research, seeking to gain insights into eco- adoption as a phenomenon and assess its adoption. To do this, the research had to set out the questions to be answered by the study.

Ritchie and Lewis (2003 p48) stress that research questions need to meet the following requirements:

- clear, intelligible and unambiguous
- focused, but not too narrow
- capable of being researched through data collection: not too abstract

- relevant and useful, whether to; policy, practice or the development of social theory
- informed by and connected to existing research or theory, but with the potential to make an original contribution or to fill a gap
- feasible, given the resources available
- of some interest to the researcher.

The research questions were developed bearing in mind the requirements noted by Ritchie and Lewis and to ensure the questions were in line with achieving the aim and purpose set out by this study "**To investigate the adoption of eco-innovations by Scottish food and drink SMEs**".

To address the research purpose in depth, the study was carried out in *three phases*. In the first stage, *an exploratory pilot research* was undertaken to identify the extent to which eco-innovations has been adopted by Scottish food and drink businesses. The second stage is an *exploratory study* to categorise eco-innovation adoption in the Scottish food and drink industry, using Rogers model of innovation adopters. The third stage was an in-depth investigation to determine the level of knowledge and understand their perspectives in the areas of importance, adoption, motivators and barriers to eco-innovations. This informed the classification of adopter types which was developed to enhance further understanding of how businesses have imbibed this environmental culture change towards going green.

This three stage multi-level approach was used throughout the study to explore **the adoption and diffusion of eco-innovations by Scottish food and drink SMEs** and used to answer the following sub- research questions:

Q1: How aware and informed are Scottish SMEs on the concept of eco-innovations?

The investigation of research question 1 was triggered by the literature review in chapter 2 suggesting a lack of awareness by SMEs in relation to eco- adoption; this was explored

within the pilot and further explored within the next two stages of the research. The knowledge awareness of the potential adopter is also considered by Rogers (2003) to be vital in the successful adoption of an innovation, as such the research felt it relevant to explore this further within the investigation.

Q2: What level of importance is accorded to the adoption of eco-innovations by the Scottish food and drink SMEs?

The investigation of Q1 led to Q2 as these two elements are considered relevant to the successful adoption of any innovation. The research felt it would be relevant to probe and explore the attitudes, beliefs and perception of eco- adoption by businesses as this would in turn reveal if and how important eco- adoption is, and what being “green” means to the businesses within the food and drink sector.

Q3: What are the motivators or barriers food and drink businesses experience in the adoption of eco-innovations?

Some factors relating to this question have been identified within the literature, and while the research takes into account these findings, it is also aware that change is constant especially for an ongoing issue such as eco- adoption, the factors that may be applicable within a study conducted 5- 10 years ago might not necessarily be the same issues today and in some cases where the same issues still exist it might be worth understanding why. For instance, the pressures from a variety of stakeholders including regulators, communities, shareholders, customers, employees, non-governmental organizations, and competitors concerning various natural environmental issues, still exist. The difference is that many aspects of these pressures have become even more pronounced. Part of these changes and increased awareness arose from economic and geopolitical forces that have caused organizations to further consider the importance of greening their industries (Sarkis et al. 2010). This makes it worth exploring and reconciling the empirical findings with that of the existing knowledge.

Q4: What forms of eco-innovation are adopted by the SMEs in the Scottish food and drink sector?

This question explores the different forms of eco-innovation found to be adopted by SMEs in the industry. Given the lack of a structure set of what constitutes a green or eco-management practices, this study has to take into account all forms of eco-innovations adopted by businesses that help to reduce the environmental impact. These forms of eco-innovations found are used to generate a category of eco-innovations adopted by the businesses in the food and drink industry.

Q5: What would a scale of greenness reflecting eco-innovation adoption comprise?

Through this question, the study draws from Rogers (2003) adopter category and seeks to illustrate eco-innovation adoption and generate a typology of eco-innovation adopter types based on their adoption of the categories created. The relevance of answering this question is that it sheds light on the extent of eco-innovation adoption as it applies to the businesses in the food and drink sector. It also seeks to identify and reveal key traits associated with eco-innovation adopters.

As stated earlier, the above questions were derived from scanning the literature in chapter 2 and the answers to these questions are mapped with the research findings and Rogers' framework (detailed in chapter 3) and used to generate a typology of eco-innovations adopters. The next section discusses the relevant research philosophies, approaches applicable to the study and the choice of methods applied by the research.

4.3 Research Design

The design of a research is vital to the identification of issues and planning to be carried out. Bryman and Bell (2007 p40) state "A Research design provides a framework for the

collection and analysis of data". It is also considered the blueprint of research dealing with at least four problems: what questions to study; what data is relevant; what data to collect; and how to analyse the results" (Yin 2003). Table 4.1. presents key philosophical classification assumptions to consider when planning the research design. Typically, a research will need to take a philosophical stance or position that will guide the nature of research to be conducted and the best approaches and strategies applicable to the chosen research paradigms (Denscombe 2002).

Table 4.1: The position of research design within the research process

Research Design					
Research Philosophy					
Epistemology			Ontology		
Constructionism			Objectivism		
Phenomenology (Interpretivism)			Positivism		
Research Approach					
Inductive			Deductive		
Research Strategy					
Qualitative			Quantitative		
Case study	Ethnography	Action Research	Survey	Grounded theory	Experiment
Data Collection Methods					
Interviews	Observation	Diary Records	Questionnaire	Archival Records	Documentation

Source: Saunders et al. 2009

Some researchers (e.g. Easterby-Smith et al. 2012) contend that ignoring the philosophical considerations during the process of research design can seriously affect research quality. To address this issue and to make an informed decision on the research design, the study has identified ontological and epistemological assumptions (as shown in table 4.1) and taken a position with the paradigms and approaches it considers most suited to the nature of study. The next sub-sections identify these approaches and associates them with the current study.

4.3.1 Research Epistemology

Crotty (1998) described epistemology as the way of understanding and explaining how we know what we know". Epistemology is concerned with providing a philosophical grounding for deciding what kinds of knowledge are possible and how we can ensure that they are both adequate and legitimate (Maynard 1994). Epistemology is the study of knowledge and is more concerned with identifying the origin of knowledge (Dawson 2002). This study establishes its interest in the study and knowledge of eco-innovation and eco-innovation adoption.

4.3.1.1 Constructionism

Constructionists perceive reality as if it is socially constructed (Saunders et al. 2009). Constructions exist in the mind of individuals and the role of the inquirer is to understand, reconstruct, analyse and critique participants' views in a way that leads to construct meaningful findings/outcomes (Denzin and Lincoln 1998). Shadish (1995) indicated that social constructionism refers to "constructing knowledge about reality, not constructing reality itself". This epistemology rejects the objectivists' perspective of knowledge (Crotty 1998) implying that both the subject and the object actively participate in the creation of the meaning.

In this sense, people tend to construct meaning in different ways even when looking at the same phenomenon (Crotty 1998). In other words, the constructionist paradigm is a

perspective that emphasizes how different stakeholders in social settings construct their beliefs (Schutt 2011). The aim of the researcher is to understand and reconstruct people's beliefs trying to reach a common consensus. Such constructions are open to new interpretations as information increases. Constructionism and phenomenology are interconnected in a way that one cannot be phenomenological and at the same time owe to objectivist or subjectivist epistemology (Crotty 1998).

This research takes constructionism as an epistemological stance because it allows for the study to engage in the social world and reality of Scottish food and drink SMEs and construct a reality on their adoption of eco-innovations as the phenomenon under study. All participants were actively engaged and studied to ensure a clear understanding of the impact of eco- adoption for the businesses.

4.3.1.2 Interpretivism

Social reality can be viewed as being constructed. It is "based on a constant process of interpretation and reinterpretation of the intentional, meaningful behaviour of people – including researchers*"* (Smith 1989 p.85). Thus, depiction and/or interpretation of the social inquiry is a constructive process and consequently the researcher cannot be isolated from the phenomenon investigated (Smith 1989). For interpretivists, the world is too complex to be reduced to a set of observable laws and generalizability is a less important issue than understanding the real conditions behind the reality (Gray 2013).

The main goal of the interpretivist is to understand the meaning of the social situation from the point of view of those who live it. The inquirer must interpret the event, understand the process of meaning construction and reveal what meanings are embodied in people's actions (Schwandt 1994). Apart from constructionism, it is important for the interpretivists to find out the subjective meanings or realities which stimulate people's actions in order to understand and make sense of these actions in a way that is meaningful for the research participants (Saunders et al. 2009). A researcher can perceive the data, which he has

collected with his own senses and interpreted it by his mind. So, any researcher cannot not be certain that he has realised the reality properly or that his understanding is more valid than others (Schutt 2011). Thus, there is not just one reality in the social world but researchers understand issues in different meanings (Rubin and Rubin 2011). Bearing this in mind, the study takes on this view of interpretivism.

By taking an interpretivist approach, this research focuses on the social and environmental reality of Scottish food and drink businesses, through in-depth engagement and discussion with the participants of this study, the study is able to understand and shed light on issues relating to eco-innovation adoption, the impact of adoption on these businesses and the overall implications towards enabling the achievement of a greener industry for SMEs and ultimately attaining a zero waste Scotland goal.

4.3.1.3 Phenomenology

There are many classifications of paradigms at the philosophical level existing in the literature. Meredith et al (1989) highlight the dimension that shapes the philosophical basis for research activity, rational and existential dimension. This dimension is concerned with the nature of reality and whether there is just one reality, which is logical and independent of the researcher, or whether the reality is subjective and socially constructed. For the same dimension, researchers have used alternative terms labelled positivist and phenomenological (Clough and Nutbrown 2002; Saunders et al. 2009; Easterby-Smith et al. 2012; Collis and Hussey 2013). Researchers in the past have used the term social constructivist and interpretivist interchangeably within phenomenological dimensions of research philosophy. For this research, the author focuses on two main research paradigms- Positivist and Phenomenology, as these two paradigms may be considered the two extremes of a continuum.

Positivism is concerned to uncover truths and facts using experimental or survey methods and have been challenged by phenomenologists who assert that these methods impose a

view of the world on the subject rather than capturing, describing and understanding these world views. The research problem undertaken by a phenomenologist does not involve examining facts to discover their underlying structure, but understanding a phenomenon from the viewpoint of the individual involved in its creation in accordance with their own language, representation, motives and intentions (Hirschman 1986). The researcher will be able to develop an inside understanding of the social realities by immersing himself or herself in the context.

Phenomenology is therefore "the study of lived, human phenomena within the everyday social contexts in which the phenomena occur from the perspective of those who experience them" (Titchen and Hobson 2005 p.121). It implies that people's experience of social reality provides a basis to understand the meaning of that reality. Hence, the researcher should work towards having new meanings and increasing his understanding of the phenomena from the social world (Gray 2013). The phenomenological approach focuses on exploring how human beings experience the phenomenon, i.e. how they perceive it; describe it; make sense of it. To reach such understanding, the researcher should conduct in-depth interviews with people who live with or have directly experienced the phenomenon (Patton 2005).

Titchen and Hobson (2005) identified two different approaches to looking at the phenomenon. Firstly, a direct approach, in which the phenomenon can be investigated by exploring human consciousness in a direct way, the researcher conducts interviews with the interested stakeholders to reach their experiences of the phenomenon. Secondly, an indirect approach, in which the observer gets into the social context of the phenomenon to live it personally with the participants in order to notice and identify the common meaning and practices. Phenomenology relies on personal experiences to explore and understand the existing issue. This inductive approach tries to find the internal logic of the subject (Gray 2013). Table 4.2 outlines the major differences between the positivist and phenomenological stances, as identified within the literature.

Phenomenology is a theoretical perspective that uses relatively unstructured data collection methods and follows an inductive approach for collecting data. It is characterised by the ability to discern issues that are not involved originally in the aim of the research. This perspective also has an advantage of generating thick descriptions of people's experiences or perspectives within their natural settings (Gray 2013).

Table 4.2 Paradigm positioning within research studies

	Phenomenology	**Positivist**
Basic beliefs	-The world is socially constructed and subjective -The observer is a party to what is being observed -Science is driven by human interests	-The world is external and objective -The Observer is independent Science is value free
The researcher should	-Focus on meaning -Try to understand what is happening -Construct theories and models from the data (inductive approach)	-Focus on facts -Locate causalities between variables -Formulate and test hypotheses (deductive approach)
Methods include	-Using multiple methods to establish different views of a phenomenon -Using small samples researched in depth or overtime -Qualitative methods	-Operationalising concepts so that they can be measured -Using large samples from which to generalise to the population. -Quantitative methods
Aim	-Discovery	-Discovery
Research goal	-Invention	-Discover and explain the structure of reality
Subject-object relationship	-Understand the significance people attach to social reality and their motivations and intentions	-Independent
Origin of knowledge	-Interactions	-Observation of reality

Validity of Knowledge	-Empathy	-Consistency with facts
Nature of research problem	-Consistency with experience	-Examination of the facts
Origin of research problem	-Development of an inside understanding of a phenomenon studied	-Identification of theoretical inadequacies for explaining or predicting reality
Research position	-Descriptive, inductive	-Prescriptive, causal deductive
Strengths	-Ability to understand people's meaning -Adjust to new ideas and issues as they emerge	-Wide coverage of the range of situations -Fast and economical
Limitations	-Needs great deal of time and resource -Difficult analysis and interpretation -Difficult to control pace, progress and endpoint	-Inflexible and artificial -Not effective in understanding processes

Sources: Easterby-Smith et al. 2012; Lincoln et al. 2011.

From the comparison shown in table 4.2 the assessment of phenomenological research differs from positivist theory assessment. Positivists seek rigour using statistical criteria and conceptions of reliability and validity to evaluate the quality of quantitative findings. Sample size, common methods bias and sampling error are common concerns. In contrast, the phenomenological tradition is assessed in terms of "trustworthiness criteria" including credibility, transferability, dependability and conformability and "authenticity criteria" including fairness and ontological, catalytic and tactical authenticity (Lincoln and Guba 2011). Positivism relies on cause and effect, similar to the natural world, which may exist quite independently of the people's belief (Denscombe 2002); whereas, in an interpretivism paradigm, the meaning is given by people (Easterby Smith et al. 2002). It is both the phenomena and the related context, as it is understood by the people, which are significantly important for this study, thus influencing the adoption of an interpretative approach. By

taking into consideration both the ontological and epistemological assumptions, the study posits that the interpretative paradigm holds stronger ground than the positivist paradigm and is more suited to the research questions addressed.

The understanding and impact of these paradigm or philosophical issues on the quality of management research is considered highly relevant (Amaratunga et al. 2001; Easterby-Smith et al. 2012; Collis and Hussey 2013). The understanding of philosophical issues is useful to clarify the research design (what, why, how questions; its interpretations; and data analysis); recognize the suitability of designs and their choices based on research questions; use and apply a design that may be outside the researcher's past experience (Easterby-Smith et al. 2012).

In this respect, the issues and impact of eco- adoption were treated as a phenomenon and investigated from the perspective of different food and drink businesses in Scotland. The phenomenon of eco- innovation adoption in food and drink businesses was investigated in a direct way using multiple-qualitative research methods to explore and understand people' experiences regarding the issues being investigated, these include: semi-structured interviews and document analysis. Using such qualitative methods allowed the research to interact effectively with the businesses and obtain in-depth views from different angles regarding eco- adoption by food and drink businesses. The information obtained from the data collection was then analysed and interpreted to find common perspectives from which a scale of greenness is formed and a conclusion drawn on the adoption of eco-innovations by the research participants.

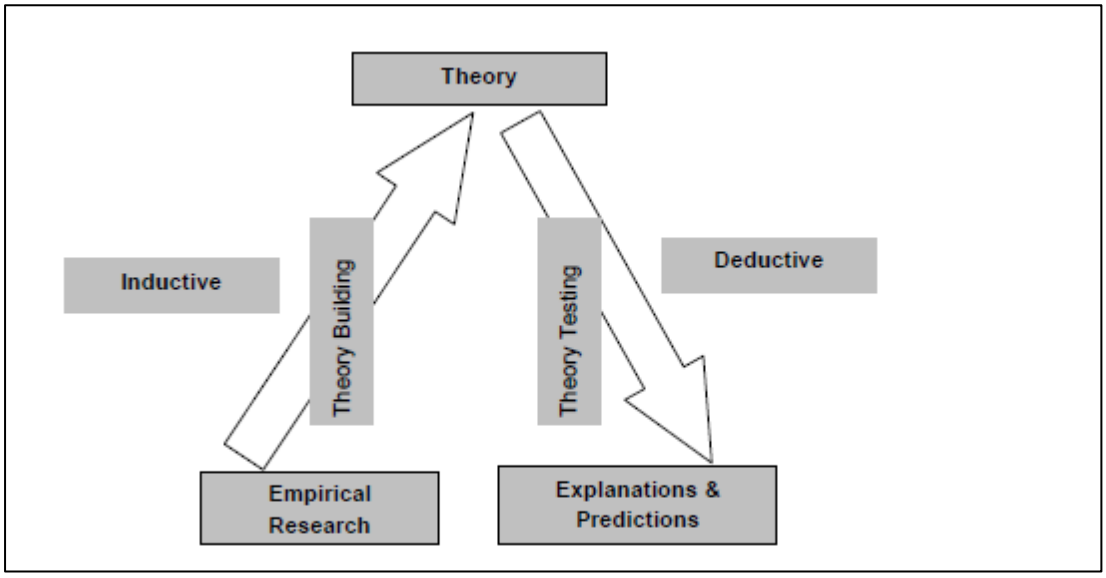
4.3.1.4 Inductive and Deductive Research

A researcher should explain clearly which approach is being followed in his or her research project. Therefore, it is important to classify the research approach in terms of whether it is inductive or deductive. Saunders et al. (2009) differentiated between these two types of the research design. First, the deductive approach, known as testing a theory, in which the

researcher develops a theory or hypotheses and designs a research strategy to test the formulated theory. Second, the inductive approach, known as building a theory, in which the researcher starts with collecting data to develop a theory.

As illustrated in figure 4.2. there are two alternative ways of working to which the production / testing of theory can be carried out: deductive approach and inductive approach (Ghauri and Gronhaug 2005; Saunders et al. 2009; Easterby-Smith et al. 2012; Denzin and Lincoln. 2011).

Figure 4.2. Illustration on inductive and deductive research approaches



Source: Kumar 2010.

The current study is structured using inductive research design. Saunders et al. (2009) noted that the inductive approach gives the chance of having more explanation of what is going on. The research process started by exploring and collecting the data from different sources and by using multiple sources of evidence: semi-structured interviews and various document analysis to develop a model for greenness in Scottish food and drink SMEs. The secondary sources of data used in this research, involved the reviewing previous studies, reports, and documents on Scottish food and drink businesses, while primary data was collected by interviewing the owner/manager of businesses in Scotland. Easterby-Smith et al. (2012) and Gray (2013) indicated that qualitative research is often associated with inductive research

designs in which a range of methods are used to collect the data and explore the problem from different perspectives.

4.3.1.5. Research Strategies

Research strategy refers to a general orientation to the conduct of business research (Bryman and Bell 2007 p28). Research strategy is a systematic and orderly approach taken to the collection and analysis of data so that information can be obtained to answer the research questions posed by the researcher (Jankowicz 2005). Research strategy is classified at two levels- level 1 takes into consideration the quantitative and qualitative research (Bryman and Bell 2007); and level 2 forms the distinctive cluster of strategies such as experiments, survey, case study, ethnography, grounded theory and action research (Saunders et al. 2009).

The decision to choose a specific methodology should be based on its suitability to answer the questions set out by the research (Bryman, 2003). Qualitative research stresses social meaning and the relationship between the researcher and the topic of research. Quantitative research on the other hand measures and analyzes causal relationships between variables (Denzin and Lincoln 2011). The approaches differ basically in terms of: their analytical objectives; types of questions posed; types of data collection methods used; types of data produced; degree of flexibility in study design (Mack et al. 2005). Qualitative research is an interpretative approach concerned with understanding the meaning people give to the phenomena within their social setting.

Snape and Spencer (2003) outlined key elements which distinguish the qualitative approach, among these is the approach which provides a deeper understanding of the social world; it is based on a small-scale sample; it uses interactive data collection methods, i.e. interviews; it allows new issues and concepts to be explored. While quantitative research follows the positivist paradigm (Easterby-Smith et al. 2012) and refers to the measures and count of things. Techniques to ensure this include randomization, blinding, highly structured

protocols, and written or orally administered questionnaires with a limited range of predetermined responses. Sample sizes are much larger than those used in qualitative research so that statistical methods to ensure that samples are representative can be used (Carey 1993). A summary of the differences between both approaches is presented in table 4.3.

Table 4.3: Qualitative and Quantitative Approaches.

Attributes	**Qualitative**	**Quantitative**
Theoretical orientation	Generation of theory (Inductive)	Testing of theory (deductive)
Epistemological orientation	Phenomenological	Positivism
Ontological orientation	Subjective (Constructivism)	Objectivism
Framework	Explore phenomenon Flexible style, instruments of data collection; interviews, observations, focus groups, documents	Confirms hypotheses on phenomenon, Rigid style, Structured instruments of data collection; experiments, questionnaires, surveys
Objective and focus	Describe, understand and Interpret; relationships, variations, experiences, norms	Quantify, predict and describe: variation, casual relationships
Data and Questions	Non-statistical, textual, verbal Open-ended	Statistical, Closed-ended
Sample	Small	Large
Analysis	Interpret data, descriptive analysis	Statistical analysis and techniques

Sources: Mack et al. 2005; Creswell et al. 2007; Bryman and Bell 2007.

The research adopts a qualitative method for the study, to enable an in-depth approach to investigate the adoption of eco-innovations by Scottish food and drink SMEs. Qualitative research studies have been noted to seek to illuminate, comprehend and explore situations,

without manipulating the phenomenon of interest (Carter and Easton 2011).

4.4 Research Methods Applied in the Field of Study

SMEs make a significant group of businesses since that they constitute the majority in terms of the number of businesses, total number of employees and total turnover. Research into environmental activities of SMEs adoption of eco-innovations are limited as the primary focus is placed on environmental activities of larger businesses (Lewis et al. 2015). With this area still being an emerging field of study, most research has been quantitative in nature and focused on describing SMEs environmental activities and looking for overall trends. Far fewer studies have focused on uncovering the motivations in detail for SMEs to undertake activities to reduce their environmental activities (Revell and Blackburn 2007) and advocates more qualitative based studies to balance out existing research in the field. This thinking has further influenced the decision to adopt qualitative methods for this research study. The study takes into account a review of key studies undertaken in this field and evaluates the methodological approaches utilised by the existing study and how this relates to the current study.

This review identified studies relevant to the research scope conducted over the last two, the methodological approaches adopted within these studies are noted and highlighted in table 4.4 below:

Table 4.4 Methodological approaches with eco- adoption literature

Author and Year	**Title**	**Methodology / Methods**
Hillary 2004	Environmental management systems and the smaller enterprise	Qualitative survey Literature review Focus: SMEs within 12 EU member states
Gadenne et al. 2009	An Empirical Study of Environmental Awareness and Practices in SMEs	Quantitative: questionnaire Focus: Australian SMEs
Revell et al. 2010	Small Businesses and the Environment: Turning over a new leaf?	Mixed: questionnaires and interviews Focus: small firms in London
Brammer et al. 2012	Environmental Management in SMEs in the UK: Practices, Pressures and Perceived Benefits	Quantitative survey Focus: multiple industries: metal, mining etc
Wilson et al. 2012	An Evaluation of the Impact and Effectiveness of Environmental Legislation in Small and Medium-Sized Enterprises: Experiences from the UK	Qualitative Interviews Focus: SMEs North west England (multiple sectors)
Kasim and Ismail 2012	Environmentally friendly practices among restaurants: drivers and barriers to change	Quantitative: questionnaire survey, Likert scale Focus: Restaurants in Malaysia
Triguero et al 2013	Drivers of different types of eco-innovation in European SMEs	Quantitative survey Focus: SMEs within 27 EU member states
Ormazabal et al. 2015	Evolutionary Pathways of Environmental Management in UK Companies	Mixed: survey and semi-structured interviews Focus: multiple sectors: Building, financial, plastic etc
Graafland and Smid 2015	Environmental Impacts of SMEs and the Effects of Formal Management Tools: Evidence from EU's Largest Survey	Quantitative Survey Focus: SMEs from 12 EU

		countries
Sainidis et al. 2016	Environmental turbulence: impact on UK SMEs' manufacturing priorities	Mixed: survey and interviews Focus: Manufacturing SMEs

Source: Author generated

The review of literature in Chapter 2 on green environmental management demonstrates that some research has been undertaken in this area but existing research on green implementation has mainly covered three general aspects namely drivers and barriers, impacts and legislations e.g.: (1) Drivers and Barriers of Environmental Reform (Hillary 2000; Drake et al. 2004; Revell 2007; Gadenne 2009; Revell et al. 2010). (2) Environmental Impacts of SMEs (Schaper 2002; Hillary 2000). (3) Evaluation of Environmental Legislation in SMEs (Baldwin 2004; Wilson et al. 2012) and (4) SME Engagement in Environmental Activities (Revell et al. 2010; Cassells and Lewis 2011; Brammer et al. 2012).

However, while this serves as a good basis for understanding SMEs and green management, the findings from most of these studies cannot be generalised, as noted by Hillary (2004), "*The SME sector is not a homogenous sector. It is diverse and heterogeneous. Studies which seek to investigate the sector and draw conclusions about it, are to some extent, comparing not just apples and pears, but the whole fruit bowl…. It is recommended that future research consider parts of the sector either as sub-groups by size, i.e. micro, small and medium, or by industrial sector".* The study considers SMEs and narrows the focus to the food and drink industrial sector as recommended by Hillary.

This study has found that there are limited research efforts evident in the case of Scottish SMEs and particularly the food and drink sector, a sector that generates a high amount of waste 10million tonnes (WRAP 2017) which has a negative impact on the environment. Therefore, this study took an approach that draws on the established findings from existing research while exploring the case of the food and drink sector. The results of past studies

indicate that there is a growing awareness of environmental issues in the SME population and many businesses need help to imbibe the green culture. It therefore seems timely to investigate whether the growing trend for 'clean and green' in the UK, especially for Scotland is now sufficiently strong to overcome the considerable barriers to environmental reform experienced by SMEs.

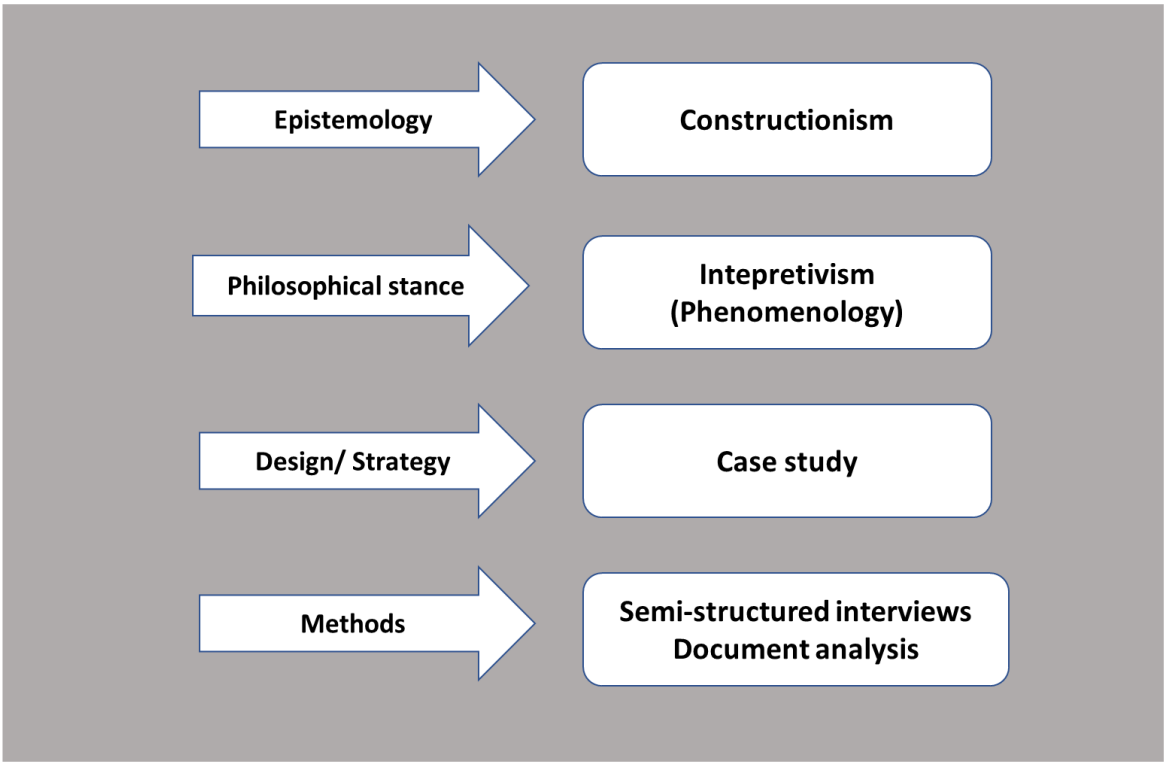
The limitations of certain methods were taken into consideration when deciding on the how best to investigate the set research questions. The study contemplated using surveys at some point as this approach is considered useful when dealing with large numbers. However, due to the low response rate (Meritt 1998) associated with questionnaire surveys particularly in the field of study and a general tendency for respondents of surveys to overstate their concern and interest in environmental surveys as a means of being seen as environmentally conscious (Davies et al. 2002), the study avoided this and decided to adopt approaches that would portray the actual state and trends of eco- adoption initiatives within the industry.

Following the decision not to adopt the use of surveys, a qualitative approach was considered a more viable option to investigate the research and achieve the aim of the study, especially since the area of focus was particularly lacking in qualitative studies. The researcher decided this would offer a deeper understanding of the eco- adoption issues investigated within the study, consideration was also given to the fact that a good amount of environmental literature deploys the use of quantitative methods and the outcomes generally tend to lack deeper theoretical analyses (Blackburn and Stokes 2000). The qualitative approach has enabled the research questions to be answered by providing a broad and robust picture of the actual conditions surrounding eco- adoption initiatives in Scottish food and drink SMEs. Qualitative research is distinguished as a highly-contextual approach where data is gathered over long periods and in natural real-life settings (Gray 2013; Creswell 2013). It can answer how and why questions rather than giving a brief view of the phenomenon studied.

4.4.1 The Research Approach

Studies of methodologies distinguish research approaches beyond the use of qualitative and quantitative approaches; for instance, Crotty (1998) asserted that research should distinguish epistemological and theoretical perspectives in that a researcher could not claim to be both objectivist and constructionist at the same time. As a general guide, this research uses the Crotty (1998) approach to assert the position of this research. The study takes on the views, perspectives and beliefs of small and medium sized business owners within the Scottish food and drink industry regarding green issues and their adoption of eco-innovations into their business activities. The study follows a path through constructionism – interpretivism (phenomenology) as the philosophical ground, adopts a case study as the strategy, using qualitative techniques and investigates the research with the use of multiple methods of semi-structured interviews and document analysis (see Figure 4.3).

Figure 4.3 Research Approach Adopted



Source: Author generated

4.4.2 Research Methods

Crotty (1998 p.3) defined research methodology as: *The strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes*. The choice of the research methodology is influenced by the researcher's theoretical perspective and also his attitude towards the ways in which the data will be used i.e. a deductive or inductive approach (Gray 2013). It should also explain the rationale behind the selection of the methods adopted (Crotty 1998). The methodology adopted by the study draws on the design of a case study. This is a form of qualitative research design that focuses on issues with individual cases, as it builds on a detailed understanding of the case through multiple sources of information such as interviews, documents, reports and observation. It uses an analytical approach to give a detailed description of the case; the setting of the case and the presentation of the data may be in chronological order or not (Yin 2003).

The justifications for the selection of case study methodology and the research methods are explained in detail in the following sub-sections. The objectives set at the various stages of the research study along with the procedures and the methods used to fulfil such objectives are summarised in figure 4.3 and table 4.5.

Table 4.5: Research Stages

	Stage 1	**Stage 2**	**Stage 3**
Aim	Exploratory pilot	Identify the forms of eco-innovation activities	Explore attitudes of SMEs regarding eco- adoption, its impact and issues
Objectives	Scan the food and drink scene to get a view on eco-innovation status	Generate list of eco-innovations that informs the scale of greenness	Understand attitudes, perception, motivators and barriers to eco-adoption

Procedure	Exploratory interviews for general understanding of eco- adoption	Conduct document analysis on information listed on websites relating to eco-innovations	Engage food and drink businesses on their committed to eco-innovation adoption Conduct one to one interviews with businesses Develop a model on the scale of greenness using best practices within the industry
Methods	Semi-structured Interviews	Web Content Analysis	Semi-structured Interviews

Source: Author generated

Case study is viewed as a methodology (Yin 2003; Crewell et al. 2007; Denzin and Lincoln 2011), an inquiry strategy, a comprehensive research strategy (Merriam 1998), an object of study and is further noted to have a long-distinguished history across diverse disciplines, with popularity in science studies, law and social sciences (Creswell et al. 2007). Qualitative case studies differ and can be classified by the size of the case; this could be an individual case, multiple individuals, a group, an activity, a process etc. In the case of this research, document analysis and semi-structured in-depth interviews were used to collect data. Qualitative methods seek to understand what happens in practice (Hammersley 1993), they are well suited to uncover areas to be investigated, in this study i.e. the adoption of eco-innovations by these companies.

4.5 Data Collection

A number of stages were followed to develop the case studies and gather data and these are described below as pilot, web and interviews in the following sections.

4.5.1 Pilot study- Stage 1

An exploratory pilot study was conducted using interviews to gain insights into the Scottish food and drink industry, with the main aim of assessing the general perception of eco-innovations by the businesses within the industry. The pilot was considered a good way to build the confidence of the researcher in dealing with respondents, pre-test the interview questions, and identify challenges that may arise in answering the questions and also to determine the suitability in the context of the research questions and objective.

In order to increase the interest and the likelihood of participation from food and drink businesses, a copy of the research overview was published in the e-news segments of the Aberdeen and Grampian Chamber of Commerce, requesting an interview from members. Likewise, the researcher set-up a twitter account used to tweet and also followed the potential food and drink businesses to be interviewed. The social network engine served as a useful channel for keeping the researcher informed of the activities of food and drink companies and also to make contact and interview requests.

A total of 6 Scottish food and drink businesses made contact and were interviewed for the pilot study. Prior to the interview, an overview of the research and an electronic copy of the interview question guide was emailed to respondents. The interviews were digitally recorded and transcribed by the researcher. The data was further analysed by adopting a theoretical framework approach of identifying key themes of interest, grouping the similarities and dissimilarities and carrying out a comparison between the findings and existing literature. A summary of the profile of participants from the pilot is presented in table 4.6.

Table 4.6: Summary of Pilot study participants

Characteristics	**Company A**	**Company B**	**Company C**	**Company D**	**Company E**	**Company F**
Type	Bar and Restaurant	Bar	Meat, Game and Poultry production	Bar and Restaurant	Alcoholic Beverages production	Organic Fruit and Vegetable Farm
Employees	40	5	2	13	5	7
Annual turnover	450- 500K	350-450K	100-200K	200-300K	250-350K	100-200K
Eco-innovations adopted	Recycling	Recycling	Recycling	- Recycling -Low food miles -Supplier selection	-Product redesign, -Low energy equipment	-Recycling -Low logistics miles
Location	Aberdeen	Aberdeen	Shetland	Aberdeen	Glasgow	Edinburgh

Source: Author generated

The table in 4.6. highlights the general characteristics such as business type, employee and annual turnover the 6 businesses interviewed at the pilot stage. Most importantly it also presents evidence of some form of eco-innovation which has been adopted by the businesses. All participants for the pilot were businesses based in Scotland. The aim and purpose of the pilot study were met and the information obtained was used to inform the next stage of data collection. Other benefits from conducting the pilot include:

1. It provided a starting point for engagement with food and drink SMEs on eco-adoption.

2. The pilot helped refine the study approach, and identify areas worth investigating.

3. It helped identify challenges that may be encountered when conducting interviews.

4. It provided an opportunity for practicing how best to use probes and prompts, improving the research skills of the researcher.

4.5.2 Web Data - Stage 2

To achieve the fifth objective, i.e. “Generate a scale of greenness based on the forms of eco-innovations adopted by Scottish food and drink SMEs”, as set out by this study identified in Chapter 1, the study was required to establish a scale set of eco-innovations applicable to the food and drink industry. Therefore, a robust survey of web-based documents and content was conducted on websites of North East food and drink businesses to establish a list of eco-innovations within the industry. The study obtained contact information from the database called “North East Scotland Finest” and populated the information onto an Excel spreadsheet to be sorted and organised for data to be gathered in an orderly form.

Table 4.7: Summary breakdown of businesses listed on database

Total No of Companies on Database	201
Closed (Dissolved) Companies	13
NA or Relocated out of North East	10
No URL	57
No Adoption Evidence	69
Adoption Evidence	**52**

Source: Author generated

The database comprised a total of 201 businesses registered, out of which 13 of the businesses were closed, 10 of the businesses were no longer based in the North East of Scotland, 57 of the businesses had no active url link, therefore no visit could be made to the website, 69 had active links but no evidence of eco-innovation adoption was stated on the site, this left the research with a final number of 52 active businesses with evidence of some form of eco-innovation adoption.

Web based visits were made to all 52 food and drink businesses identified to be adopting some form of eco-innovation, the researcher spent some time reviewing the content

available on each individual site and the information was collated into a spreadsheet for subsequent analysis. The findings from the web data are presented within Chapter 5.

Much thought and consideration was put into this phase of the research to ensure the data was analysed and presented properly. Categories and themes were generated from the data collected from the websites, as the content analysis of progressed, sub-themes were created under main themes based on the relevance. The websites were revisited to ensure the research had not missed any relevant information relating to eco- adoption by the businesses. For profiling and characterisation of the businesses, the research had to obtain information such as the annual turnover of the business and number of employees by looking up the individual companies return at Company's house UK, as this sort of information is not readily available on the website.

A content analysis technique was applied to identify themes from the data, these were then listed under each web participant heading and managed in relation to its source and context. The themes and categories identified were also linked to a code sheet to ensure the businesses stayed anonymous. The data obtained from the website businesses was summarised to identify what form of eco-innovation they had adopted and in some cases where the company posted a statement or policy relating to eco- adoption and sustainability this was also noted down and classed under a theme e.g. Green policy. A range of eco-categories and sub-categories were established, the study populated the information using a content analysis per case to identify the forms of adoption applicable to each of the 52 businesses. The findings of the data obtained at this stage are presented in chapter 5. The aim and purpose of the web-data stage were met and the information obtained was used to inform the next stage of data collection. Key benefits from conducting this stage include:

1. It enabled the researcher to establish a range of eco-innovation applicable to the food and drink sector
2. By studying the forms of eco-innovations adopted by the businesses on their

websites, the researcher gained some insights into the businesses understanding and commitments to environmental issues, which also helped the researcher in the design of the questions for the interview stage.

3. It also provided the researcher with specific probes and follow-up questions for the businesses to be interviewed on their adoption of eco-innovations.
4. Finally, by conducting the web-data the researcher was able to generate the typology of the forms of eco-innovation, which was then applied within the next stage (interviews) to create the scale of greenness.

4.5.3 Interviews - Stage 3

Stage 3 was classed as the final stage for data collection and the technique adopted was semi-structured in-depth interviews. Due to the continuous rise of new businesses (and closure of existing ones), it can be difficult to gain a comprehensive database of active businesses, therefore a web-search was conducted and a list of all existing Scottish food and drink businesses was compiled from the directory of the Scottish Food and Drink Federation (SFDF), Chambers of Commerce and the Taste of Grampian totalling 890 businesses. The contact information was combined into one master data contact sheet, and the information was filtered to eliminate closed-down businesses and to ensure the contact on the list fitted the selection criteria set out by the study as follows:

- Fits the definition of an SME recognised by the research
- Operates within Food and Drink Industry
- Business base in Scotland (North-East)

The list was filtered down to a total of 150 businesses based in the North of Scotland and suitable to be interviewed. The researcher reached out to likely participants by email requests and follow-up phone calls. Unfortunately, as is the case with most studies relating to SMEs and how they respond to participating in research, the study experienced difficulties

and delays when it attempted to recruit participants. While some of the contacts either requested to be contacted at a later date (and never committed to an interview), some turned down the request and some never responded to the interview requests. After a few months of failed attempts in trying to recruit participants from the industry, the study decided to adopt going through the help of a contact of the primary Supervisor, Mary Holland from the Chamber of Commerce. Therefore, a convenience sampling approach was adopted by the research to increase the turnout of participants for the research, with the assistance of Mary Holland. Direct requests were sent to food and drink businesses via the chambers' mailing list and newsletter. In total, 18 businesses all located within the North-East of Scotland indicated an interest and were interviewed for the research.

4.6 Data Collection Technique

The interviews were semi-structured, this was found appropriate due to the individual nature of the respondent firms and the potential of this method to generate rich data for the research to explore as each interview progressed. Semi- structured interviews are deemed flexible as they allow interviewees to expand on the topic they consider important and to discuss issues they consider relevant which can open up new lines of enquiry (Yin 2003).

Interview topics and questions include details of the company, annual income, knowledge and awareness of eco-innovations, decisions to foster such initiatives, existing initiatives carried out by the company, drivers and barriers to such eco-innovations. A summary of the themes explored during the interviews is presented in Table 4.8.

Table 4.8: Summary Interview Protocol

Themes	**Topics Explored during Interview**	**Link to Research Question**
Demographics	-Type/ Location of firm/ -Age/Turnover/ Size/ -Products/ Business Role	General introduction and business characterisation
Awareness-knowledge of eco-innovation	-Meaning of green -Perception and understanding of eco-innovation	RQ1
Understanding importance of eco-innovation adoption in F&D SMEs	-Relevance of adoption of eco-innovation and business environmental impacts	RQ2
Forms of eco-innovation adoption undertaken	-Eco-innovations adopted evidenced by activity, policy, partnerships etc	RQ3
Motivators and Barriers to eco-innovation adoption	-Perceived attributes of eco-innovation -Facilitators/Challenges/Impediments	RQ4

Source: Author generated

The summarised interview protocol guide in table 4.8 reflects how the research structured the questions to focus mainly around 4 key areas of the research. While every interview was unique and different in its own way, the questioning format was semi-structured in nature, the protocol was considered handy as it was used so as to ensure that the discussions with the participants was kept in focus of the research. This was particularly useful when in need of a prompt and follow-up on statements made by the participants on green issues.

At the point of conducting the interview, participants were presented with an information sheet, that confirmed the nature of the research, the interview process, and all participants were assured that their details would be anonymised with the findings. For copy of participant information sheet, Interview protocol guide and interview design sheet (see

appendix I, III and IV). A consent form was also presented to each participant prior to the interview to ensure the participant had a clear idea of the process (see appendix III).

Of the eighteen semi-structured interviews conducted most lasted between 60-90 minutes. The interviews were with owner-managers involved in managing the environmental procedures of the business. All interviews were conducted at the participant's business sites and allowed the research to make observations on behaviours and where available request copies of reports, green marketing materials and relevant credentials relating to the adoption of eco-innovation. The next section will explain how the information gathered from the eighteen respondents was managed.

4.6.1 Data Management

To avoid the risk of losing data or relevant information that can occur from taking notes during an interview, the researcher decided to record all interviews using a dictaphone. The interviews were transcribed prior to the next scheduled interviews; this was done to enable the researcher to probe on new issues or possible issues raised during previous interviews to see if there were commonalities shared by the respondents.

The use of software packages such as NVIVO, NUD.IST, CAQDAS are popularly used within research for coding, generating patterns from large amount of narrative texts collected from open-ended interview or from historic documents (Yin, 2003). NVivo is a qualitative data analysis software which was used to manage data. The researcher attended a training course on how to manage qualitative data effectively using Nvivo, to gain a proper understanding and use of the software capabilities. This data management tool was extremely useful as it offers a transcribing feature that allowed the interviews to be imported and transcribed within Nvivo in a timely manner. The transcriptions were also verbatim, to allow for proper capture of the participant views without distortion or research misinterpretation of meaning. Nvivo also allows for the transcribed data to be effectively organised, managed and analysed within the same file base. Therefore, the data was also

analysed within Nvivo (see appendix VI for overview of analysis nodes from Nvivo), details of analysis will be discussed in the next section.

4.6.2 Data Analysis

Conducting an analysis of a large amount of interview data can be burdensome and is probably the biggest challenge of qualitative research (Yin 2003). The researcher contemplated on how best to condense the rich data and present the findings in a manner that the reader and audience could best understand. Miles et al. (2013) provided guidelines for qualitative data analysis and suggested techniques for data presentation and conducting research analysis. Their proposed methods are frequently used by qualitative researchers for data analysis. The study applies the three steps proposed by Miles et al. (2013) to analyse the data gathered from the 18 food and drink businesses. The stages are briefly presented below.

1. **Data Condensation**

This is the first step in analysing qualitative data. This process requires the researcher to select, simplify, organise and transform the data in the form of field notes, interview transcripts, documents etc. Condensation is considered part of the analysis process because it entails activities such as written summaries, coding, theme development, generating categories and writing analytic memos (Miles et al. 2013). For the purpose of this study, the research generated summaries of each case interview based on a systematic format of themes identified in the interview protocol. This was done after transcription of each interview conducted per company visit to maintain consistency and ease of information management

2. **Data Display**

Miles et al. (2013 p.12) define display as *"*an organized compressed assembly of information that allows conclusion drawing and action". They also suggest methods of data display such

as the use of charts, matrixes, tables, grid and networks. Matrixes and tables were used as data display techniques to present the qualitative data collected in this phase of research. For more information on data display technique, refer to Chapter 6 on interview findings. One key benefit of carrying out a data display is that it helps the research better understand what is happening within the study, which can result in drawing a conclusion or digging deeper for further understanding based on the information on display.

3. Data Verification and Conclusions

This is the final stage of the analysis technique recommended by Miles et al. (2013). Data verification could be experienced during writing or reflection on fieldnotes and is based on the meanings and interpretations ascribed to the emerging data. Within the detailed summaries applied within this research, the study was able to familiarise itself with the identification of key themes and findings from emerging data, this was used to compare participants' views for similar and contrasting views. Final conclusions were drawn up once no new idea or information was identified within the data being analysed and this also established a point of data saturation and allowed the research to write up the final conclusions of the findings.

4.7 Summary

This chapter reviewed the research from a process perspective by breaking down the doctoral research into a list of activities that are undertaken in the eight chapters of the dissertation. The research takes on phenomenology and an interpretivist approach to focus on the social and environmental reality of the adoption of eco-innovation by Scottish food and drink businesses.

A three-stage approach was used to collect and assess the data namely the pilot, the web documents and the interviews. This gave a broad-based view of what the real situation is with eco-innovations awareness, forms of eco-innovation and barriers to adoption within the

Scottish food and drink industry.

The Researcher undertook training in Nvivo data management techniques allowing the use of the software to manage data at the collection phase of this research and also a dictaphone was used for recording during face to face interviews. These tools helped to greatly improve data quality (see appendix V for summary of Nvivo auto coded responses, a technique applied to manage and condense the data collected).

The researcher followed a three-step data analysis process as recommended by Miles et al. (2013) to condense, display and verify the data sets to enable the identification of data saturation point, clear data analysis and draw useful conclusions.

CHAPTER FIVE- WEB BASED DATA FINDINGS

5.1. Introduction

This chapter provides the findings of the web based study conducted on the websites of fifty-two (52) North-East Food and Drink businesses. The data was collected from the data base called “North East Scotland Finest Food”, and consisted of a total of 201 businesses, a summary of the list obtained from the database is provided in table 4.7 in Chapter 4 where the data collection is also discussed in detail. Out of the 201 businesses found, the study sought to identify businesses engaged in some form of eco-innovation adoption and upon review of the content of the businesses from the online repository, (52) fifty-two North East Scottish businesses emerged as adopters of eco-innovations, the data was collected on the form of eco-innovations adopted by the various businesses and analysed to generate the eco-innovation categories which was also included within the analysis of the study.

This web-site analysis was exploratory in nature, with the aim of exploring and seeking to understand the adoption of eco-innovations by Scottish food and drink businesses. Therefore, the primary focus of this chapter is to present the findings of the contents found from the website data which represents the views of these fifty-two businesses. It captures the forms of eco- innovation adoption applicable to the businesses within the industry, identifies the extent of adoption by the businesses and emerges in the categorization of eco-innovations adoption, which is used as a framework for analysing the participants within chapter 6 (i.e. interviews).

5.2 Profile and Demographics of Web Businesses

To provide a general overview of the profile of businesses explored within this website analysis, this section presents the key characteristics of the web-respondents, and is split

into four main aspects namely; Business size, Annual turnover, Type of businesses and Location of the businesses. Table 5.1. gives an overview of the 52 websites analysed.

Table 5.1: Overview of Business websites

Website Code	**Type**	**Year Business started**	**No of Employees**
WB1	Fish processing	1987	4
WB2	Organic Farm (Veg)	1980	5
WB3	Ice- cream manufacturer	1954	42
WB4	Oil Producers (rapseed)	2012	10
WB5	Coffee supplier	2007	3
WB6	Primary Shellfish Producer	2010	6
WB7	Potato crisp producer	2009	5
WB8	Bar and Restaurant	2006	28
WB9	Restaurant (Bakery and shop)	2013	2
WB10	Organic farm (Fruit & Veg)	1991	2
WB11	Organic farm (Fruit & Veg)	2006	3
WB12	Organic farm	1981	3
WB13	Organic Farm	2005	2
WB14	Organic Farm	2002	8
WB15	Brewery	2006	200
WB16	Drinks Producer (fruit wine)	1987	3
WB17	Primary fish Producer	2003	4
WB18	Primary fish Producer	1977	44
WB19	Mixed Game Farm	2000	4
WB20	Cattle Farm	1996	3
WB21	Meat and Game Smoker	1980	8

WB22	Shop (online local food store)	2000	3
WB23	Salmon Smoker	1988	4
WB24	Bakery and Mill	2004	8
WB25	Food Preserves	2010	3
WB26	Dairy Farm (Organic)	2013	7
WB27	Fish Producer	1997	10
WB28	Fish Producer	2005	7
WB29	Fish Producer	1995	2
WB30	Organic farm (Fruit & Veg)	1992	1
WB31	Farm shop	2009	8
WB32	Farm (Fruit & Veg)	1920	2
WB33	Organic farm (Veg)	1997	2
WB34	Fruit Farm	2010	3
WB35	Farm (Fruit & Veg)	2001	1
WB36	Organic farm (Veg)	2013	1
WB37	Farm (Veg)	2009	2
WB38	Farm (Fruit & Veg)	2012	5
WB39	Farm (Veg)	2007	2
WB40	Lodging and Restaurant	2004	3
WB41	Buffalo Farm	2004	6
WB42	Cattle Farm	1998	4
WB43	Butcher and Game Supplier	1986	10
WB44	Butcher and Game Supplier	2006	4
WB45	Snack Producer (Beef jerky)	2002	5
WB46	Cattle Farm	2012	2
WB47	Game Farm and shop	2004	1
WB48	Retail and wholesale Butcher (Meat)	2003	2

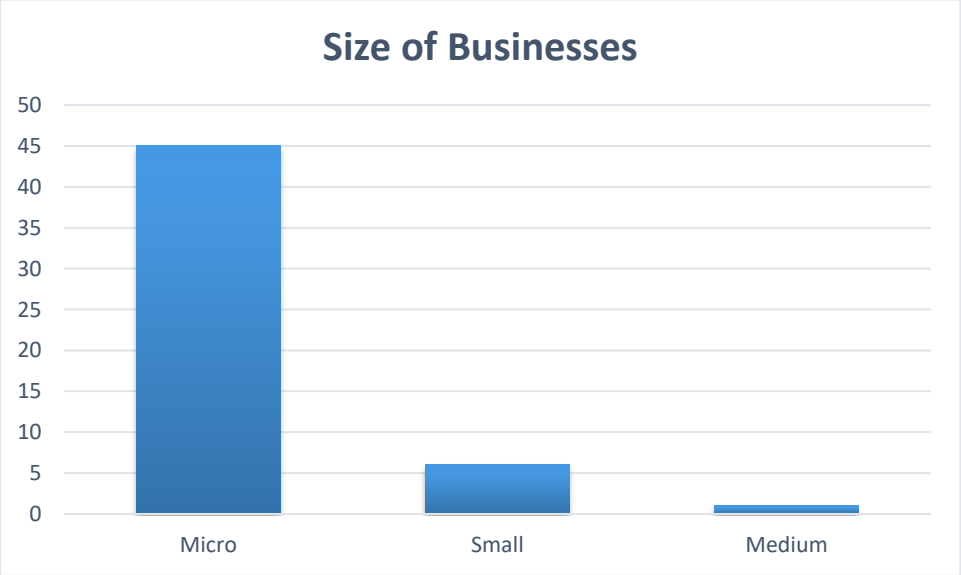
WB49	Organic Farm and Butchery	2006	5
WB50	Preserves Producer	2013	1
WB51	Herb Garden Supplier	2006	1
WB52	Oil Producer (Rapseed)	2008	1

Source: Author generated

5.2.1 Business Size

The data showed the majority of the businesses to be micro-sized with a total of (45) forty-five businesses with less than nine employees. A smaller number of (6) six fell within the small businesses, this group was distinguished by businesses that have between ten to forty-nine employees. The last group represented within the findings had the smallest number with (1) one business, having over fifty-plus employees and classed as a medium sized business. The figure 5.1 illustrates the classes of businesses represented within the finding of the study.

Figure 5.1: Size of Businesses by number of Employees

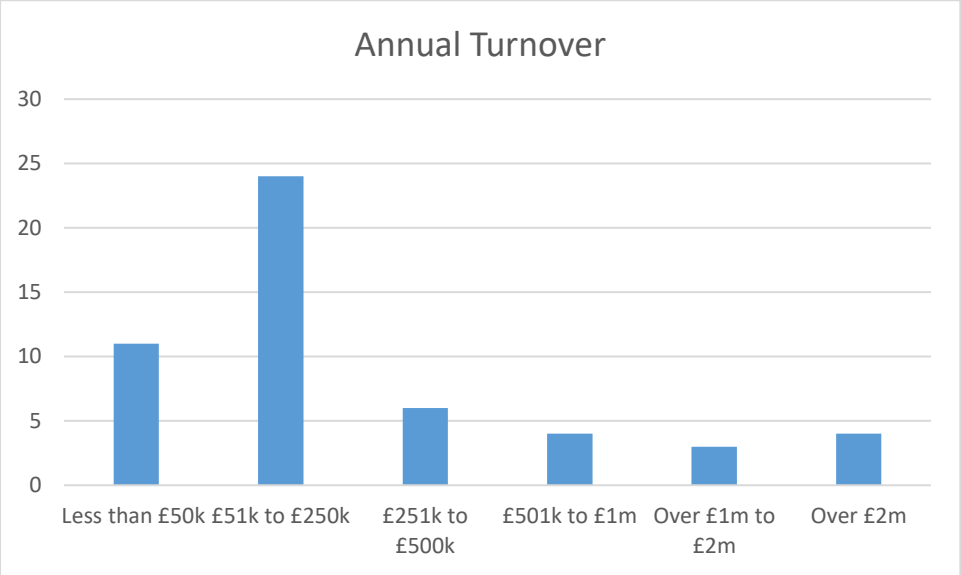


Source: Author generated

5.2.2 Business Turnover

A look at the turnover of the businesses showed a range from £10,000- over £2m annually. The distribution of turnover was split into groups to establish a classification of the businesses based on their earnings as shown in figure 5.2. The majority of businesses fell in the range of earnings between £51k to £250k.

Figure 5.2: Annual Turnover of Businesses



Source: Author generated

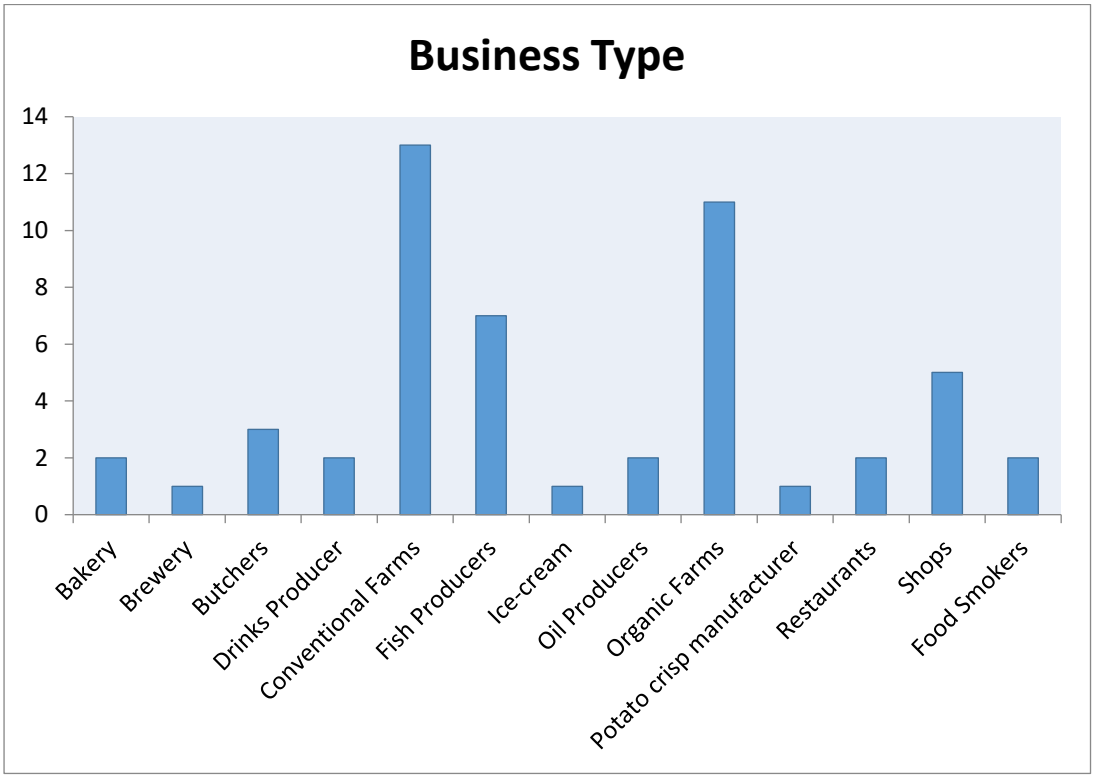
With a relative distribution of businesses with earnings between £501 to over £2m. The classification used to fit the businesses focused on the size rather than turnover, which classed them as small and medium based on the total number of employees within the businesses, this classification used also fits the UK Companies Act classification of 2006.

5.2.3. Business Activities

The findings show a wide range of activities of the businesses operating within the food and drink sector. The conventional farms and organic farms represent the majority of the

businesses from the web-based data, followed by fish producers, food shops and butchers. The methods applied within an organic farm differ in comparison to conventional farms. It was therefore necessary to split the types of farms, unlike the conventional farms, organic farms make use of natural practices for growing crops and avoid use of chemicals, using only natural methods on the farm.

Figure 5.3: Business Type

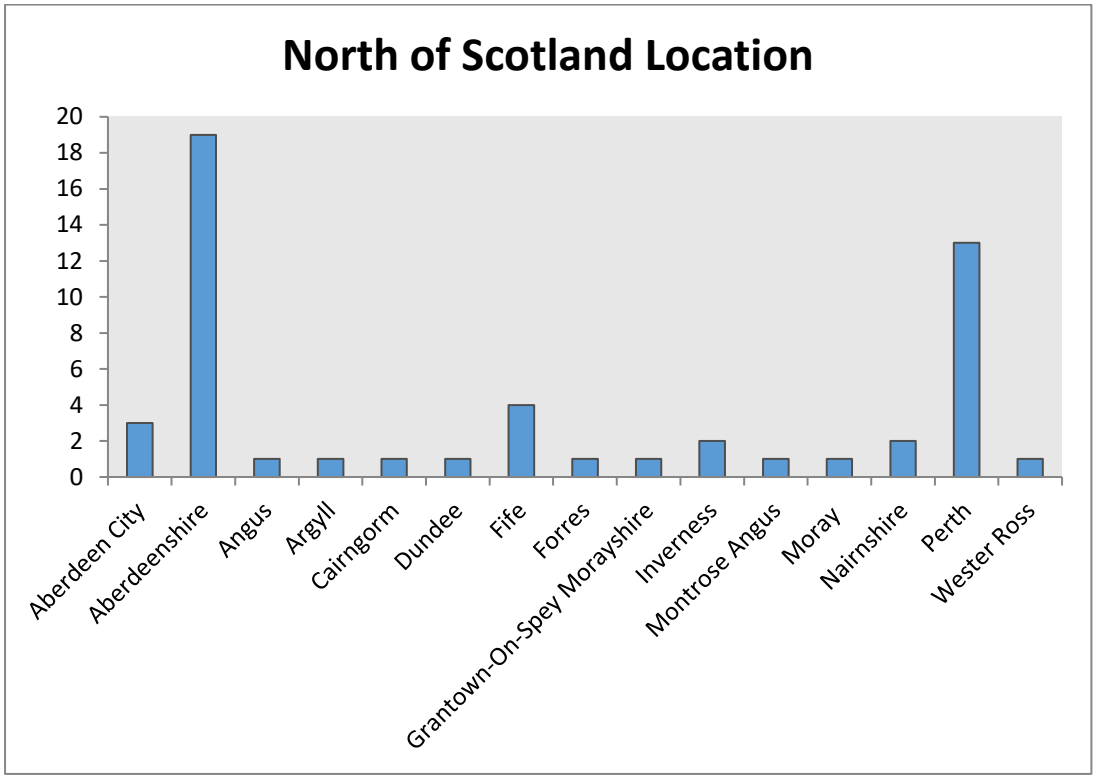


Source: Author generated

5.2.4. Business Location

The location of the businesses was classed according to the counties in the Northern Scottish region to ensure the details of the businesses remained anonymous. In total, the study grouped 15 counties under which the businesses are located. Aberdeenshire holds the highest number of businesses from the study, followed by Perth, Fife and Aberdeen city, with the rest of businesses distributed across other counties in the North of Scotland.

Figure 5.4: North of Scotland Location of Web-Businesses



Source: Author generated

Having established the demographics of the respondents used within this stage of the web-data based on the UK classification it considers the businesses analysed to be mostly small and medium sized enterprises. The next section will look at the form of eco-innovations adopted by these businesses.

5.3 Web Categories of Eco-Innovations Adoption

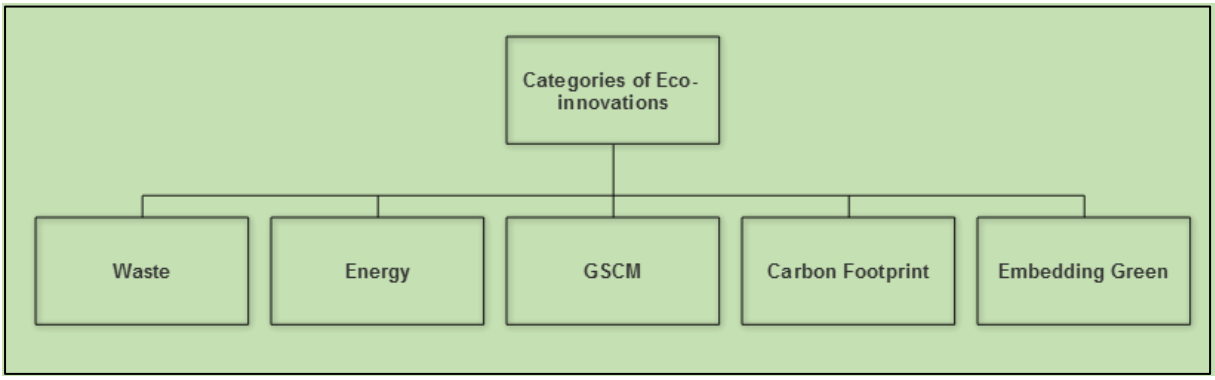
The word web-categories is used within this study to refer to the range of activities/ innovations captured from the websites of the businesses which were found to be adopters of some form of eco-innovation. Due to the diverse and broad range of eco- innovations (inclusive of green initiatives, eco-friendly practices and activities) that exist within the literature, and without any clear set of classification such eco-innovations that could be applied, the study sought to record all evidenced forms of eco-innovations by grouping the

various efforts identified from the various websites of the food and drink businesses, this was captured using a matrix list. To start with, the list established was quite broad as each eco-innovation was captured in line with what each of the 52 businesses stated they were engaged in, this resulted in an initial list of (38) thirty-eight forms of eco-innovation activities. Bearing in mind that it would be difficult to represent the data in this manner as it would be quite broad, therefore after establishing the forms of eco-adoption per business, the data was sorted into broader forms of adoption, which resulted in the creation of main categories and sub-categories.

The main categories represent the overall description of what the eco- innovation being adopted related to or could be classed under, while the sub-themes reflected the actual activity being adopted by the business for example; Waste was identified as a main category, while activities like recycling, reduce, reuse and composting were classed as sub-themes that relate to Waste. This was considered a useful way to condense the data and present the information in a manner that best reflected the forms and extent of eco-innovation adoption by the businesses. The method applied also helped the study create a set category of eco- innovation, which capture the key themes associated with the adoption of greening or activities aimed at minimising negative environmental impacts, thereby making it easy for businesses to identify activities which further the efforts to be green or environmentally friendly.

The key categories established are presented in figure 5.5. and show the five categories which emerged from the data. Each category relates to areas and activities where businesses within the industry will reflect their adoption of eco-innovations, and these were identified in the form of waste management, energy management, green supply chain management (GSCM), the reduction of their carbon footprint, and activities that include the embedding of green efforts by the business.

Figure 5.5: Categories of Eco-innovations



Source: Author generated

As mentioned earlier, the adoption of the various innovations is captured within these main categories and broken down to reflect sub-categories of activities classed under a main category, the following sections present the findings from each category and the extent to which these innovations are adopted by the businesses including the most prominent forms of adoption.

5.3.1 Waste Management Sub-categories

Waste management within this study refers to efforts taken by businesses to minimise or eliminate their material and process waste generated from their activities that could have an environmental impact. An analysis of the waste management innovations revealed (6) six-sub-categories associated with the waste efforts by businesses in the industry, the notable forms of waste eco-adoption found were: reduce, recycling, reuse, composting, waste conversion and zero landfill.

Most of the web-businesses indicated a high adoption rate for reducing as an eco-innovation activity which in many cases indicated that the businesses were taking conscious and active plans to minimise their use of resources where possible. The findings of some of the waste-sub-categories are presented in the following sub-sections.

5.3.1.1 Reduce

Some businesses stated efforts aimed at cutting down and reducing their environmental impact, they associate their waste reduction efforts with improving and preserving the wildlife by not overusing the resources. The web-analysis found (24) twenty-four businesses out of (52) fifty-two actively engaged in reduction and some instances of such initiatives are stated below.

> *"Organic farming has brought the wildlife back into the fields but we have also worked at improving the woods and "waste ground". [WB12-Organic Farm] (11.2016)*

> *"Our fish are caught to order, ensuring that there is zero waste" [WB6-Shellfish Producer] (11.2016)*

> *"……the integrated approach to land management is still very much in place and increasingly so as we move away from intensive production. We find this a much more effective model in producing benefits to the countryside, to the public and in maintaining an efficient business." [WB40- Lodging and Restaurant] (11.2016)*

The statement from WB40 not only acknowledges the business engagement in reducing intensive farming but also hints at the social, economic and environmental benefits as a result of this innovation, this indicates a consciousness on the part of the businesses towards business sustainability.

5.3.1.2 Reuse

Reuse is also considered an effective way to manage waste by food and drink businesses, the study found (18) eighteen businesses out of (52) fifty-two were engaged in reuse. This

effort does not increase existing waste but serves as an effective initiative to minimise waste, as noted by businesses;

> *"Where potential waste can be re-used legally and without a risk to human or animal health, the company will do so" [WB43- Butcher and Game Supplier] (11.2016)*

> *"Waste water from our factory is fed through and sustainable drainage system and potato and crisps waste is used as livestock feed". [WB7- Potato crisp producer]*

> *"We realise that kerbside collection for recycling of plastic is still very limited in the UK, so it's a pleasure to hear about how you re-use our tubs. They can be washed in the dish washer and are good for food storage but have been adapted for lots of other uses like plant pots, tidy pencil store or bird feeders". [WB3-Ice- cream manufacturer] (11.2016)*

By engaging in reuse, these businesses limit their waste and need to buy new resources for their businesses where possible, this also translates into saving cost for the businesses.

5.3.1.3 Recycling

On Recycling, the findings revealed that there were (15) fifteen businesses out of (52) fifty-two engaged in this activity, which rated as the third highest form of adoption after Reduce and Reuse as shown in figure 5.6. Some statements relating to the recycling efforts are cited below:

> *"We ensure that resources are carefully recycled and re-used wherever possible". [WB7- Potato crisp producer] (11.2016)*

Another business provides details of the various resources that are actively recycled, ranging from items used for administrative purposes such as office paper to those used for the daily operations and activities of the business such as packaging items, as noted below:

> *"recycle cardboard, plastic and wood, batteries and metal. The cardboard and plastic is baled and collected by our recycling partner and because we know that small things count too, our office recycles paper, cans, toner cartridges, batteries, mobile phones and plastic". [WB3- Ice- cream manufacturer] (11.2016)*

Recycling is a very important eco-innovation and its adoption by businesses can have significant impact towards overall waste reduction, however only 15 of the 52 web businesses cited recycling as a form of adoption. It could be that the other businesses did not bother to cite this among their ongoing adoption practices since the legislation requires all businesses to recycle their waste.

5.3.1.4 Composting

Some waste innovations in the form of composting was evidenced on some websites, with (10) ten businesses out of (52) fifty-two found to be adopting this eco-innovation. The businesses were specific in relating this to waste minimisation and a healthier form of caring for the environment, some excerpts relating to their composting efforts are provided below:
One farm owner stated their decision to avoid artificial substitutes on their farm by citing:

> *"We do not use any herbicides or pesticides on our growing areas and we follow organic growing practices. We use natural fertilizers and compost" [WB39- Farm (Veg)] (11.2016)*

Another business owner highlights composting as a measure for cutting down their overall waste stating:

> *"We separate our food waste for composting which has reduced our general waste even further" [WB40- Lodging and Restaurant] (11.2016)*

While another business stresses the decision to either recycle or compost their waste:

> *"We recycle or compost 100% of our old wood, cardboard packaging, and paper". [WB13- Organic Farm] (11.2016)*

Composting efforts were mostly identified within the businesses that operated farms such as fruit and vegetables. Composting has been noted to be a natural way to improve soil structure and yields and is considered a useful waste management innovation.

5.3.1.5 Zero Waste to Landfill

Some of the businesses confidently stated they had zero land fill waste, the findings found (4) four businesses out of (52) fifty-two indicated having zero-landfill, suggesting no waste from the business went to the landfill, though they did not specify the method of adoption for instance, one business noted having no negative impact to the environment by stating:

> *"Everything is made in small batches, and we pride ourselves on the fact that we are producing a genuinely 'hand-made' product with no impact to the environment, including landfill" [WB11-Organic Farm (Fruit & Veg)] (11.2016)*

Another clearly indicated the business values focused on avoiding landfill waste:

> *"Our business is built to be comfortable and minimise the impact on the environment avoiding waste to landfill" [WB14- Organic Farm] (11.2016)*

Only 4 businesses were found to be adopters of zero-waste to landfill, this may be due to the difficulty in ensuring all forms of waste generated by the businesses can be disposed of in a

manner that poses no harm to the environment, and could be dependent on the types of materials used by the business and their suppliers. Having a zero-waste adoption policy by these four businesses demonstrates a strong commitment to the environment through the effective management and disposal of their waste.

5.3.1.6 Waste Conversion

The study found (3) three businesses out of (52) fifty-two indicated the use of methods that converted their waste, thereby helping to minimise the overall waste generated by the business activity. One business noted the management of their waste by converting it for use by the farms stating:

> *"Our brewing by-products, spent malt, hops and yeast are utilised by local farmers" [WB15- Brewery] (11.2016)*

Another business cites their creative conversion of waste as natural fertilizer:

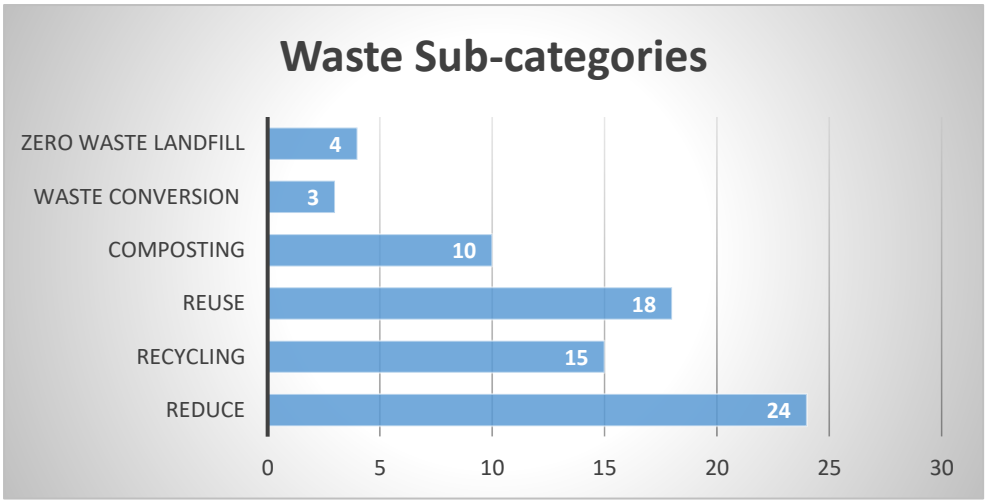
> *"The slurry from the cows is pumped up to the slurry lagoon on top of the hill and mixed with the waste water. It is then used as natural fertiliser and spread on our fields via four miles of pipework on the farm. This reduces the amount of commercial fertiliser products that have to be bought" [WB3- Ice- cream manufacturers] (11.2016)*

Waste conversion innovation adopted by the businesses indicate creativity and resourcefulness and further emphasise the decision of businesses to adopt eco-innovative methods.

In sum, most of the businesses seemed to be involved in at least one or multiple forms of waste management initiatives, leaving a few non-adopters of waste management initiatives. The chart below provides a summary of the waste-eco innovations and the extent of its adoption evidenced on the websites of the businesses analysed with reuse as the most

adopted form of eco-innovation and zero waste landfill as the least adopted form of eco-innovation.

Figure 5.6: Waste Sub-categories



Source: Author generated

Having looked at the waste sub-categories, the next section will present the findings of the forms of adoption in energy management.

5.3.2 Energy Management Sub-categories

The website analysis found (8) eight forms of energy management eco-innovations namely: Reduce Consumption, Monitoring, LED Lightning, Solar, Hydro, Wind, PIR Sensors, and Heat recovery systems. The findings from these sub-categories showed that most businesses considered the reduction of their energy consumption and the monitoring of energy use their way of sustaining the business and integrating sustainable thinking. However, a comparison between energy management innovations adopted revealed a lower number of adopters for the eight themes identified under this category in comparison to Waste management and GSCM forms of eco-innovation adoption (see figures 5.6, 5.7 and 5.8 for comparison). This could be due to the perception of cost associated with energy

management innovations especially the high technology based innovations such as solar, turbines etc.

This section will present some examples of (4) four of the most adopted forms of energy management innovations by the businesses namely; reduce consumption, monitoring, LED lightning and Solar. A summary chart illustrating all the energy management forms of adoption and the number of businesses found to be adopting each is provided at the end of this section (see figure 5.7).

5.3.2.1 Reduce Consumption

The findings showed (12) twelve businesses out of (52) fifty-two adopting innovations to help reduce their energy consumption and improve energy management. Some examples relating to the adoption of low-energy techniques and a low-energy impact building by another business are cited below:

> *"We take great care in sowing our seed and using traditional rotational farming techniques to nurture the crop" [WB52- Oil Producer] (11.2016)*

> *"We have built our award winning low impact house as well as our purpose-built business premises" [WB2- Organic Farm (Veg)] (11.2016)*

The businesses that cited reduce indicated using low energy efficient methods that help them carry out their activities in a manner that was not only cost-effective to the business but also beneficial to the business environment by cutting down on high energy use and emissions of pollutants to the natural environment.

5.3.2.2 Monitoring

Eleven (11) businesses out of (52) fifty-two were found to be adopters of energy monitoring innovations. Many of the businesses considered this innovation as a means of measuring their usage and reducing costs by stating;

> *"Improving energy efficiency saves resources, protects the environment and cuts costs" [WB8- Bar and Restaurant] (11.2016)*

> *"We look at ways of reducing our energy consumption; by implementing energy efficiency initiatives" [WB38-Farm (Fruit & Veg)] (11.2016)*

> *"All our energy use is monitored and best efforts are made to minimise the energy used. The horse power of tractors is matched to the equipment being used and where possible two jobs are undertaken at once - e.g. placement of fertilizer at the same time as planting" [WB7- Potato crisp producer] (11.2016)*

The efforts taken by businesses to monitor energy use and adopt innovations reveals a strong awareness on the part of these businesses to managing their resources and energy usage.

5.3.2.3 LED Lightning

Six (6) businesses out of (52) fifty-two indicated the adoption of LED lights within their businesses. The use of LED lights is gaining popularity even among businesses as a means to managing their energy use more efficiently.

One business stated their commitment to the use of greener sources of energy such as the LED lights stating:

> *"We are committed to increasing energy efficiency by using LED lights and investigating alternative green energy sources" [WB43-Butcher and Game Supplier] (11.2016).*

Another business identified the decision to replace the existing high energy bulbs with LED stating:

> *"We are continuing to continue to replace halogen bulbs with energy efficient bulbs" [WB40- Lodging and Restaurant] (11.2016).*

LED Lights are noted to be more cost-effective, with a durable lifecycle when compared to traditional fluorescent and incandescent lights, besides its financial advantages, LED lights also offer environmental benefits of using less energy and having a very low impact on the environment with a decreased level of emissions being released into the atmosphere.

5.3.2.4 Solar

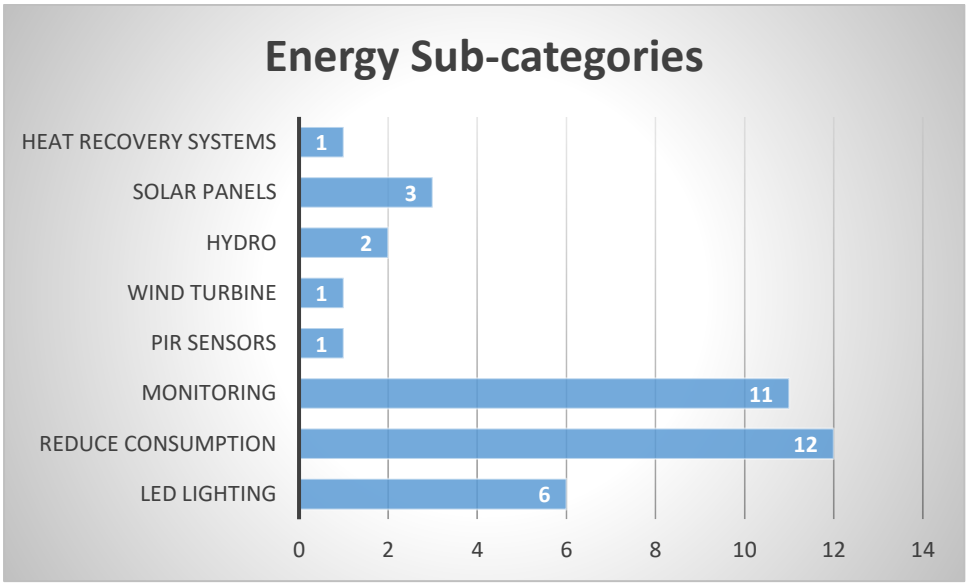
Three (3) businesses out of (52) fifty-two were found to be adopters of solar as an energy management innovation, statements relating to their adoption measures are presented below:

> *"We are reducing our energy consumption by implementing energy efficiency initiatives as well as taking advantage of solar technology on the farm" [WB38-Farm (Fruit & Veg) (11.2016)]*
>
> *"We have also installed a 10-acre site of solar panels with capacity of 1.8 MW…this provides a good mix of power types - all working towards our aim to be self-sufficient in energy and remove our dependence on fossil fuel all together" [WB3- Ice- cream manufacturer] (11.2016)*

The businesses consider their adoption of solar power an efficient way to make use of natural resources (daylight and sunlight), and carry out their activities effectively without being dependent on fossil fuel which is also harmful to the environment.

The other forms of energy management found were not popularly listed by the businesses with Hydro energy having (2) two adopters, Wind (1) one adopter, PIR Sensors (1) one adopter, and Heat recovery systems (1) one adopter. Despite the sparse number of adoption of these eco-innovations when compared (see figure 5.7 for summary chart) to the other energy related innovations, they are identified as useful alternative sources of energy and effective forms of energy management.

Figure 5.7: Energy Sub-categories



Source: Author generated

Having presented the findings on energy management, the next section will look at the eco-innovations by businesses on green supply chain management.

5.3.3. Green Supply Chain Management (GSCM) Sub-categories

The classification of initiatives under Green supply chain management (GSCM) were quite robust from the findings. These were grouped into 6 six sub-themes associated with the practice of GSCM namely; Traceability, Local sourcing, Ethical sourcing, Sustainable packaging, Supplier customer engagement and Green purchasing. Findings of some of the GSCM-sub-categories are presented in the following sub-sections.

5.3.3.1 Traceability

Product and process traceability ensures transparency and reliability along the supply chain, it also gives the consumer the confidence of knowing exactly what process the product has gone through and where the product comes from, disclosing its environmental impact as well. The findings found that (28) twenty-eight businesses out of (52) fifty-two were active adopters of product traceability. Some statements on forms of traceability evidenced within this study include;

> *"All products are fully traceable and excellent quality controls from 'cow to cheese'. Assurances can be given for the highest standard of animal welfare" [WB26-Dairy Farm (Organic) (11.2016)]*

> *"Traceability of the end product is completely assured by literally seeing the product through from pasture to customer" [WB47- Game Farm and shop] (11.2016).*

> *"Our shops have a strict traceability system so we can always tell you the exact source of the meat you are buying". [WB41- Buffalo Farm] (11.2016)*

> *"We're confident we can offer you the best selection of coffee as our roasters have actually been to the farms to hand select our beans and see for themselves how*

Fairtrade and Rainforest Alliance are helping the families and the communities who produce the coffee."[WB5-Coffee supplier] (11.2016)

The above statements indicate that the businesses understand the importance of being transparent to the customers, offering details about the various processes their products have passed through along the supply chain. This can help limit risks and unnecessary exposure of products since the businesses monitor the processes along the supply chain with their suppliers.

5.3.3.2 Local Sourcing

Local sourcing was found to be a popular form of adoption by the businesses with (25) twenty-five businesses out of (52) fifty-two adopting this as a way of supporting their community by re-investing in it and patronising local suppliers and also looking out for their environment. Examples of such instances are presented below:

"We stock prime beef and lamb direct from... along with a wide variety of other meats and poultry, delicious deli foods and fresh fruit and vegetables, all locally sourced" [WB19- Mixed Game Farm] (11.2016)

"To ensure that only quality fresh Scottish fish is available to customers, the business, personally visits the local fish markets to select fresh fish for processing" [WB28- Fish Producer] (11.2016)

The web analysis also noted that while some of the businesses stressed local sourcing as their way of fostering the local community and integrating green thinking within their businesses (by cutting down on activities along the supply chain), the businesses also used this as a means of marketing by labelling their products with tags that read 100% locally

sourced, boosting the public image of the businesses and attracting customers to their brand.

5.3.3.3 Ethical Sourcing

Fourteen (14) businesses out of (52) fifty-two were found to be adopters of ethical sourcing. These businesses agreed with the importance and need to procure their products in a manner that not only benefits the business but takes into account the social responsibility along the supply chain, ensuring a process of safety and fairness to the environment, by not risking and endangering the resources for the future. Statements relating to some of the ethical sourcing adoption found are presented below:

> *"Hand diving and creel fishing are low-impact, non-invasive fishing methods that do not cause damage to the sea-bed. We put ethics at the heart of our business. As a result, you can be 100% confident that you are getting what you're paying for: shellfish that has not come at the expense of the marine environment". [WB6-Shellfish Producer] (11.2016)*

> *"We catch prime condition wild salmon and seatrout in environmentally friendly traditional Scottish bag nets (traps), ensuring our product is of the highest quality" [WB17- Primary Fish Producer] (11.2016)*

The above excerpts indicate a growing awareness and action taken by the businesses to be accountable for their actions and striving to achieve a more sustainable business environment to operate in.

5.3.3.4 Sustainable Packaging

The findings found (10) ten businesses out of (52) fifty-two were adopters of sustainable packaging. Sustainable packaging measures reduce the environmental footprint of the materials, encourages reuse of packaging where possible, and eliminates tons of packaging waste along the supply chain. The decision by businesses to cut down on packaging waste demonstrates their concern for their environment, examples of such instances found include:

> *"We have a strong environmental policy which encourages everyone to bring reusable cotton shoppers and so minimises the need for disposable carrier bags, and because the produce is local we don't need to use huge amounts of packaging to protect it in transit either". [WB25- Food Preserves] (11.2016)*

> *"We use as little packaging as we dare, by delivering your fruit and veg in re-usable boxes, we can avoid most packaging, but we bag fruits that are easily bruised, and veg that lose water quickly, to keep them in tiptop condition" [WB14-Organic Farm] (11.2016)*

The above statements show that businesses are conscious and mindful of their packaging use and explore ways that minimise and improve packaging by their businesses.

5.3.3.5 Supplier/Customer Engagement

Eleven (11) businesses out of (52) fifty-two were found adopting collaborative efforts that engaged their suppliers and customers about their environmental innovations. Some stressed the importance of having their customers understand the relevance of their efforts as stated below:

> *"Change will ultimately come from the customer, who increasingly demands higher environmental standards from food producers. Together, we hope that we can contribute to a culture of environmental stewardship which may ultimately lead to the recovery of our seas". [WB6- Shellfish Producer] (11.2016)*

Another business emphasises working with both their suppliers and customers to ensure a safer business environment stating:

> *"We are committed to working closely with suppliers and customers and to make them aware of our policy". [WB43- Butcher and Game Supplier] (11.2016)*

By managing their relationships and communicating their business environmental policy commitments with customers and suppliers, businesses are more likely to achieve better results, through the support and compliance of all parties along the supply chain.

5.3.3.6 Green Purchasing

Innovations relating to green purchasing policies were found with four (4) businesses out of (52) fifty-two. Green purchasing entails conscious efforts taken by businesses to procure products and services with the least impact on the environment and human health. Some businesses indicated this through;

> *"We are committed to supporting a responsible and efficient fishing industry that balances consumer demand with the conservation of fish stocks for future generations" [WB27- Fish Producer] (11.2016)*

> *"We have been the first to take a number of important initiatives that have now filtered into the mainstream – removing endangered species and low welfare livestock from our menus, ensuring our suppliers are actively committed to*

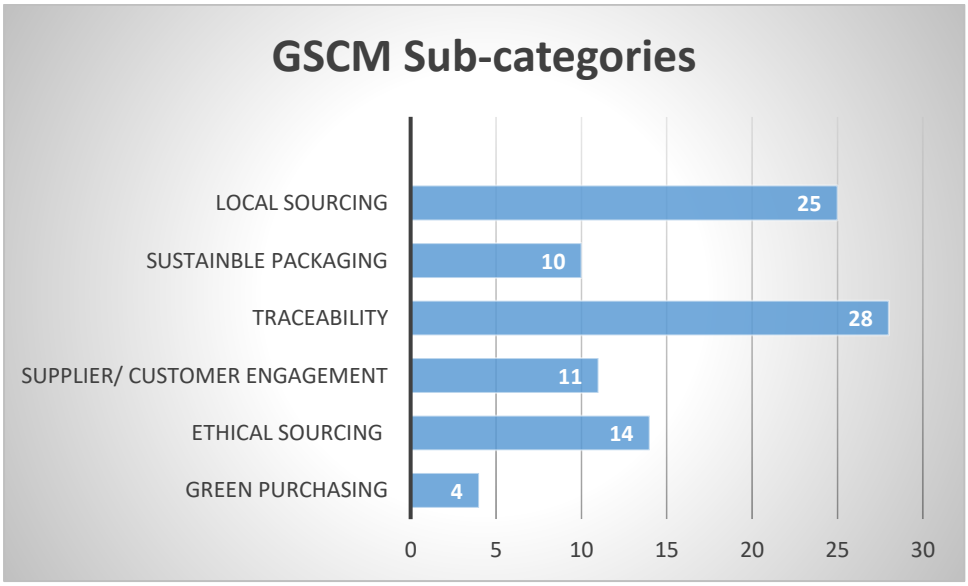
supporting and protecting the area they farm, its ecology and communities". [WB8-Bar and Restaurant] (11.2016)

"Furthermore, we only work with growers who display similar commitment to environmental policies and ensure that they comply with appropriate environmental stewardship programs like the LEAF Marque, Soil Association, Assured produce and Natures choice schemes". [WB7- Potato crisp producer] (11.2016)

The above statements reflect the actions taken by businesses to support their environment by conserving resources and supporting supply chain operations that comply with environmental policies.

The analysis found the most prominent forms of green supply chain management innovations undertaken by the businesses to be Traceability and Local sourcing, with green purchasing seen to have the least number of adopters. A summary of all the forms of GSCM and their extent of adoption is shown in figure 5.8.

Figure 5.8: GSCM Sub-categories



Source: Author generated

The above section presented forms of green supply chain management innovations found within the web business analysis, the next section will present the finding the fourth category of eco-innovation; Carbon Footprint.

5.3.4. Carbon Footprint Reduction Sub-categories

Eco-innovations that relate to Carbon foot-print reduction were identified in the form of low product miles, eco-efficiency, and logistics management. Some of the businesses identified with efforts to reduce their overall business foot-print and these are presented in the following sections:

5.3.4.1 Low Product Miles

Twenty-six (26) businesses out of (52) fifty-two were found to be adopters of low product miles. Having products with low miles was cited by many businesses and it was an advantage they were keen to be identified with and appeared to use for marketing their products. This was seen either in terms of where they procured their materials or who they sold to in terms of their end client. This gave a strong indication that the businesses strived to keep their product mileage low in consideration for the environment. Some statements relating to such instances are listed below:

> *"We source our venison and small game locally, thus helping to keep the distance produce travels, food miles low". [WB44- Butcher and Game Supplier] (11.2016)*

> *"Most produce travels from less than 20 miles and the furthest guest producer less than 90 miles to our markets. This keeps our CO2 emissions very low." [WB25- Food Preserves] (11.2016)*

Businesses are seen to be taking measures that reduce their emissions by regulating and measuring their daily activities particularly through the adoption of low product miles, it further cuts down on transportation costs for the businesses, while improving their green credentials.

5.3.4.2 Eco-Efficiency

The web analysis found seventeen (17) businesses out of (52) fifty-two with eco-efficient innovations. Eco-efficiency within this study refers to various voluntary measures taken by the businesses to minimise their carbon footprints. This could be planting trees and support for greener space or monitoring their emissions so it can be properly managed. Some examples of such efforts adopted by the businesses are presented below:

> *"We've planted over 30,000 native trees and over 1 km of mixed native hedges to soak up some CO2 and give wild birds safe places to perch and nest". [WB13- Organic Farm] (11.2016)*

> *"Our sites are monitored on a continual basis for environmental impact, with formal measuring of seabed impact taking place on an annual basis". [WB18- Primary Fish Producer] (11.2016)*

Eco-efficiency measures adopted whether large or small by these businesses demonstrate environmental stewardship and reflect genuine concern and commitment to the environment by the businesses seen to adopting such measures.

5.3.4.3 Logistics Management

Three (3) businesses out of (52) fifty-two were found to be active in the adoption of logistic management. Logistics involves movement of goods and services from one point to another.

It is a large part of the supply chain of many businesses and has the capacity to negatively impact the environment through the build-up of carbon footprint and emissions generated through transportation. Factors relating to the businesses taking steps to make their transportation systems more efficient such as reduced travel, reduced pollution, routed logistics and bulk shipping of goods and services were considered logistical management efforts. Some examples identified from the websites are presented as follows:

> *"Committed to reducing our fossil fuels by…making use of established delivery routes, minimise the use of company vehicles where possible, use public transport where possible and practical". [WB43- Butcher and Game Supplier] (11.2016)*

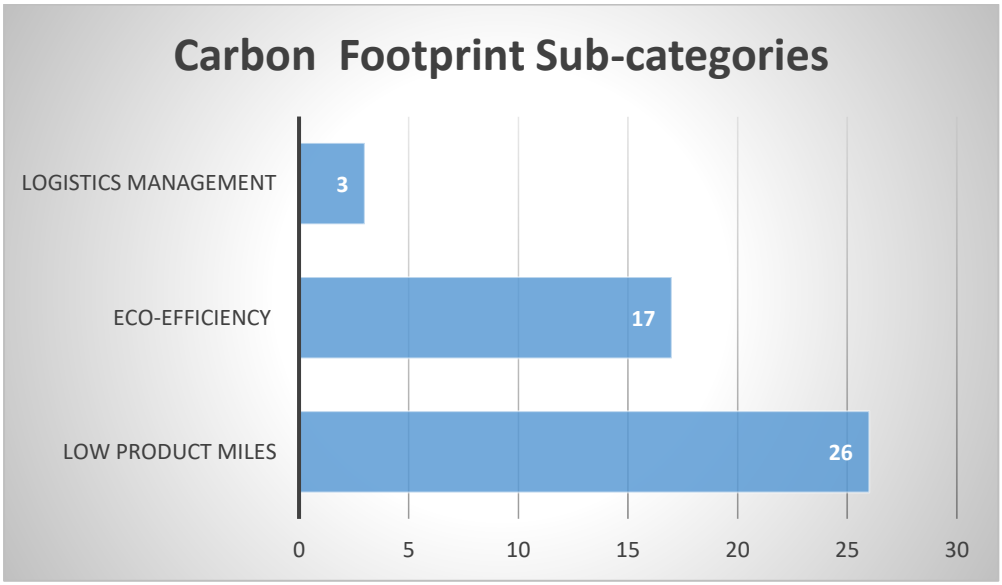
> *"We ensure that vehicles are subject to regular maintenance and checks to meet or exceed regulations on exhaust emissions" [WB7- Potato crisp producer] (11.2016)*

> *"Our deer are shot on the farm. So, in addition to this being excellent for animal welfare, it also omits the use of vehicles to take the animals to an abattoir" [WB46- Cattle Farm] (11.2016)*

The above quotations exemplify the steps taken by the businesses to curb their carbon emissions using practical measures that are financially beneficial to the company by lowering their transportation costs and environmentally beneficial to the environment by reducing emissions caused by operational activities.

The analysis found the most prominent forms of carbon-footprint innovations undertaken by the businesses to be Low product miles and Eco-efficiency, with logistics management seen to have the least number of adopters. A summary of all the forms of carbon-footprint and their extent of adoption is detailed in figure 5.9.

Figure 5.9: Carbon Footprint Sub-categories



Source: Author generated

The next section presents the findings in the fifth eco-innovation category; Embedding Green and its related-sub categories.

5.3.5. Embedding Green Sub-categories: Thinking and Practices

While exploring the data, the study established a category that represents factors considered relevant to the successful adoption of eco-innovations. These factors relate to issues concerning the business eco-strategy (green) which could be reflected in the form of a policy, or in some instances the statements made by the businesses which establishes their position or values as a business in terms of what their environmental considerations are or in some cases how the business integrates their environmental thinking within their daily operations. The study therefore identified such efforts by the businesses as “Embedding Green: Thinking and Practices”.

The data collected from this section was split into four sub-categories to reflect evidenced forms of the business involvement in embedding green thinking and practices.

Table 5.2: Embedding Green

Embedding Green: Thinking and Practices						
Sub-categories 1: Position /Stance/ Ethos						
WB	Policy	Statements	Values			
Evidenced	12	21	20			
Sub-categories 2: Engagement and Internal						
WB	Employee Training	Improve Efforts and Outreach	Best Practices			
Evidenced	2	6 7	4			
Sub-categories 3: Accreditations and Certifications						
WB	ISO 14001	SALSA	MSC	Organic	Fairtrade	Other
Evidenced	1	2	3	6	3	4
Sub-categories 4: Green Recognition						
WB	Green Awards			Green Listings		
Evidenced	6			1		

Source: Author generated

These sub-categories as shown in table 5.1, represent different forms of activities and actions that represent the business and their environmental culture towards the adoption of eco-innovation.

5.3.5.1 Position, Stance and Ethos

As presented in table 5.1, the first sub-category covered position, stance and ethos, which represented instances where the business declared a position in relation to eco innovation on the websites. This category was split further to capture evidence of businesses with a

policy (environmental), statements (acknowledging their commitments to green issues) and values (affirming their beliefs on environmental issues).

5.3.5.1.1 Policy

Evidence of a green policy was represented in the form of actual policies where the business detailed their eco-adoption activities. However, this was not very popular as not many businesses had provided sections to capture green policy for the business or how they were tackling environmental issues. The study found a total of twelve (12) businesses out of (52) fifty-two with clearly written environmental policies that stated the businesses commitment to their green policies and indicated how their policies were implemented. Some excerpts from the policies are presented below:

> *"Our business recognizes that its daily operations impact upon the environment in various ways, and is aware of its responsibility to minimise the potential harmful effects of such actions wherever, and whenever this is possible…. strives to achieve continual environmental improvements, to minimise the creation of waste, and to prevent pollution". [WB18- Primary Fish Producer] (11.2016)*

Following the above statement, WB18 also went on to list all the environmental innovations adopted by the business as a commitment to their environmental policy.

Another example taken from WB8 detailed within their environmental policy states:

> *"we pride ourselves on being at the forefront of environmental initiatives. We see our role as not only delivering locally sourced food of great quality but also honouring and preserving the environment from which this resource has arrived" [WB8- Bar and Restaurant] (11.2016)*

Similarly, the above business also indicated eco-innovations under adoption in line with their environmental policy.

5.3.5.1.2 Statements

The data analysis showed twenty-one (21) businesses out of (52) fifty-two with statements on the environment, this was a much higher representation in comparison to the twelve (12) businesses that had detailed policies with commitments to the environment. The study also found that while this larger number of the businesses had declared statements on the business position towards environmental concerns, some of them were not detailed or specific enough to evidence what the businesses were actually doing in terms of their adoption which could be misleading. The study relates to some of the issues that can arise from the use of such generic statements in section 5.4. within this chapter. Some statements indicating the commitment of the businesses to the environment include:

> *"we are committed to demonstrating good environmental stewardship in everything that we do". [WB7- Potato crisp producer] (11.2016)*

> *"Our values of health, environmentalism, co-operation, and ethical responsibility are a vital part of our business". [WB10-Organic Farm (Fruit & Veg)] (11.2016)*

However, despite the brief and unsubstantiated nature of some of these statements, the study considers them relevant towards taking a stance on environmental issues within the business environment and an indication that the businesses will continue to integrate and embed green thinking within its operations.

5.3.5.1.3 Values

Twenty (20) businesses out of (52) fifty-two reflected thinking that the study ascribed to under environmental values. The values attributed to green were captured to reflect perception and belief, this information was used to represent the business environmental values. Some examples of such instances are stated below:

> *"It is important that we farm and manage the land in a sustainable way". [WB38-Farm (Fruit & Veg)] (11.2016)*

> *"We believe in producing quality food, whilst caring for the countryside". [WB12-Organic Farm] (11.2016)*

> ***"**Environmental technology is also something that is very important to us". [WB15-Brewery] (11.2016)*

The values of a business are considered important by this study since they reflect the beliefs, thinking, attitudes and behaviours of the business and can influence the daily decisions and actions taken by the businesses towards embedding eco-innovations.

5.3.5.2 Engagement / Internal

Sub-categories identified from the data suggest some businesses actively making internal engagements to further foster their green position and culture. The forms in which these were found include employee training, improved eco-efforts and outreach and best practices. These are presented in the following sections below.

5.3.5.2.1 Employee Training

Two (2) businesses out of (52) fifty-two were found to be involved in training their employees on environmental issues. These businesses stated their commitment to integrating eco-innovations within their businesses by ensuring their workers also had a good understanding of the business stance towards incorporating "green" and the required support and training to carry out their eco-activities. Some examples are cited below:

> *"We are committed to achieving environmental best performance by communicating the policy as appropriate to colleagues, staff, customers, suppliers, and any other interested parties and stakeholders. Ensuring that staff is made aware of environmental issues as part of standard training programmes" [WB18- Primary Fish Producer] (11.2016).*

> *"Increase environmental awareness amongst our staff through development, training and promotion [WB43- Butcher and Game Supplier] (11.2016)"*

Employee training is considered a useful tool in the integration and embedding of green thinking and values. It ensures the employees are familiar with the values of the business and comply accordingly.

5.3.5.2.2 Improve Eco-efforts and Outreach

Eight (8) businesses out of (52) fifty-two were found to be engaged in initiatives targeted at improving environmental efforts and outreach. These businesses indicated an interest in not only improving their environmental impact but also extending their efforts to include their stakeholders. Some quotes relating to such instances are presented below:

> *"…. has launched a simple but realistic programme to minimise waste, safeguard the environment and raise awareness of green issues amongst all staff members and visitors" [WB40- Lodging and Restaurant] (11.2016).*

> *"put in place practical initiatives aimed at improving the health of their marine environment and protecting and improving the habitat for the shellfish that we harvest" [WB6- Shellfish Producer] (11.2016).*

Embedding the attitude of continuous improvement and reaching to stakeholders on the importance of environmental issues can positively influence the rate of eco-innovation adoption.

5.3.5.2.3 Best practices

Four (4) businesses out of (52) fifty-two were found to be adopters of environmental best practices. These was also seen as a strategy by some of the businesses. Some notable forms of such best practice identified by the businesses include; setting up processes that help the businesses monitor and evaluate their environmental performance. Examples of such practices are stated below:

> *"Monitoring purchasing practices and internal operations, including energy and transport, to ensure best use of natural resources and minimal environmental impact" [WB18- Primary Fish Producer] (11.2016).*

> *"We work closely with several leading marine and farming environmental bodies, to ensure that we have the very latest information on our sustainability targets [WB8- Bar and Restaurant] (11.2016).*

Integrating best practice can be a useful and practical way for businesses to stay informed and ensure they adopt eco-innovations that deliver beneficial results.

5.3.5.3 Accreditations and Certifications

Having identified the list of eco-innovations from the web-data, the study sought to identify those that were formally listed with environmental accreditations or certification from organisations for standardization and associated eco bodies and institutions. The analysis found the prominent forms of accreditations and certification obtained by businesses to include; ISO 14001 with one (1) business, Safe and local Supplier Approval (SALSA) with

two (2) businesses, Marine Stewardship Council (MSC) certified with three (3) businesses, Organic certification with six (6) businesses, Fairtrade with three (3), other forms of certification identified were grouped together into Four (4), these included LEAF (Linking Environment And Farming), IFM (Integrated farming practices), Assured produce and Natures choice schemes, DEMETER certification and the Scottish Seafood Association.

While the businesses that had these forms of accreditation and certification cited them on their website, not many referred to ways in which this enabled their environmental adoption process, therefore not many quotations were taken. However, the one business noted to be ISO certified provided some context on their certification stating:

> *"This company enhances its reputation for the quality of its products, and the service it provides to its customers, through best practice in staff development, husbandry, methodology, environmental protection, and by maintaining certification to the internationally recognized environmental management, ISO 14001" [WB18- Primary Fish Producer] (11.2016).*

Businesses adopt environmental management systems through the process of accreditation and certification; these provide them with a structured process for improving their environmental performance and is also useful to auditing and monitoring the business activities.

5.3.5.4 Green Recognition

The data analysis found that some businesses had earned some form of recognition for their eco-innovation efforts. These recognitions are given to businesses considered to be highly innovative in their approaches to tackling environmental issues, this is usually reflected through their adoption of creative eco-innovations with sustainable outcomes and proven

results. These were identified by the study in the form of awards and listings associated with eco-innovation adoption. In total, six (6) businesses out of (52) fifty-two had obtained recognition through various awards for their eco-innovation efforts and one (1) business was listed and acknowledged on a blog for its eco- activities.

Recognition can be useful towards acknowledging businesses that actively participate in environmental activities. They promote change and share ideas of creative and innovative approaches that can motivate other businesses to engage in the adoption of eco-innovations.

5.4 Cited Drivers to Eco-adoption

In some instances, some businesses cited factors that influenced their decision to adopt eco-innovations, while this was not stated by many businesses, the study thought it useful to capture statements that indicated the drivers for eco-innovation adoption where it was stated. In some instances, it stemmed from the moral obligation the business felt towards the environment, the cited drivers are presented below:

> *"We are all being encouraged to live our lives in a more ecologically sustainable manner these days, and indeed many of us have been doing just this, long before politicians realised there may be some 'mileage' in raising their own ecological 'game' by following suit. We've incorporated this long-held philosophy into our business, by keeping things on a local footing". [WB44- Butcher and Game Supplier] (11.2016)*

> *"It's a wonderful environment and we're committed to keeping it that way, both visually and by adopting 'green' working practices". [WB3- Ice- cream manufacturer] (11.2016)*

> *"We support organic farming because we believe it's best for the long-term fertility of the soil, best for building and maintaining biodiversity, best for the health and wellbeing of wildlife, our livestock and ourselves, best for the quality of our water supply, and because it uses less of the Earth's ever diminishing resources" [WB13- Organic Farm] (11.2016)*

Drivers reflect the philosophy and core values of a business and factors that influence the decision to either adopt or reject certain innovations.

5.5 Generic Statements on Eco-Innovation Adoption

It was mentioned earlier within the section on embedding green (see statements) that an emerging theme from the data showed some of the businesses acknowledged their support for environmental issues but these were not clearly detailed. As a result, they appeared make claims stating that they were green, without providing any specific examples or evidence of the forms of eco-innovation adopted by the business to back up their statement. Some examples of such generic statements are presented below:

> *"We are committed to supporting a responsible and efficient fishing industry that balances consumer demand with the conservation of Fish stocks for future generations" [WB27- Fish Producers] (11.2016).*

> *"Committed to natural horticultural production" [WB33- Organic farm (Veg)] (11.2016).*

> *"Our values of health, environmentalism, co-operation, and ethical responsibility are a vital part of our business". [WB10- Organic Farm (Fruit & Veg)] (11.2016)*

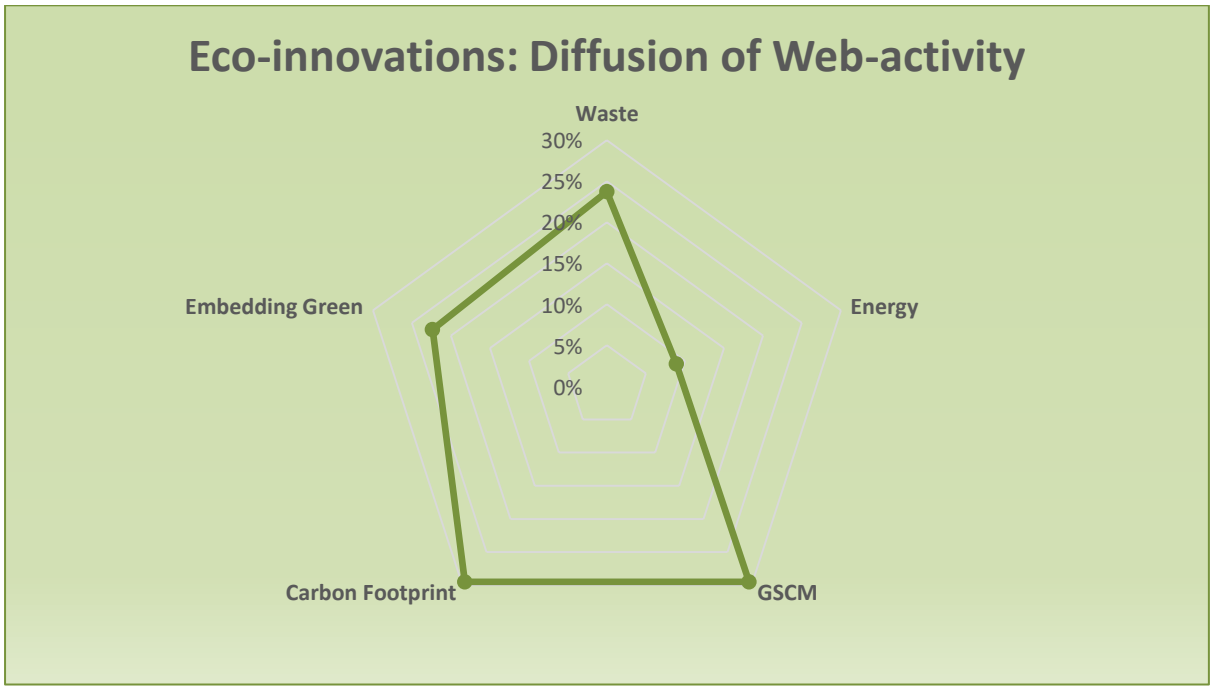
While these businesses made an environmental statement, which shows the business has considerations towards environmental impact, they did not support their stance by providing

further information on forms of eco-innovation adopted in-line with their environmental statements. Such businesses put themselves at risks of being classed as green-washers.

5.6. Discussion

Five broad categories of eco-adoption initiatives emerged from the findings of this exploratory study of the websites of Scottish food and drink businesses, these categories were split into further sub-categories to represent the key forms of eco-innovation adoption activities evidenced by the businesses. The study found the most prominent categories evidenced by the businesses to be carbon foot print reduction, green supply chain management and then waste management. The businesses returned a lower rate for embedding green, while the adoption of energy management had the lowest rate, which suggest there might be challenges encountered with adopting energy eco-innovations (see figure 5.10 for diffusion summary).

Figure 5.10: Eco-innovations: Diffusion of Web-activities



Source: Author generated

Figure 5.10 depicts the extent of diffusion by the businesses based on the 5 categories of eco-innovations created. The extent of adoption was established by calculating the aggregate per category as set out in figure 5.5. and then presented as illustrated in figure 5.10. This was done to provide an overall snapshot of how well the five eco-innovations have diffused within study and also provide a measure for illustrating diffusion of eco- adoption as exemplified by Rogers (2003) in his diffusion of innovation model.

As noted earlier, the findings reveal carbon footprint and GSCM to be the most diffused forms of eco- innovations. This may be as a result of the fact that most businesses are increasingly growing conscious of the need to cut down on footprints where possible, similarly growing collaborative efforts along the supply chain which relate to adopting green supply chain management efforts, there has also been an increase in the literature concerning the reduction of supply chain environmental impacts (Govindan et al. 2014; Jabbour and Jabbour 2016). Waste, was found to be the next most diffused, followed by embedding green and with Energy being the least diffused innovation to be adopted by the businesses, this could be a result of the cost associated with alternative green energy sources such as wind, solar, hydro etc. thereby deterring some businesses from easily adopting such innovations. The literature cites the lack of investment capital and insufficient information to be a major barrier to the adoption of energy innovation (Fleiter et al. 2012; Trianni and Cagno 2012; Meath et al. 2016).

Similarly, while most businesses identified having a green policy or stance in the form of an environmental policy, green statement or value, the study found only businesses with policies to be detailed in explaining their efforts. Those who evidenced in the form of statements and values were generally brief and not as detailed as the discussion of their environmental efforts. Not many businesses seemed to be engaged in employee training and outreach in the form of collaboration. This might be a result of the lack of knowledge,

unstructured nature, and weak managerial skills that could easily inhibit the adoption of environmental policies and innovations in SMEs (Clancy 2001; Hillary 2004).

The use of accreditation, certification and green recognition from environmental bodies did not seem very important to the businesses analysed within this study as very few had evidenced this. This could be because of the processes involved in obtaining certification, which might discourage some from seeking it. The complexity of some of these management systems has been noted within the literature to be too administrative, with tons of paper work that can be viewed as burdensome and time-consuming for SMEs to adopt (Perrini and Tencati 2006; Revell and Blackburn 2007; Zorpas 2010). SME's lack of knowledge and expertise required to implement environmental management systems has been cited as a barrier (Ortiz et al. 2013).

The use of generic statements by the businesses was identified within the study, and though it is not largely evidenced this has the implication of having such businesses that fall within this category to be viewed as "green washers", i.e. the act of misleading regarding the adoption of environmental business practices. Businesses that make vague environmental statements without evidencing it are at risk of green washing, therefore businesses are advised to support their claims with actual evidence undertaken within the business. In agreement with this Rawlins (2008) notes that businesses need to present accurate, substantial and useful information that support their environmental activities. These could be specific details relating to their environmental improvements and eco-innovation measures (Esty and Winston, 2006). Such actions will go a long way to addressing the issue of greenwashing accusations or perceptions.

5.6. Conclusion

Due to the growing environmental concerns (e.g. global warming, resource depletion and pollution) affecting the environment, businesses are responding to such concerns by integrating environmental thinking into their processes and operating responsibly (Hillary 2017). Websites and social media outlets are gaining popularity and noted to be used as strategic tools by businesses to publicise their green credentials and attract customers (Brindley and Oxborrow 2014; Martinez 2015; Ottman 2017). This chapter discussed how the research investigated the environmental innovations publicised by businesses.

Content analysis has served as a useful approach applied by the research to enable it to meet its objective 3 i.e. identifying the forms of eco-innovations adopted by SMEs. It enabled the researcher gain insights into how the businesses in the sector carry out their activities responsibly. Also, there were benefits found with using this method as it saved time and effort. By applying web-content analysis, the researcher was able to avoid the challenges that arise from trying to have a face to face interview e.g. making contact, follow up calls and visiting the premises. This method saved the researcher considerable time and allowed access to sufficient data for the study.

By conducting this web-content analysis on the 52 Scottish food and drink businesses, the research emerged with 5 categories of eco-innovations to be used as a guide for understanding eco-innovation adoption and the extent of its diffusion within the Scottish food and drink industry. These five categories are used to inform the main phase of the study, where the interviews are conducted with eighteen food and drink businesses from the North of Scotland i.e. the application of the 5 categories on the various businesses to emerge with a scale of greenness and a typology of eco-innovation adopters.

The study acknowledges some limitations of this content analysis. Firstly, the method adopted i.e. content analysis of websites is heavily dependent on the information posted by

the businesses on their website, as such the researcher can only speculate to the meanings of statements and interpret positions held by the businesses. Secondly, the inability to engage the businesses and verify their eco-innovation activities makes it difficult for the study to draw on the adoption experiences of the websites, and is only able to analyse the forms of eco-innovations mentioned on the sites. However, this method (content analysis) served its purpose and enabled the researcher to gather useful information that was used to lead to the main phase of data collection (in-depth interviews), where the study was also able to gain a better understanding about the adoption of eco-innovations that were identified through the use of the web content analysis. The findings of the interviews are presented in the next chapter.

CHAPTER SIX- INTERVIEW FINDINGS

6.1 Introduction

The previous chapter provided the answer to research question three (3) by establishing a list of the forms of eco-innovations adopted by businesses within the food and drink industry and then sorting them into five (5) main categories. This chapter provides the findings of the in-depth interviews conducted with the research participants and uses this to answer the remaining research questions. Findings within this chapter are presented using illustrated quotes to give detailed accounts from research participant's views and perspectives.

There are 9 sections in this chapter: Section 6.2; provides an overview of the participant profile. Section 6.3; presents the findings on the understanding of being "green" and the awareness-knowledge of the concept of eco-innovations research participants. Section 6.4; findings on the importance placed of eco- adoption to the participants and their industry. Section 6.5; the forms of eco-innovation adopted by the participants, Section 6.6; findings of factors promoting (motivators) or discouraging (barriers) participants from the adoption of eco-innovation. Section 6.7; findings on the perceived attributes of eco-innovation adoption. Section 6.8; the impact of adoption, including challenges encountered, benefits acknowledged and suggestions to enhance adoption and section 6.9; provides an overview of the extent of eco-innovation diffusion.

6.2 Profile of Research Participants

This section provides a general overview of the interview participants. The participants are identified using codes to maintain confidentiality. A profile of the participants used within the research is provided in table 6.1. A total of eighteen (18) businesses were interviewed, all within the food and drink sector, located within the North-east of Scotland and all participants were owners.

Table 6.1: Profile of Research Participants for Phase Three

Research Participant Code	**Type**	**Age**	**No of Employees**
RP01	Restaurant	2+	40
RP02	Food and drink catering services	13	96
RP03	Bottled water producer	18	10
RP04	Fish and Chip Shop	5	14
RP05	Fish Processor	150	30
RP06	Food and Drink Inn	2+	20
RP07	Dairy Producer	87	28
RP08	Hotel	22	100
RP09	Primary Fish Producer	30	6
RP10	Farm Activity Park	12	15
RP11	Beef Farm Producer	15	26
RP12	Bakery	60	125
RP13	Fish and Chip Shop	9	16
RP14	Restaurant	11	30
RP15	Organic Farm	53	8
RP16	Brewery	2+	5
RP17	Food Condiment Manufacturer	80	200
RP18	Fish Can Processor	18	230

Source: Author generated

Table 6.1 shows the type of businesses engaged by the study; all operating in the same sector but noted to be providing different products and services as they comprised of retailers, manufacturers and producers. The Scottish food and drink businesses within this study are between the age of 2 and 150 years, and the number of employees working for these businesses range between 5 and 230 and fall under small and medium sized

enterprise (SMEs). Having identified the key characteristics associated with the participants, the next section will present the findings of the understanding of eco-innovations by participants.

6.3 Understanding of "Green" Issues

To provide and in-depth understanding of the businesses and their adoption of eco-innovations, the study decided to explore the perception of the participants on the subject asking general questions on what being "green" means to them. This was used to gain an assessment of how well the participants understood the concept of eco- adoption. The definitions ascribed as being "green" by the participants are presented in table 6.2.

Table 6.2: Definition of Green by Food and Drink Businesses

Research Participant	**Quotations on Green Definitions**
RP01	*"I think it's about having the right moral principles by which you operate and then being able to apply them in a manner that returns a profit and then sticking to those principles".*
RP03	*"Trying to be as environmentally friendly as possible, and as aware as possible to try and recycle, reuse, don't waste, switch off where possible and just try and be as aware as possible".*
RP04	*"Being green in my mind would be less waste, being more conscious of your resources"*
RP06	*"Green means that you are trying to recycle and do as little damage as you can".*
RP07	*"Being efficient in terms of energy, waste, how we do go about our everyday activities concerned with the business and also how we can reduce our*

	footprint, our impact in the community, in the UK, in the world"
RP09	*"I think green is showing the world of your providence"*
RP12	*"Organic, recycling, that's about it, we try to make everything healthier"*
RP15	*"Sustainability and I guess green means to me, not destroying the environment"*
RP17	*"Making sure what the company is doing is having the least impact it can on the environment and it also making sure we don't do anything illegally we shouldn't be allowed to do"*
RP18	*"Being green to me means being environmentally sensitive, so we try to recycle where possible, we reuse and try to source locally"*

Source: Author generated

From the responses of the participants, the study established that the majority of the participants identified with two main perspectives when reflecting on eco-adoption. First, from a waste perspective as established from the definitions quoted by RP03, RP04 and RP07 and from the moral obligation perspective. Those who associated green with taking the right actions and responsibility were such as RP01, 09, and RP15.

To further explore their understanding of "green", respondents were asked if they considered their business to be "green". Some of the respondents confidently considered themselves "green" and stated;

> *"We have been a green business before we even opened. From day one, when we opened here, we had no burners, no fossils fuels, no gas, nothing. We started on 100% local renewables and we are still with that same 100% local renewables. So, from the very first day one of our operation we have not in any way used any power*

or any energy that has had a negative impact on the environment, and that was easy, it wasn't difficult" [RP01- Restaurant].

"Yes, absolutely and that's because I have changed my thinking and my attitude in the last decade. I have tried by and large to abide by the quota so that's environmentally good, I have adopted and changed fishing method when opportunities were being denied me and regulations was choking me, then I looked for new opportunities, new ideas, new fisheries, that was reacting to an environmental change" [PR09- Primary Fish Producer]

Other participants justify their green status stating:

"Yes, I think we can call ourselves a green business, I don't see any reason why we shouldn't. I mean we weren't forced to adopt these practices, but we did because we wanted to". [RP10- Farm Activity Park]

"I think that we like to think that we are, and that we do a lot of the right things, but having said that, you know there is an environmental impact that in everything that we do, so how can we improve our environmental impact, you know we do what we do and that creates some packaging and some waste, but if everybody recycles then effectively we don't contribute any waste, but the reality is people don't all recycle". [RP03- Bottled water producer]

The responses from participants within this group show that the businesses have justified being green by stating how their business cares for the environment, or by doing a little extra by choice, and by reorienting their thinking and adopting more practical means to suit the business needs without harming the environment.

While majority of the participants consider themselves green businesses another participant was hesitant and did not consider themselves "green" but also noted their business to be

more active in the adoption of green practices when compared to similar businesses that have earned awards and recognition for doing less:

> *"I don't think we are, but I think that we should be. One of the things we want to do is get into awards and stuff like that, because you sometimes look at companies and go " that's crap, what we are doing is far more than that so we have been trying to see if we can enter into certain awards, because I think what we are doing is quite good and is worthy of getting recognition, but personally if you ask me, I would say no because it is what I should be doing" [RP11- Beef Farm Producer].*

Another participant rates their efforts to be average and does not consider the business to be "green" based on their current activities:

> *"No unfortunately. Within the company, our people and processes we always try and have efficiency savings, so I suppose our green attitude (like we recycle where we can etc.) so our green attitude I would probable say is average, but then down to our actual processes then we would be really low on a scale, unfortunately" [RP16-Brewery]*

6.3.1 Awareness, Views and Perception of Eco-innovations

Most of the participants provided some definition of what they considered "green", therefore the study sought to understand the extent to which participants understood and were aware of eco-adoption. Therefore, participants were asked about their business environmental impact, most participants were able to identify areas within their business activities considered to carry negative impact.

Table 6.3: Participant awareness of business impact

Research Participant	**Key Business Impact**	**Sample Quotations**
RP01- [Restaurant]	Packaging and Transportation	*"There is plastics and all those things that you need to use in the food business, packing bags are never recyclable because they biodegrade too quickly with the wet product in, so you know I would say packaging of internal waste would be our biggest impact, then second to that all of our customers and staff have to travel here by cars and that obviously has a massive impact"*
RP17- [Food Condiment Manufacturer]	Energy Waste Water use	*"the main areas of our impact really are 3, we have energy, we have waste and we have water. The energy has to do with what we are currently using and if we can control that it will be brilliant, because it will save us money as well as being environmentally sound. The waste side of it that's another area that we are looking at, what waste streams have we got in at the moment, what can we do to improve those"*
RP11- [Beef Farm Producer]	Power/Electricity	*"the power we use, we use a 180000 kilohours of power just to run this business and that's a huge amount of power, so yes we are having an impact in that"*
RP15- [Organic	Transportation	*"I think vehicles are the only things that still*

Farm]		*carry an impact"*
RP16- [Brewery]	Power/Electricity Packaging	*"Our electricity us, our packaging, and that's most of it really cause the rest of it is organic matter"*
RP18- [Fish Can Processor]	Water	*"we do use a lot of water, a lot of water comes in and a lot of it goes out, obviously it's not something we are lacking in the Northeast of Scotland"*
RP04- [Fish and Chip Shop]	Packaging Waste	*"Definitely the refuse, the packaging, because there is a lot of packaging involved in the takeaway side of the business, a lot of packaging involved in the goods coming in to be disposed of so coming in that's a big impact to some extent"*
RP06- [Food and Drink Inn]	Internal waste Electricity	*"Well I suppose I would say just anything we throw out, waste and electricity as well which clearly has a negative impact".*
RP03- [Bottled water producer]	Packaging Transportation	*"The negative part is that we do use consumables; you know bottles, glass, plastics. We have to transport goods around so there is a carbon foot-print around everything that we do, transportation whether its local, national or international that's a negative"*

Source: Author generated

From the impacts identified in table 6.3, most of the participants consider packaging, transportation and energy consumption to be their biggest forms of impact.

Not all participants considered their business to have some form of environmental impact. One participant felt that since the business had reviewed their transport operations locally, this meant they had no impact.

> *"I don't think so but maybe I have a lot to learn, for our transportation we only deliver within Aberdeen and Shire and we try to stay very local, we don't go beyond the borders of Aberdeen, we use to go further, but not anymore" [RP12- Bakery]*

Clearly, the consideration of environmental impact for this participant was viewed in terms of transport emission, not considering in-house business activities.

Another participant noted that the business had little or no environmental impact and attributed this to exposure and knowledge from external green organisations, which enabled the business to identify areas to improve their environmental efforts stating:

> *"It was more of a progressive thing, and it still is now, everyday something new comes up or out, new product or system in place. So, gas and electrical are both 100% renewable now, so that then changed my views, if it wasn't for doing the SRA (Sustainable Restaurant Association) I would have just been thinking otherwise". [RP13- Fish and Chip Shop]*

6.4 Importance towards Eco-adoption

After establishing views of "green" and general awareness-knowledge of eco-innovations by the participants the study moves on to explore the relevance of eco-adoption to the businesses. This was considered an effective way to gain deeper insight into the role "green" plays in the industry. The respondents were prompted with questions relating to their industry and whether thy considered eco-adoption a relevant issue in their industry.

Some participants agree that eco-adoption is highly significant and a global concern noting;

> *"I think it's becoming more so a concern for everybody because there is so much support there to do something about it, and I think that now institutions like the Scottish food and drink network they are all providing opportunities for businesses to up their game, whether that's award ceremonies, whether that's support in implementing green technologies, whether that's funding to implement green technology and all of that is very attractive I suppose to the new generation, and I think there is particularly here, there is a big shift in the mentality it". [RP01-Restaurant]*

In agreement, another participant states

> *"I think it should but it boils down to what the motivation will be for the businesses to go green. For me, I live in the land I want it to be here for my children and that's important to me but what I am able to do I am able to do either cost neutral or not at a huge amount of cost, so in terms of business we have shareholders who are looking for a return on their investment, so until it is either forced upon them by government, supermarkets or the customer is willing to pay more for that product they won't do it or there's no motivation for them to do it, its two extremes…. It's important to me, it's important to our industry and nation I think, but I think it will become more and more important as time goes on." [RP11- Beef Farm Producer]*

However, some participants held a more sceptical point of view on the issue and considered it more of an act of display rather than a genuine intention towards eco-adoption:

> *"Waste is an issue, but in reality, nobody gives a damn, or very few people give a damn, I will guarantee you 90% of the people don't give a damn, and we noticed when we have big corporate days here and I go around picking up cans of Coca-Cola with one sip out of them, that attitude prevails, every morning I work along the side and will pick up thrash that just been thrown out the window" [RP10- Farm Activity Park]*

One participant stressed the lack of understanding which makes it difficult for eco-adoption to be considered relevant stating:

> *"The whole food sector, the whole food and drink network is not clued up enough, they know its law but they have all got this mentality that they are using less than what they need to be using, so they don't understand it, and I think there is a fear fact as well, one would be price, they are scared that it would cost them more money, although general waste has come down in price cause it light now, its all light weight products, so it's gone from being an £18 a day to £9 wheel, but the food waste is expensive" [RP13- Fish and Chips Shop]*

Another participant felt it was important to the food industry due to changing trends.

> *"I think the problem with the food and drink industry in terms of waste is an endemic thing where societal values have changed and the number one priority is now to have a bigger house, no two is car, and so how you feed yourselves is not important, there's a common phrase now on how people spend so much on their house and car they have very little left for food and are down to a £5 left a week for food" [RP18- Fish Can Processor]*

Other participants attribute the relevance of eco-innovation adoption to delivering what the consumers want stating;

> *"No point being left with a high-end product and wasting money it's not viable or being held with the low value, it's really up to the consumer to say what they want, so it is a challenge for every company to try and tick all these boxes, but we have to if we want to survive". [RP12-Bakery]*

> *"Well I think it's all driven by the consumers wishes and desire, they are probably responsible for some waste because they only want the best" [RP09- Primary Fish Producer]*

The views taken by the above participant suggest customers facilitate waste along the food and drink chain and can influence a positive reduction of such waste if they want to. The next section presents the findings on the forms of eco-innovations adopted by the interviewed participants.

6.5 Forms of Eco-innovation adopted

The categorisation of eco-innovations created from the study in chapter 5, will be applied within this chapter to determine the forms of eco-adoption undertaken by the 18 participants within this study. The results are presented per category in a table showing the different eco-innovations being adopted by the participants. The forms of adoption are presented below.

6.5.1. Waste Management

Ninety-four percent (94%) of the participants engaged in one form of waste management effort or the other as they were actively involved in the planning and sorting of the various wastes being generated by their business. Interestingly, waste management efforts by the participants indicate recycling to be the most popular form of adoption with 89% the businesses adopting as shown in table 6.4. Other popular forms also include reuse with 44% and composting with 39% of the participants as adopters.

Table 6.4: Waste Management Adoption Activities

Waste Management						
Participant	Reduce	Reuse	Recycling	Composting	Zero landfill	Waste conversion
RP01	X	X	X	X	X	X
RP02			X	X		
RP03		X	X			
RP04			X			
RP05		X	X			
RP06			X			
RP07	X		X	X		X

RP08		X	X			
RP09						
RP10		X	X	X		
RP11			X	X		X
RP12		X	X			
RP13			X	X	X	
RP14			X	X		
RP15					X	
RP16			X			
RP17		X	X			X
RP18		X	X			

Source: Author generated

Eleven percent (11%) of the businesses noted they reviewed their waste and decided to embark on ways to reduce their waste where possible through innovations that enable them to manage their waste more effectively and even generating extra income by disposal of waste, as stressed by one of the participants below:

> *"So, we looked at the rubbish and said what can we generate for us as well as our incomes, so we do, for a number of years now, probably 13 years we have compacted and compressed our cardboards and now we sell that on in bails so we are having a small income from our waste" [RP07- Dairy Producer]*

The reuse of waste is adopted by 44% of the participants, especially for waste that is non-recyclable and will have to go to landfill, an example of reuse by a keen participant is stated below:

> *"We no longer buy polystyrene boxes in our smoke house, we take the waste, reuse it and send it back on, and if more businesses did that, these boxes are fit for reuse for several uses, that would have a huge impact." [RP01-Restaurant]*

The recycling efforts noted by some businesses include their efforts in sorting and separating the various materials from glass, cardboard, food waste and the general non-recyclable waste as confirmed by a participant:

> *"Cans, juice tins, bottles, plastic bottles, food waste, scraps, we recycle cardboard as well, glass as well, but we just take that up the road, and then everything else just goes to the general waste" [RP04- Fish and Chip Shop]*

Another participant describes their application of composting on the farm as an effort to minimise the waste from the business:

> *"We are taking different principles, using lots of compost, which comes from here, so all our food is then composted, we create between 50- 100 tonnes of food grade of food waste per annum, which is then converted into food grade compost and we take about 2,500 tonnes back to the farm to spread on the land, and what that's then doing is we are putting on about 10 tonnes a hectare of the compost over arable land and that's reduced us from using P&K sulphate and potash, as bagged man-made fertilizers so in terms of our green credentials in fact it acts as a soil conditioner, improving our soil as well as our carbon footprint". [RP11- Beef Farm Producer]*

A keen participant and eco-innovation enthusiast notes how the business has achieved a huge saving through its waste conversion efforts which ensure the business does not create any waste, as all forms of waste generated is harvested and converted to generate water and heat for the business use, ensuring zero waste to landfill as stated:

> *"we harvest all of our waste and convert that into heat and hot water, so that's one of our main green things, now that is a huge impact, a business of this size to generate its heat and hot water for, I mean we use thousands of litres of water for; dish washing, for all the public facilities, for hand washing, there's a massive load of things and so our main saving for the environment is that we don't use any energy to*

produce them, it all is done from our waste and so that's a huge impact" [RP01-Restaurant]

17% of the participants were found to be adopters of zero waste, while 22% confirmed the adoption of waste conversion methods. Having looked at the waste management innovations the next section will present the findings on energy management adoption.

6.5.2. Energy Management

Energy management refers to the means by which the participants adopt eco-innovation aimed at reducing and cutting down on their business energy consumption in a manner that saves the business money and is also safe for the business environment in which they operate. Among the categories developed within chapter 5 under the energy management theme in section 5.2.2, seven energy eco-innovations were found applicable to the participants as highlighted in table 6.5. Details on the adoption of each green energy innovation is further discussed below.

Table 6.5: Energy Management Adoption Activities

Energy Management							
Participant	Heat recovery	Solar	Wind Turbine	PIR Sensors	Monitoring	Reduce consumption	LED Lightning
RP01	X				X	X	X
RP02							
RP03						X	
RP04				X			
RP05							X
RP06						X	X
RP07				X			X
RP08					X	X	X
RP09							
RP10		X	X				X
RP11						X	

RP12							
RP13					X	X	
RP14							
RP15	X						
RP16							
RP17			X				X
RP18							X

Source: Author generated

Some of the Heat recovery innovations adopted by the businesses include; bio-digester, biomass, wood chip boilers, all of which are renewable and more sustainable sources of energy. Sixty-one (61%) of the businesses were found to be adopters of one or forms pf energy eco-innovations. One participant details how their choice to adopt green energy began from the moment the business was open ensuring their energy processes were based only renewable sources stating:

> *"We started on 100% local renewables and we are still with that same 100% local renewables. So, from the very first day one of our operation we have not in any way used any power or any energy that has had a negative impact on the environment, and that was easy, it wasn't difficult. We put in our heat recovery systems so that we generated all of our own heat and hot water" [RP01- Restaurant]*

A participant describes the initial difficulty they experienced when looking to adopt Solar for the business, as most of the sources they came in touch with were not reliable and this resulted in a delay as it took much longer to adopt the innovation but they eventually found a reliable source and finally adopted the use of Solar for the business stating:

> *"the solar panel was an interesting one cause I would have liked to have had them a few years ago but I couldn't find a company to deal with whom I felt I could trust,*

> *cause there are guys in shiny suits that will tell you anything, but they are just a bunch of rascals, and eventually I found a guy in Alford who is an electrician, also a farmer, who put a 50 kilo watt of solar on his own farm and he helped me, I know that in 2 years' time when there's a problem he will still be there" [RP10- Farm Activity Park]*

Six percent (6%) of the participants were found to be adopters of solar as a form of managing their energy use in a more environmentally friendly way.

One business acknowledges that after reviewing their energy usage, it considered ways to cut down its impact and be an eco-friendlier business, it was prompted to invest in greener innovations such as wind turbines stating:

> *"The measures that we have already put in place such as our energy use, there are 2 turbines we have in place at the back, everything produced from those turbines come directly to here for us to use. Over the last few years we looked at how we could do that in an environmentally friendly way so that's why the turbines came in and the bio-mass boiler, from an energy point of view for the emissions and the impact" [RP17-Food Condiment Manufacturer]*

Eleven percent (11%) of the participants were adopters of wind turbines.

In a bid to monitor their electricity usage more efficiently and cut down on costs, one business owner decided to adopt the use of key fobs for their lodges to ensure use only when needed:

> *"The key fobs for the rooms operate with the electric and so no lights switch on until you put the key in, but when you leave the room, you have to take the key with you, so the lights go off, which is a great thing, and what we also plan to do is put in the motion light sensors in the corridors and fire escapes, because otherwise they are on all the time" [RP08- Hotel]*

Similarly, the adoption of passive infrared sensors (PIR) by 11% of the businesses is considered an effective way to cut down on electricity usage within the business:

> *"our lights are on a timer, a sensor even, so if there's period of the day where there is no one out here sitting, the lights will go off, through the back and in the storage as well". [RP04- Fish and Chip Shop]*

The conscious effort to reduce consumption taken by 33% of the participants also facilitates the green effort as every little counts' towards minimising the use of energy while saving the business cost. The importance is as emphasised by participant RP03 below:

> *"the other thing is being economical, you know not wasting, switching things off, switching machines off when we are not using them, and not having heaters on and the windows open at the same time, you know stuff like that it's just trying to be as aware as we can" [RP03- Bottled water producer]*

The adoption of energy efficient LED Lights is increasingly gaining popularity within the business environment with 44% noted to be active adopters. In regard to future adoption of this eco-innovation a participant notes:

> *"We are looking at LED light, we have some trial LED in one area of the shop, so we are doing that just to see where we can minimise the electricity bills" [RP07- Dairy Producer]*

The next section identifies the forms of eco-innovations relating to green supply chain management adopted by the research participants.

6.5.3. GSCM

Sub-categories of green supply chain management (GSCM) captured in table 6.6 indicate that few businesses are involved in the use of these efforts, Participants indicated their involvement in sourcing locally, sustainable packaging and green purchasing, the overall

adoption effort by the participants was moderate with 50% of the research participants adopting some form of green supply chain management eco-innovation.

Table 6.6: GSCM Adoption Activities

GSCM						
Participant	Local sourcing	Sustainable packaging	Traceability	Supplier / Customer Engagement	Ethical Sourcing	Green Purchasing
RP01	X			X	X	X
RP02						
RP03		X				
RP04	X					
RP05						
RP06	X					
RP07						
RP08	X					X
RP09		X			X	
RP10						
RP11	X					
RP12						
RP13		X	X			X
RP14						
RP15						
RP16						
RP17		X				
RP18						

Source: Author generated

The decision for businesses to engage in local sourcing is considered an effective way to minimise the business trading impact along the supply chain, as the lower the miles and distance, the lower the environmental impact generated. With 28% of the participants as adopters, local sourcing is considered a way to boost support for local markets and farmers and enable a more sustainable local market as noted by a participant below:

> *"Our sourcing of course is very critical, you know, I will have vegetables delivered here, they were picked this afternoon seven (7) miles off the road and its one lady, on a farm, picking them by hand , delivering them in a tiny little vehicle in plastic cases that she takes away, they are not coming in cardboard boxes, they are not coming in polystyrene, they haven't been on a lorry or on a motor way, they didn't come from Spain in an aeroplane over the night, its one local lady who is supporting her family, now that compared to buying from a Veg wholesaler, so its local, it's got really low impact on the environment" [RP01- Restaurant]*

Over the years, environmentalists have stressed on the need for more sustainable packaging (Garcia-Arca et al. 2014) which not only meets the functional needs of the business but also has a reduced environmental impact and improved footprint resulting in the creation of greener packaging innovations like the 100% recyclables and the compostable packaging materials, 22% of the participants noted adoption of this eco-innovation. One business notes the use of such stressing:

> *"A lot of packaging we have got on the shelves is compostable, we do a lot of outside catering events as well and all the utensils and products we use out there are all compostable" [PR11- Beef Farm Producer]*

Traceability is considered an effort that enables the effective monitoring and tracking of the processes and channels through which the goods and services of business pass (Engelseth et al. 2014), traceability enables transparency along the supply chain, detailing where the product has come from, distance travelled, and provides for a better understanding of the environmental impact linked to a product, some businesses highlight their product traceability to show customers how they are improving their environmental impacts as a business, the findings indicate a low rate of adopters for traceability with only 6% of the participants accounting for the adoption of this eco-innovation, however an enthusiastic adopter of this eco-innovation relates how the business integrates this within their processes stating:

> *"What we have done is create an app with a little story about us, click on the menu and its linked to screens in the shop, so I can change the details on my handheld and it will reflect on the digital screen at the shop, so it tells you what boat the fish is from, where the potatoes are from and every product, so if you click on for instance the boat, it comes up with a map, 3 pins, top pin tells you it comes from the Peterhead market and its MSC certified, 2nd pin says it goes to get processed in Aberdeen, and the 3rd pins says todays fish is from that boat, and then say for instance product is Scampi, it has two pins on it, bottom pin tells you how many calories, and the top pin tells you it's from that boat, its giving the traceability of every product" [RP13- Fish and Chip Shop]*

Supplier and Customer Engagement is also considered within green supply chain management as an effective way to communicate green concerns and needs to the suppliers, and facilitate collaboration along the supply chain, while also communicating green improvements to the customers (Homburg et al. 2013), 6% of the participants accounted as adopters of this eco-innovation. An optimistic adopter acknowledges how this is applied by the business stating:

> *"I try to encourage some of our suppliers where we can to give us stuff that we can recycle, so some of that packaging goes back into the food side of things if its compostable" [RP07- Dairy Producer]*

Eleven percent (11%) of the participants confirmed the use of ethical sourcing. The process of ethical sourcing ensures the procurement of goods from suppliers within the supply chain in a responsible, fair and sustainable manner without negative impact on the business environment of the end-suppliers. This has resulted in many businesses disclosing labels and tags on their products that declare such compliance, for instance one participant notes:

> *"all of our coffee is fair trade, rain forest alliance friendly, slave free foundation, all of our cakes are fair-trade" [RP01- Restaurant]*

Green purchasing is adopted by businesses that are keen to promote trade in products that have minimal negative environmental impact when compared to other conventional type products, 17% of the participants were found to be adopters. One participant details how this is adopted with their suppliers:

> *"All our suppliers are given a SQAT (supplier quality assurance questionnaire), which says to them, when there an initial product coming in, basically it will re-assesses them to make sure it's not just the product doing what we want, but making sure the supplier are the sort of people we can go with longer term and also we question if they have an EMS in place and if is it certified, so those questions are asked in our audit of the suppliers and then depending on the sort of response we get from them our purchasing team will decide on whether we can go with them or not" [RP17- Food Condiment Manufacturer]*

The next section presents the findings on the carbon footprint eco-innovations adopted by the participants.

6.5.4. Carbon Footprint Management

Carbon footprint management considers the measures and strategies adopted by the participants to reduce the overall emissions generated by their business activities. Prominent measures adopted by the participants include; logistics management, eco-efficiency and low product miles. The use of low product miles is the most popular theme adopted within carbon footprint management. Fifty-six (56%) of the businesses indicated this as a way to cut down their footprint as presented in table 6.7.

Table 6.7: Carbon Footprint Management Adoption Activities

Carbon Footprint Management			
Participant	Logistics Management	Eco-efficiency	Low product miles
RP01	X	X	X
RP02	X		
RP03			
RP04			
RP05			
RP06	X		X
RP07			X
RP08			
RP09		X	
RP10			X
RP11		X	X
RP12	X		X
RP13		X	X
RP14			X
RP15		X	
RP16			
RP17			
RP18			

Source: Author generated

As seen from table 6.7 the adoption of carbon footprint innovations is not widely implemented by the businesses with only fifty-five percent (55%) evidenced as adopters of one or more forms of eco-innovation and forty-four percent (44%) of the participants as non-adopters of carbon footprint eco-innovations.

Twenty-two percent (22%) of the businesses adopt different measures to facilitate an eco-logistics management process. A participant notes the adoption of routing the delivery

vehicles as a way to cut down on the doubling back of trips which creates a negative impact for the business stating:

> *"What we constantly do but maybe not enough is try and route out the drivers so that we are not doubling back" [RP12- Bakery]*

The adoption of eco-efficient measures that consider aspects within the business that could significantly impact the emissions of their operations was found to be adopted by 28% of the participants. This requires the regular review of the business activities to ensure efficient measures are taken towards inbound and outbound activities:

> *"I look at every aspect of every commodity used within, bought in, and goes out, so whether it goes out with the customer in the hand or goes out as carbon from spent gases, everything you know. 89% of the produce used in this shop is within a 50-mile radius of the business, so food miles and carbon footprint are very important for me" [RP13- Fish and Chip Shop]*

Ensuring the mileage on their goods and services stay low is considered very important by 44% of the businesses looking to stay green, therefore much emphasis is placed by the participants on sustaining low product miles which also minimises their carbon footprint as noted by one of the particpant:

> *We use local produce, its local meat fish landed off the boat, it's all local it's not stuff flown in from abroad. So, all our food and drink suppliers are all local. I also try to minimise the carbon foot-print on deliveries by picking up the items directly from our local suppliers on my way to work, that way they do not have to deliver to the business". [RP06- Food and Drink Inn]*

Having looked at the forms of carbon footprint adoption, the next section moves on to discuss ways in which eco-innovations are embedded by the businesses.

6.5.5. Embedding Green

As noted in Chapter 5, the study sought to identify how eco-innovations being adopted by the businesses were integrated into the business. This was determined by looking at the internal and external green efforts of the businesses in the classification of a category called "Embedding Green". A breakdown of the sub-categories to Embedding Green and the extent of adoption by the participants are presented in table 6.8.

Table 6.8: Embedding Green Activities

Embedding Green									
Position /Stance/ Ethos					**Engagement and Internal**				
Participant	Green Policy	Green Statement	Values		Employee Training	Outreach		Accreditation Certification	Green Recognition Award
RP01	X		X		X	X		X	X
RP02	X				X			X	X
RP03			X						
RP04		X	X						
RP05									
RP06									
RP07	X		X		X				
RP08			X						
RP09		X	X						
RP10	X		X					X	X
RP11	X		X			X		X	X
RP12									
RP13	X		X		X	X		X	X
RP14									
RP15	X							X	
RP16			X						
RP17	X					X		X	
RP18		X							

Source: Author generated

6.5.5.1 Green policy

Green policy refers to the environmental commitment made by businesses towards ensuring the business abides by the laws and legislation relating to environmental issues. Mostly, a policy will include details of the sort of environmental practices and activities the business is engaged in. All participants were asked if they had an environmental policy, and forty-four (44%) indicated they did. Some participants showed the researcher documents which detailed the environmental policies and stance of the business, one of such participants went further to elaborated on their green policy stating:

> *"We have a really strong environmental policy; we have a green file here that details all the information on the business regarding simple things from our chemicals that we use and all of the data sheets that define how good they are. So, our implementation and policies are all in there, all the various things that we have done or those we are doing, all of the recycling, we have a pretty strong commitment to being a green business and making sure that all the staff are aware and are doing the same things" [RP01- Restaurant]*

Another participant notes having a green policy available on the website, but also noted it was mandatory for employees to know the business green policy and they were occasionally tested to ensure they fully understood the position of business on green issues:

> *"Yes, and its mentioned on our website, our policy is part of our staff induction, so all staff have to know about our environmental policy about our beliefs, about the fish and they have to do a quiz on MSC sand stuff so it proves they have got an understanding of it". [RP13- Fish and Chip Shop]*

Other participants noted as having green policy confirmed this was readily available to view on their websites (this was later verified by the researcher by visiting the websites).

6.5.5.2 Statements

While some of the businesses acknowledged not having a green policy, seventeen percent (17%) of these were able to verbally provide statements that reflected their position and commitment on green issues; citations on some of the verbal statements are provided below:

> *No, we don't have one. But we support the local fishing to sustainability standards, and just try good practice" [RP04- Fish and Chip Shop]*

> *"The policy would be to show to the world that we are fishing sustainably, and we take our stewardship seriously, because probably again, this comes with maturity and age, you do understand that you have got to leave for tomorrows children, you cannot be greedy and fish everything, I think what we have got to be doing more is making sure we are protecting the juvenile stocks, cause the juveniles stocks is tomorrows fish, so you do not want to be wiping out the baby ones before they are even at a mature age to breed or to be next year's catch. So yes, we definitely have a policy, though maybe not a written down policy but it's certainly a policy that is in our minds and thoughts". [RP09- Primary Fish Producer]*

6.5.5.3 Values

Fifty-six percent (56%) of the participants indicated to a reasonable degree that they consider green issues to be relevant and of high importance in today's business environment. While this section briefly highlights the facts relating to participants who indicated their value of "green" as presented in table 6.8, there are further discussions presented within section 6.4 detailing the level of importance placed on eco-adoption by the participants.

6.5.5.4 Employee Training

Employee training is considered an effective way by twenty-two percent (22%) of the businesses to embed green thinking within the workplace particularly for the employees, as

one participant notes the initial difficulty encountered when training the workers on how to sort the recycling waste, but stressed the effectiveness of repeated training as a means of helping them adapt to the process stating:

> *"It's like driving a super-tractor, if you want to turn right, it takes a long time, but once it's gone right or whatever direction you want it to go, it's fine. So, it's repetition, repetition and repetition and sadly that's all there is to it, and little by little they will take it on. I would like to think the young people will be more aware than the mature ones but no, they are worse off when it comes to sorting the recyclables. And as for composting, I pick out forks and spoons and all sort of things that shouldn't be in the compost bag. For example, up until now, we have had to buy in our lettuce and it comes in a cellophane bag, so this one had been sitting a bit long so it was going a bit off, so they put it in the composting bin, but they left it inside the cellophane bag, I mean how annoying is that? It really is an on the job training, because it's an ongoing project, Now I can hardly find a can or bottle in the wrong bin now, but you know this is 10 years later of repetition and repetition, and so now they have mastered their recycling routine" [RP10- Farm Activity Park]*

Another participant notes the active engagement of the employees in a green training course which not only trains them in how to be green, but also helps them understand the importance of why the process is done that way, thereby fostering green education within the workplace:

> *"We have training classes for the workers, we educate them about what bins to use, about food waste, about food waste bags, what it all means, what it's all about. So, we have trainings, staff are trained before they start work, when they get an induction, it's called "Green Friend training", which is run as a yearly refresher" [RP02- Food and drink catering services]*

One business cites the use of training, but also uses rewards as an incentive to encourage employees to think and foster "green" within the business:

> *"It depends on the training they get from the start, if you just put the bins in and expect them to do it it's not going to happen, but if you put the bins in and explain to them what's going on and where it's going and why it's going there you get better compliance. Another prime example as well is I tell them if you come up with a good idea as well I will reward you and it serves as an incentive for them to come up with ideas that reduce our waste and trying to be more conscious of their actions, and you are not going to know and see everything so you want to tap into the brains of the youth as well, they think on a different level and they are new up and coming and things evolve all the time". [RP13- Fish and Chip Shop]*

6.5.5.5 Outreach

Outreach is seen as the efforts made by the businesses in engaging the community in their green efforts. This also helps to raise awareness of the adoption of eco- innovations by the businesses with twenty-two percent (22%) of the participants confirming adoption. A participant notes the use of highlighting their efforts using visual materials that can easily captivate the visiting audience:

> *"We tell the stories like, on the blackboard, we do a lot on our menu, so we change little things on the menu, so we say on it things like" this menu is printed on a 100% recycled paper and we are a low carbon business, and we have little messages everywhere that we can, and then our website is quite good, we do a lot with social media posts about it, and gradually people learn these stories" [RP01- Restaurant]*

Another participant notes the use of an open-day event to share their green story and enlighten attendees:

> *"I think just letting people know, just the fact that we are doing trees, we are doing hedgerow, we are doing wild bird seed mixing, we have an open day this Sunday and*

we intend to self-advertise our green credential on that day as well" [RP11- Beef Farm Producer]

Other participants use outreach as a means to educate other interested businesses or individuals. They also have available a digital board instore to inform customers about their food, where it comes from and the business green credentials stating:

"I am a trainer for the range manufacturers, so I am quite involved. I have got an open-door approach, I mentor 3 of them last year and I let them come and work for me for free so they can get a different perspective and understanding, and I teach them about sustainable fishing, about environmental policies things like that, so they go away they are captivated, if they go away with one or two ideas then its positive. On the walls we have digital screens, so what we do is we have got like carbon footprint up there, MSC and I have also got an app for the shop so you can download it on apple or google and what it does is try and make the website informative because its more interesting to people if its nibs and bits of information about environmental stuff within the business" [RP13- Fish and Chip Shop]

The use of questionnaires by businesses is also a form of outreach as one participant circulates questionnaires to their customers, asking about their green activities, which in turn they also use with their suppliers as an effective means of acting on feedback and giving the customers what they want:

"Every year we have customer questionnaires come in, asking what we are doing, are we reducing our impacts, what we have done recently, a bit like some of the questions you have asked, some of the customers ask this of us and we ask that of our suppliers as well." [RP17- Food Condiment Manufacturer]

6.5.5.6 Accreditations, Certifications and Memberships

Participants were asked about how they stayed informed on eco-innovation and if they had accreditation or certification with any environmental bodies, thirty-nine percent (39%) were found to be actively involved. In relation to their sources of green information, participants also identified with diverse sources including social media outlets, as quick ways to catch up on the latest eco-innovation and general food and drink associations:

> *"Aberdeen Grampian Chamber, we are members of Grampian food forum, members of Grampian food federation, so all the different bodies who will give you different strands just to keep you abreast" [RP18- Fish Can Processor]*

> *"We stay updated through Scottish Enterprise" [RP05- Fish Processor]*

> *"Generally, through social websites like face book, there are a few signs and pages I follow, they have always got sort of eco-innovation on them and so generated on line through face book that sort of thing". [RP16- Brewery]*

> *"Through the industry groups, the food forum, but there's also no shortage of information these days, twitter face-book, everything". [RP14- Restaurant]*

> *"We just really depend on letters from the likes of the council or TV adverts" RP06 [Food and Drink Inn]*

> *"We rely on information from the government" [RP09- Primary Fish Producer]*

In terms of their green accreditation and certification, most participants identified with a variety of associations and organisations such as:

> *"The Carbon Trust" [RP01- Restaurant]*
>
> *"LEAF (linking environment and farming)" [RP11- Beef Farm Producer]*
>
> *"The soil association license, level 2 member of the WES (wildlife estates), QMS, FSQC," [RP15-Organic Farm]*

and having certification based on:

> *"ISO140001 standard for environmental management systems" [RP17-Food Condiment Manufacturer]*

6.5.5.7 Green Recognition Award

Among the participants, twenty-eight percent (28%) stood out for achievements from their green efforts and eco-innovation adoption. The participants acknowledge recognition and awards received due to their business environmental innovation and some citing how such recognition has increased their customer base:

> *"As you can see we have won a lot of awards, in just two and a half years we've won around 14 different awards for the business. So, we have the Gold green tourism award, we have an eat safe award, that recognises us as an exemplary business with regards to food hygiene, we have 9 great taste gold awards for our products, we won the best fish and sea food products in Scotland in the Scotland food and drink excellence award, so that generates interest, when people come they ask more, they see more, they come back they notice a bit more because their eyes are a bit wider open" [RP01-Restaurant]*

> *I just wrote a press release yesterday from the green awards so we try to keep our name on the forefront" [RP10- Farm Activity Park]*

> *"Sustainable Restaurant Awards opened a bit of a door and it made me think actually this can be done, so I entered Scottish green awards and also won, it gives you a bit of fire in your belly to prove a point" [RP13- Fish and Chip Shop]*

One participant notes their intention to start participating in awards to create more awareness and publicity about the business effort, as they seemed to be doing more than some businesses who had earned green awards:

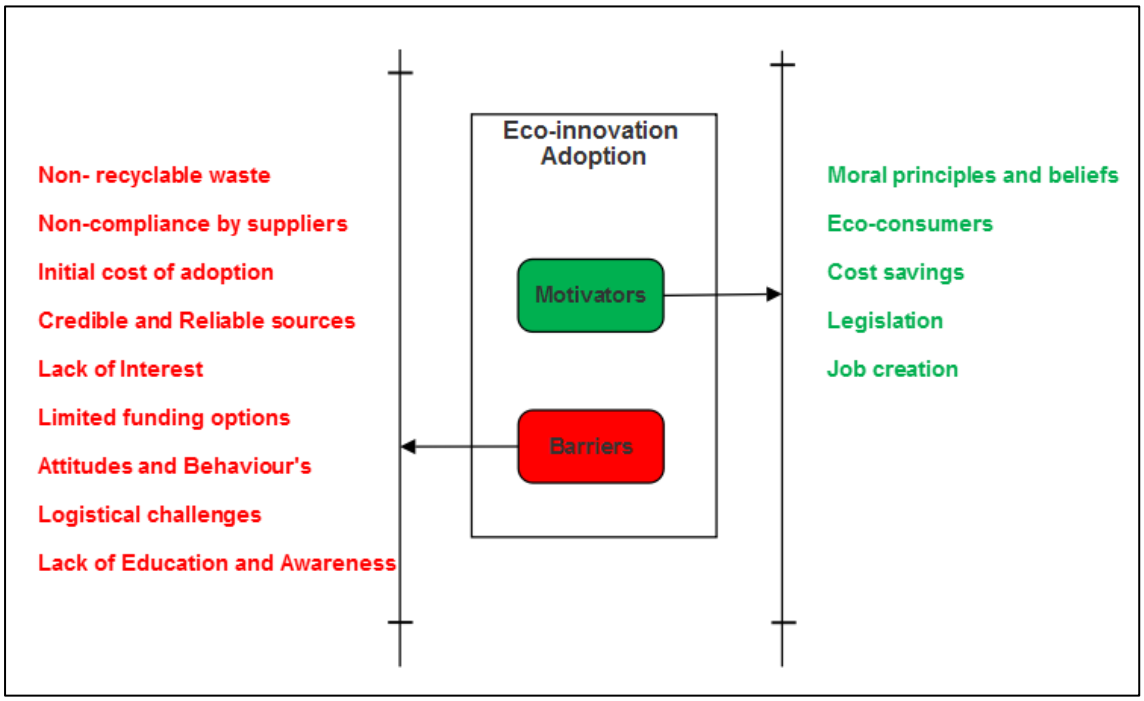
> *"One of the things we want to do is get into awards and stuff like that, because you sometimes look at companies and go " that's crap, what we are doing is far more than that so we have been trying to see if we can enter into certain awards, because I think what we are doing is quite good and is worthy of getting recognition" [RP11-Beef Farm Producer]*

Having looked at the forms and extent of eco- innovation adopted by the participants, the study moves on to understand the motivators and barriers associated with adoption of these eco- innovation, these will be explored within the following sections.

6.6 Motivators and Barriers to Eco-Innovation Adoption

Participants were asked about factors they considered to be motivators that encouraged their adoption of "green", and they were also asked about factors that were considered barriers and obstacles to eco-adoption. The findings suggest more barriers exist to eco-innovation adoption than motivators and these factors are depicted using in figure 6.1 drawing on the force field technique to illustrate driving factors for and against the adoption of eco-innovation.

Figure 6.1: Motivators and Barriers to Eco-innovation adoption



Source: Author generated

6.6.1 Motivators to Eco-adoption

This section presents the findings from the participants on the key factors that have motivated their businesses to adopt eco-innovations, these are illustrated using direct quotations from the interviews.

6.6.1.1 Moral Principles and Beliefs

When prompted on what encouraged the businesses to adopt eco-innovation, sixty-five percent (65%) of the participants identified with being motivated by their principles, and the need to do what they considered to be morally right by the environment. Some quotations are presented below on the moral principles and beliefs of the participants:

> *"We don't do it because we care about feedback, tariffs and the government, we haven't tried to exploit any technology that there are specific rewards and grants for, what we've done is, done it because it was the right thing to do" [RP01- Restaurant]*

> *"It made sense, it was the right thing to do, I wanted to do the right thing to protect the environment". [RP03- Bottled water producer]*

> *"I think common sense shows you that you need to adopt a certain amount of green practices. I mean before we became smarter with gear, you would go into an area and take up a huge amount of small fish, you just discarded it, you didn't even think about it, you just let it go, but its later that you realise that that 20 boxes you just dumped, if they were the size they would be 80 boxes. So just common sense tells you that you need to adopt better practices but not everyone is like me." [RP09- Primary Fish Producer]*

6.6.1.2 Eco-Consumers

Consumers keen on green products and services is identified as being a huge driving factor among twenty-three percent (23%) of the participants who acknowledged wanting to key into such clients as stated below:

> *"There are eco tourists out there, they travel the length and breadth of the country and the biggest thing for them is seeing environmentally sensitive businesses, people who care about local food, they are paying 10-12 pounds more per visit to see that kind of stuff than a regular tourists, and you know the fact that we have won the gold green tourism award is quite helpful because they see us on the websites like the visit Scotland where we are the only gold green tourism business in this region" [RP01- Restaurant]*

Another participant highlights how their adoption of eco-innovations has always distinguished them from their competitors and attracted eco-consumers stating:

> *"We did a survey about 8-9 years ago around Christmas time, and one of the questions was, why do you come to us, what are food miles, nobody knew what food miles were and literally within a year to 18 months food miles was the buzz word, the fact is we have always been aware of it and its always been something a point of difference that we can as a product we can sell, we can certainly do one better than a lot of our competitors". [RP11-Beef Farm Producer]*

In addition, one participant notes how the drive for eco-innovation is in high demand by consumers and as businesses they have to meet the requirements stating:

> *"I think the world has become very environmentally friendly, people want to see that you are adopting green practices as a company, and there is nothing you can do but comply". [RP02- Food and drink catering services]*

6.6.1.3 Cost savings

The cost saving benefits also associated with eco-innovation, some short term and others long term are also considered an attraction for the businesses with fifty-five percent (55%) citing it as a motivator to adoption. Any innovation which saves the business money will no doubt increase its profitability, some quotations evidencing such cost saving instances are provided below:

"Well it was partly economic because we had, Charolais cattle which are physical really big animals and eat lots of food so we couldn't keep growing our food and try to pour fertilizer on the ground to keep growing our food and still losing lots of money, so I went back to native breeds and they utilize non-fertilized materials better and it's an altogether better way of farming" [RP15- Organic Farm].

It probably saved us some money in terms of our waste disposal and it's made everybody within the business more aware of our own waste generation and our impact" [RP03- Bottled water producer]

"Business decision wise, when you look at what you do, from a green point of view you can also have benefits by looking at what you are doing from the energy usage, waste reduction of our cost, so it does have a cost side to your business… you can turn around and say if we are seen as an environmental or green business do people then start using us more because they adopt the same philosophy, so again this being boiled down to bottom line, how can it fetch you a business, reducing cost also maybe increasing income". [RP07- Dairy Producer]

Another participant cited savings achieved through the adoption of biomass technology and an improvement in the lifecycle of their soil through composting stating:

Well, in terms of the Biomass at the end of the day it improves our cost of production and that's a positive thing with profit, in terms of the compost it going to improve our soil conditions, so that means it will be in good health for the next generation" [RP11- Beef Farm Producer]

6.6.1.4 Legislation

Seventy-five percent (75%) of the participants acknowledge that their adoption was driven by the introduction of waste reduction legislation for which companies could face a penalty for non-compliance. This resulted in some businesses taking pro-active steps to commence the

process of reducing their waste before the legislation became enforced as noted by some of the participants below:

> *"There was legislation introduced so we decided to start early, just to get into the habit of it before the legislation was enforced". [RP04- Fish and Chip Shop]*

> *"The legislation would indicate that you must." [RP06- Food and Drink Inn]*

> *"We try to recycle as much food waste as we can because there is a new law that has come in, I think it's this January it comes in where you can use a food waste disposable, so we are trying to get our guys educated as much as we can into recycling the food waste rather than offering people takeaway, and if we do offer takeaway it needs to be in the takeaway boxes, which are all compostable". [RP02- Food and drink catering services]*

6.6.1.5 Job creation

One participant acknowledged the creation of new employment opportunities associated with eco-adoption and considered this an economic win as well as environmental.

> *"It's been very encouraging to adopt these initiatives, and again it has created jobs, people come on board the company with specific roles towards the environment, PR people, Green CR roles, so it is beneficial to the workforce and employment as well". [RP02- Food and drink catering services]*

Having looked at the factors motivating the businesses to adopt eco-innovations, the next section presents the findings on the factors hindering the businesses adoption of eco-innovations.

6.6.2 Barriers to Eco-adoption

While the participants indicated factors that have encouraged them to adopt green, they also indicated several factors which they considered to be barriers to their efforts to going green, citations relating to these factors are presented in the following sub-sections.

6.6.2.1 Non-recyclable waste

One of the difficulties faced by eco-innovation adopters is when dealing with non-recyclable waste as it impedes their efforts to achieve total eco-adoption. One participant expresses their frustration at this barrier stating:

> *"We receive a lot of polystyrene chilling boxes with products that need to be chilled and most businesses would receive them and discard them into general waste, we keep all of those polystyrene boxes and reuse them because they are inherently very bad for the environment. People could half the use of the polystyrene boxes if they re-used them. But you know it is the thing that I think is probably the worse area but it's almost unavoidable until the whole industry changes its approach to it [RP01-Restaurant]*

6.6.2.2 Non-compliance by Suppliers

Thirty-eight percent (38%) of the participants identify the non-compliance of suppliers to be an issue that affects their eco-adoption process, especially when they have no control over such suppliers and are unable to enforce compliance on their part, some instances are cited below:

> *"If I am being perfectly honest I think these green initiatives such as recycling although good are kind of treating the symptom as opposed to treating the cause, it's the same as in regard to supermarkets and stuff, we talk about recycling, well the emphasis is placed on the consumer to recycle as opposed to producer to reduce packaging waste etc" [RP04- Fish and Chip Shop]*

> *"A lot of the time I suppose they could do, but it's being able to force them to do that and if you are just one as a buyer saying they should reduce the amount of cardboard that you put in your packing to me, they will probable say yes but they are not going to do it unless all or majority of their customers start saying that and then*

they can see a benefit from their business or marketing point of view". [RP07- Dairy Producer]

6.6.2.3 Initial Cost of adoption

Cost is a major factor considered by seventy-five percent (75%) of the businesses as a barrier to the adoption of certain types of eco-innovation. In many cases these relate to the adoption of high technological eco-innovation especially within the renewable energy options and though there are options for incentives and tariffs offered by the various government schemes, not many businesses are able to afford the initial cost to engage in such schemes as noted below:

"When it comes to the big things like biomass, solar panel or wind turbine, big investments involved there, so the government support systems that are in place, tariffs and renewable heat incentives of course make perfect sense. it all makes sense but you have still got to pay for it in the first place and worse than that, the turbine is the worst of all, so for example if it's a £100,000, you spend it and sure the theory is that you produce electricity and so you save on your electricity bill, you export some of your electricity so you get paid for that as well and of course you get the support subsidy payments, but you don't really get that, it was at least 10months before we got the first payment and you've still got to pay the cost in the meantime. So, it's like I say diversification is not for the poor, if you can't afford to do it, you can't afford to do it, no matter how sexy the grant system might be, so there is a big issue there and that's a big problem for a lot of people." [RP10-Farm Activity Park]

Another participant states their inability to invest in certain types of eco-innovations due to the high cost noting:

"It comes down to cost and scale, so big breweries and distilleries have the output and the volumes to be able to handle investing in green technology, for us if we were to invest in green technology because of our volume it will be like decades rather

than years before we get our money back and of course for business and unfortunately it is driven by the bottom line" [RP16- Brewery]

A dairy producer assesses the initial cost associated with investing in eco-innovations stating:

"The initial spend is quite considerable, its back down to cash from a business point of view. If you can save yourself £10,000 over 5 years, but it cost you £10,000 to put them there in the first place, it's a difficult decision to make if you are not looking to go on 5 years of a certain scheme. So, cost is a major factor to consider, because we would love to do everything we could if money was no object, we would be the greenest company in the North East, but money is an object so we are not". [RP07- Dairy Producer]

In addition, the cost difference between conventional packaging and green packaging is considered an issue by some businesses, making it difficult for them to afford while trying to keep their business profitable, some quotations highlighting such views as stated below:

"It is difficult, but you probably find that the degradable packaging is probably double the price and that is again an issue because we are all trying to strive in this business were we are all trying to make profit, so it's a difficult one, because you get this probably cheap and cheerful things coming from abroad and it holds the biscuit so it's difficult to say no I don't want that I am going to take the one that is 10 times dearer just because its degradable, there has to maybe be help for businesses because your packing its totally on us the employer, the business, the bakery, the manufacturer and we have got to take all this on our own expenses so it is a problem, because you want to be green, you want to be organic, you want to be all these things" [RP12- Bakery]

"We could be more environmentally friendly in regards to the packaging, unfortunately its quite narrow margins locally here, and what would be termed a

green packaging is considerably more expensive than less green options, like that box up there, a lot of stuff is polystyrene based, you know for takeaway meals or trays with chips, stuff like that, which I don't believe are very good for the environment, they are not biodegradable, there are greener options which I assume will biodegrade a lot quicker but the difference in price is quite considerable" [RP04- Fish and Chip Shop]

"There are cost restraints to doing more and we are not in a financial position to do that right now" [RP06- Food and Drink Inn]

6.6.2.4 Reliable sources of support

Fifty-one percent (51%) of the businesses cite the issue of not having reputable sources of support to assist in the adoption of certain eco-innovation which could sometimes result in a business seeking assistance when falling victim to fraudulent schemes and scams, an instance of such is stated below:

"Actually, I think it's actually a major impediment to renewables being adopted, finding good quality, trustworthy, and companies to deal with. Undoubtedly finding companies and organisations to help you achieve what you want to do, i.e. get a supplier that is trustworthy, honest, capable etc. When it comes to renewable we really don't have these at all, instead there are scammers and jokers which if they are not selling solar panels will send you letters telling you, you have won the lottery, so I would consider this the biggest challenge". [RP10- Farm Activity Park]

Another business stresses the difficulty experienced by SMEs when it comes to accessing information and support unlike the large businesses that can afford to outsource the project to a contractor, most small businesses cannot afford to do this, stating:

"We need advice and guidance from whether it's the local authorities or the government about what to do and how to do it, but they must take the limitations of the small companies into account. The big guys who have got lots of money can

afford to bring in you know contract, waste people, but we can't so it has to be realistic and in line with the business, because if it's not and there's too much of that then there is no business, small businesses like ours need a little bit of help, there has to be a structure in place to enable us to be able to do things easily which we have with a lot of our recycling, so we can get a lot of help so it can be done easily". [RP03- Bottled water producer]

6.6.2.5 Lack of interest

One participant further hints at the notion that while green seems attractive on paper, there is a lack of genuine interest in practice by many retailers who can facilitate the adoption of eco-innovation by the industry stating:

"The supermarkets are not driving for it, they are not really pushing for it, they like the chat but they are not willing to pay for it, like I say, everything comes at a cost". [RP11-Beef Farm Producer]

6.6.2.6 Limited funding options

A business owner acknowledges the difficulties encountered with accessing funds and getting potential investors interested in investing in the adoption of eco-innovation stating:

"Challenges in terms of getting other people to buy into it in terms of financially as well, in terms of this is a big deal as well and having to find different ways of funding, because it being a huge amount of investments for the business in the last couple of years" [RP11-Beef Farm Producer]

6.6.2.7 Attitudes and Behaviour

Sixty-five (65%) of the participants consider the negative attitude and behaviours associated with greening efforts to be a major barrier to the successful adoption of eco-innovation for businesses. Some relate it to the behaviours associated with employees and their inability to comply and in some cases the owner's lack of interest in such efforts. The following

quotations indicate the views and perspective of participants in relation to attitudes and behaviours as a barrier to eco-adoption:

> *"Even in terms of staff, you know we recycle, but getting them to put the items in the right bin, and my point is this could end up back in my farm and you put that bit of plastic in the wrong bin and that doesn't come out and so it gets lost in 2000 tonnes and you won't see it, but it's still going to be lying in my ground in 400 years' time, so it's getting that whole lesson across to them , so something as small as that can make a big difference and all the way through". [RP11-Beef Farm Producer]*

> *"Sometimes you get slow adopters from the staff point of view, who are still willing to not sort out rubbish and not separate food in plastic and the rest of the stuff, so that's a challenge" [RP07- Dairy Producer]*

> *"I would guarantee 99% of bars and restaurants in Aberdeen, and if we are using the example I just gave, mint, you could grow mint in a tub at the back door, but when you check, the only thing you will find at their backdoor is staff standing smoking and you only need to look at certain areas in Aberdeen and wonder, when was the last time you saw fresh herbs bursting out of union street ? and that's very sad because it's a cultural change that we need, in order to affect our food, our nutrition our green issues, our happiness, or whatever, there's just this attitude of they can't be bothered, it's not even there is it, and that really upsets me". [RP14- Restaurant]*

Another participant also notes the behaviours and actions of consumers as a deterrent to eco-adoption, and in some cases action that can be interpreted as an act of greenwashing as noted below:

> *"Organic surveys have shown time and time again how consumers get asked in front of the supermarket what are you buying today and they say, ooh I only buy organic stuff and the same people come out, open the bag and there's nothing organic there,*

but everything 2 for the price of 1, 6 for the price of 3, the cheapest possible stuff" [RP15-Organic Farm]

6.6.2.8 Time Constraints

One business owner considers time to be an impediment to the business improving the efforts made towards their logistics management, as the business often has conflicting delivery times from various customers which makes it challenging to manage when considering the environmental impact:

"Our biggest bug bear is time, cause when you've got morning goods going out you need it to be fresh for breakfast not coming in at lunch time so it's trying to keep everybody happy, doubling back will be our biggest problem, in an ideal world you'll just say right this is when we are there, we will drop it off when we are passing". [RP12- Bakery]

6.6.2.9 Lack of Education and Awareness

Forty-two percent (42%) of the participants consider the supermarket to be a major obstacle to eco-adoption citing how they overinflate prices of greener products compared to conventional products and as such consumers generally associate green products with cost, some instances of such are stated below:

"The problem here in the North East of Scotland is that your average person doesn't have the cash to spend on high value food items and organic food in my view is quite wrongly viewed as high value and it's not necessarily the case, I mean you look at a basket of organic groceries versus conventional and then sometimes the organic can be cheaper, but things like beef and lamb are more expensive, but it's a very difficult thing to get across that buying organic isn't necessarily much more expensive than buying conventional and also when you add in the benefits, possibly the health benefits, green benefits, its actually quite cheap by comparison, but they don't

educate people to think that way, rather than just looking at the price tag, it's amazing what the supermarkets get away with". [RP15- Organic Farm]

"They are not informative enough for people, so people just to the point they use any bin and I don't think people know which cups go where, things like that, and so again it's about educating people, giving them the correct information for them to be able to complete the jobs for themselves". [RP02-Food and drink catering services]

6.7 Perceived Attributes of Eco-adoption

Concerning the factors influencing the rate of the adoption of eco- innovations, the study applies the factors identified within Rogers (2003) DOI model using the "perceived attributes of innovation" as identified within chapter 3. These attributes as identified by Rogers shed further light on what makes the adoption of an innovation successful or not and are noted by Rogers to increase the rate and diffusion of innovations by adopters within a social system or result in the rejection and non-adoption of the innovation. Therefore, these factors are considered within the context of this study and the overall impact and influence such factors may have on the adoption of eco-innovation by the businesses.

6.7.1 Perceived Relative advantage

Relative advantage is considered by the study as the extent to which an adopter associates expected benefits which could be social, economic to be reaped from the adoption of eco-innovation. For example, relative advantages could be in the form of increased profitability, reduced cost, improved social image, reduced use of time and effort etc. all of which could be attributes that influence the rate of adopting an innovation. Most of the participants note some form of relative advantage that influenced their adoption of eco-innovation. For instance, one participants cited the boost in the social image and reputation of their business which has translated into more businesses and increased profitability:

"It's allowed us to grow an outstanding reputation, because as the customers and people learn that, they value us even more" [RP01- Restaurant]

Another participant cites the ease of the adoption of green technology being encouraged through the use of government incentives and tariff schemes stating:

> *"When it comes to the big things like biomass, solar panel or wind turbine, big investments involved there, so the government support systems that are in place, tariffs and renewable heat incentives of course make perfect sense."[RP10- Farm Activity Park]*

Participants cite gaining a competitive advantage over rivals as a relative advantage achieved from their adoption of eco-innovation:

> *"Nobody knew what food miles where and literally within a year to 18 months food miles was the buzz word, the fact is we have always been aware of it and its always been something a point of difference that we can as a product we can sell, we can certainly do one better than a lot of our competitors". [RP11- Beef Farm Producer]*

Similarly, another participant cites their adoption of eco-innovation as having made them the leading best practice in the field and also improved their negotiation power with their buyers:

> *"Our carbon footprint cuts, taking from our delivery mechanism and it's an industry leading one, a lot of big companies have seen how we did it and they are starting to really follow suit on it. So, we have championed it as a best practice, and it also gives us better price negotiation as well". [RP02- Food and drink catering services]*

6.7.2 Perceived Compatibility

Compatibility is viewed by this study as the extent to which eco-innovation is perceived by the adopter as being aligned with the business values and needs; as such the adopter views the innovation to be compatible with values and beliefs, customer needs or demand or an existing idea etc. For instance, a participant noted the decision to reject an innovation due to their perceived view that it ruined the view and landscape which is considered a unique trait of the business premises stating:

> *"We don't do any solar because they are a bit ugly on the roof and I didn't want to ruin my pretty building, we don't do wind turbines because I think wind turbines have got out of control in relation to the sort of wider environment. I think that the planning is a travesty really that there should be so many small-scale wind farms and they should all be put somewhere so as not be a blot on the landscape". [RP01-Restaurant]*

The cost associated with some green technology makes it incompatible for some businesses to adopt stating:

> *"I mean essentially green technology is just cost prohibitive for us and certainly for any sort of start-up and particularly for any sort of brewery". [RP16- Brewery]*

> *"It seems to be quite costly for the business, it could almost be cheaper to do nothing which is disappointing, which is maybe why we have still businesses who don't do anything about it who don't do anything about it, or who don't commit, or just commit on a piece of paper and not do a part of it so cost is a key driver". [RP07- Dairy Producer]*

In contrast to this, some participants are able to align the adoption of eco-innovation to meet the needs of the business by making savings through adoption as stated by a participant below:

> *"As a company we have invested a lot of time, especially for our deliveries, what we did, you know how you might have Coca-Cola, Cadbury, Irn-bru, all of them, they now deliver into one main supplier for us called "Chef direct", so we only have one lorry come on site now, rather than having making 8 or 10 deliveries, we have 1 delivery and they all deliver into Chef direct and they deliver it to us and we've saved 2.8million miles per year on the road across the UK on road miles from deliveries because we have stopped all these deliveries. So, what we have done is we have*

used one main supplier delivering to this one point and they deliver to us, so we have completely cut our carbon footprint on that" [RP02- Food and drink catering services]

Some participants note the need for a balance between eco-adoption and running a business:

"*At the end of the day there's no point being green if the product is not good, it's got to be the right product, so it's about working a balance between the two*". *[RP13- Fish and Chip Shop]*

6.7.3 Perceived Complexity

The complexity or simplicity ascribed to an innovation can influence the rate in which adopters will successfully accept and adopt an innovation. Therefore, the ease of use and application attributed to an innovation by its adopters will determine its adoption rate and diffusion into society. One business owner notes there were discouragements from contractors when looking for assistance in adopting a heat recovery system with zero waste. However, they were able to achieve their goal by staying true to their green ambition plan:

"We were told it wasn't possible, but guess what, two and half years in, its working, anything is possible. I don't generally believe what I hear and I like to go and work it out for myself and so I thought in principle there has to be a way that you can build a business that doesn't waste all that energy and I believed there had to be a way that you can use mostly local materials to build a building cost effectively and we built the business using local wood, local stones, Scottish flooring, you name it. We put in our heat recovery systems so that we generated all of our own heat and hot water and we did that cheaper and we did it quicker, and when the conventional quantity surveyors and facilities people said they could do it using old outdated technology, it wasn't more expensive, it wasn't slower, there's no maintenance, I don't have to have a boiler man come here it works, I don't have to have constant system maintenance programs in place because it's such a simple technology and so actually you can do it cheaper". [RP01- Restaurant]

While some participants are able to overcome the perceived notion of complexity associated with certain eco-innovation, another participant acknowledges difficulty in cutting down on their transportation impact of goods and the difficulty in being "green" and staying profitable as a business stating:

> *"There comes a point where you can't go any further and then when you look at things like your carbon footprint and things within your own business, you know we need help, how do we do that, what's practical, what's realistic, what's affordable. Because a company is just getting by and maybe doesn't have a lot of money to spare it can be quite challenging to take on these different things". [RP03- Bottled water producer]*

6.7.4 Perceived Trialability

Trialability refers to the extent to which eco-innovation can be tested for a limited period to determine their suitability and efficiency for the intended purpose. This may apply to some innovations and could also speed up the rate of adoption. Some eco-innovation that undergo trialability offer the assurance and testimonials of early adopters to the effectiveness of the innovation, which has likely seen improvements with time. One participant knows the trial adoption of LED lights stating:

> "*We are looking at LED light, we have some trial LED in one area of the shop, so we are doing that, we have had some quotes in for some sensors for the rooms, PIR sensors, so when you come in the lights come on, just to see where we can minimise the electricity bills" [RP07- Dairy Producer]*

Another participant noted the adoption of LED when the technology was considered as improving with time stating:

> *"There has also got to be practicalities in there as well, the LED lights for example I suspect the early versions of them wouldn't have lasted very well at the beginning but now the technology has been improved on and it's also fit for purpose, now they are*

more resilient, so there's a practical aspect to it as well. So, there's the reliability of putting something down and been able to trust in its ability to work, cause there's nothing worse than keying into an innovation and it starts to break down" [RP18- Fish Can Processor]

6.7.5 Perceived Observability

The perceived observability is considered the extent to which adopters can see the results of the eco-innovation they have adopted. This ability to observe the innovation could potentially influence its successful rate of adoption by other potential adopters. Some eco-innovation can be observed, and others might be less observable. Some waste management innovations such as reduction, recycling and reuse can be easily observed by their adopters. A participant however chose to shed light on the observation from the financial point of view, though noting that while they considered this to be negative when looking for immediate return on investment, the results from the use of the innovation were positive in comparison with conventional options:

"Well right now the impact is negative because we are paying for these things. If i take the wind turbine for example, that's a 20 year project cause that how long the feed in tariffs last for, of course I have no money so I say I will pay for it over 10 years, but the first 5 years are the most painful ones because of course for the first 10 months plus you have no income, then after that you've got probably enough income to pay for half of the bank payments, but as the price of fuel and the feed in tariffs increases because its index linked in 5 year time it will be a bit more easier and in 10 years' time when the debt is gone it works really well, so right now we are still at the front end of these investments and so the impact is relatively negative in that respect, even with savings in electricity and all the rest, but as electricity goes up so the saving is effectively larger, as the feeding tariff goes up and as the debt comes down it will make much more sense". [RP10- Farm Activity Park]

While various attributes can influence and impact the rate of adoption of eco-innovation, it is

clear from the perceived attributes towards eco-innovation that different businesses are keen to be able to successfully adopt eco-innovation in a manner that leaves their business sustainable and profitable.

6.8. Impact of Eco-Adoption

While some participants have prior knowledge of and interest in eco-innovation, some find it to be more complicated and require reliable sources of information and support to take on the adoption of eco-innovation. This section will examine the views and perspective of the participants towards the challenges and their views on the available support and infrastructure, the benefits encountered with eco-adoption, as well as their opinions about enhancing the rate of eco-innovation adoption for Scottish food and drink Industry.

6.8.1 Challenges to Eco-adoption

A notable challenge that seems to be an issue for the food and drink industry is transportation, as clearly stated by a participant:

> *"Transportation I think is one of the worst impacts that we have and it's a challenge because other businesses don't have the same principles that we have. So, if you want to be completely environmental then you're not going to work with those guys because e they are not good enough, but in order to build a business that has a product that people want to buy so that you can make enough profit to be this green you've got to deal with things that don't fit your strategy". [RP01- Restaurant]*

The participant further notes the packaging challenge which is considered a restriction to "green" for the industry, though this is due to food packaging regulations which result in an impact down the line:

> *"Sometimes the side effect of this great product is that it comes with some really rubbish impact on the environment through whether that's the packaging, the transportation of it or the recyclability of it, you know there are issues that you have to*

just live with, otherwise you couldn't have a product range, the customers wouldn't love it too much, you wouldn't make a profit, end of the game". [RP01- Restaurant]

Another challenge identified by another participant is that while there are green schemes and grants, a business wishing to access such options will still need to have a sizeable fund available, therefore while the options are available in theory, they are not accessible to all in practice as stated below:

"Diversification is not for the poor, if you can't afford to do it, you can't afford to do it, no matter how sexy the grant system might be, so there is a big issue there and that's a big problem for a lot of people". [RP10- Farm Activity Park]

In addition, a participant highlights the challenge of convincing others to assist in the process of going green can be a difficulty:

"Challenges in terms of getting other people to buy into it in terms of financially as well, in terms of this is a big deal as well and having to find different ways of funding, because it being a huge amount of investments for the business in the last couple of years" [RP11- Beef Farm Producer]

One participant stresses the lack of time as a considerable challenge faced by the business in going green:

"Our biggest bug bear is time, cause when you've got morning goods going out you need it to be fresh for breakfast not coming in at lunch time so it's trying to keep everybody happy, cause we also deliver to schools and again some of them have breakfast clubs and so if the children are going in back at 7 they need to get their bread so we can make certain they can toast their breakfast, so doubling back will be our biggest problem, in an ideal world you'll just say right this is when we are there, we will drop it off when we are passing".[RP12- Bakery]

The issue of compliance especially when segregating their business recycling waste is also

considered a challenge by participants with their employee, as noted below:

> *"Because you have to try and train up your staff and they will say yes, yes but do they actually do it, there is a challenge that they maybe don't recycle the bread or whatever" [RP12- Bakery]*

One participant identifies the challenge to "green" from a social point of view, stressing the difficulty with getting people to support eco-innovation:

> *"There is also the social aspect as well, which has to do with getting people to support waste reduction, it depends on what you're looking to adopt but there may be a social implementation aspect as well". [RP18- Fish Can Processor]*

A participant emphasises how the cost associated with greening is not only a challenge but can also encourage businesses to green-wash by committing to green policies on paper and doing nothing in practice:

> *"A financial challenge as well it seems to be quite costly for the business, it could almost be cheaper to do nothing which is disappointing, which is maybe why we have still businesses who don't do anything about it who dont do anything about it, or who don't commit, or just commit on a piece of paper and not do a part of it so cost is a key driver". [RP07- Dairy Producer]*

In addition, another participant acknowledges the struggle between doing right by the environment and simply focusing on profitability as a business which can be a challenge to "green":

> *"It's very hard to quantify, it's almost like marketing, it is a difficult one, because I know for a fact that it was more expensive to recycle our waste that to just throw it into the council bins, so that's a terrible state of affairs and the council should be utterly embarrassed about that, when you are a struggling or new business your*

values could be torn, you want to do something but it's going to cost you something" [RP14- Restaurant]

6.8.2 Support and Infrastructure

Participants were further prompted on their views regarding support and infrastructure. Asked if they felt there was adequate support and assistance available to enable businesses to go green, mainly the views can be split into two, those who feel the support to be adequate and those who consider the current support to be insufficient. Those who considered support adequate note:

"I think there is a lot of support out there, a lot of financial incentive out there, but I think that if you base your financial principles on those, then you're not doing it for the right reasons and you are very unlikely to succeed, if you want to be green, it's got to be for the right reasons" [RP01- Restaurant]

Another participant states that while there is support for high-tech eco-innovation, they come at a price that the business may consider expensive:

"*When it comes to the big things like biomass, solar panel or wind turbine, big investments involved there, so the government support systems that are in place, tariffs and renewable heat incentives of course make perfect sense. So if you are keen to do it then those kind of things, help you with the hurdle because none of it is cheap, it all makes sense but you have still got to pay for it in the first place" [RP10- Farm Activity Park]*

In contrast to those who consider support to be adequate, some participants express their frustration at not having sufficient support or encouragement from governments and institutions to enable them go green stating:

"No, I don't think there has been enough support, no or even enough information about green, I think we could all do with some learning facts about green issues, and

what it all seems to be for the companies right now is it is something else that we have got to find money for" [RP12- Bakery]

"If there was encouragement from the top, so say the council or government say if you have a herb basket or garden outside your business, you'll get money off it, you need to encourage it, someone need to have a vision and say this is what we need and this is what the benefits are and I think that will help" [RP14- Restaurant]

The cost implications of some of the high-value eco-innovation despite the tariffs attached is considered inadequate by some business and not helpful towards SMEs but geared towards large businesses:

"I suppose it's a two-way thing because the government can provide all the information and all the support that is possible but if the SMEs aren't willing to adopt these practices because its cost prohibiting or for whatever reasons then you know the schemes aren't going to work, but I mean in terms of, I am not sure there has been an adequate solution for SMEs, I mean lots of solutions at the moment are aimed at bigger companies just because of the heavy infrastructure investment" [RP16- Brewery]

Some businesses also face challenges seeking support or help from the regulators as they note the role they play makes it difficult to confide in them, as this could very well implicate the business by highlighting areas where they are not compliant with regulations:

"I have found is a lot of the regulators have 2 roles so they are supposed to be the ones you go to if you have a problem, but they are also the regulator and when you go to them your also highlighting to them that you have a problem so it's a duo role they play, and its not necessarily a great thing because you have got that conflict cause as soon as you say to them I have got an issue and I am trying to solve this, and they will say does that mean your omitting somewhere and next thing is ooh we need to come see you, so its really a case of which hat are they wearing at the time

your having a conversation with them, so I think some might be separated out but some of the other companies I have spoken too also face the same problem of the fine line between regulator and adviser" [RP17- Food Condiment Manufacturer]

Another participant notes that support exists in a manner that makes it difficult for business to access, stressing the need for a single focal point of contact that can assist businesses with their every eco-adoption need rather than multiple sources of information which make it even more stressful and complicated for the business to follow:

"it's difficult to say there is not enough support out there because there's a platter of people able to do bits, but it's very disjointed, what we really need is one person to come in and say you can do X with this rather than at the moment we have to speak to Scottish Enterprise about training people, speak to Aberdeenshire Council about reusing, so there's different bodies and bits that are specialising so rather than get one general point for support and answers, there are specific answers from different references and trying to get them all to tie up together is part of the issue" [RP18-Fish Can Processor]

In agreement, another participant states:

"we need advice and guidance from whether it's the local authorities or the government about what to do and how to do it, but they must take the limitations of the small companies into account. The big guys who have got lots of money can afford to bring in you know contract, waste people, but we can't so it has to be realistic and in line with the business" [RP03-Bottled water producer]

Some businesses are of the opinion that the support offered is simply more cosmetic propaganda by the government citing:

"I sometimes think they are just playing to the crowd, if that makes sense, your local authority, your government, you think by introducing these initiatives they are

appeasing an element of society which thinks we should be doing more for the society, at the same time they are expanding their exploration for other sources" [RP04- Fish and Chip Shop]

One business summarises the issue of inadequate support noting:

"I would like to see government or authorities putting more into it, it should be a thing that is done by everyone" [RP07- Dairy Producer]

6.8.3. Benefits to Eco-adoption

Huge savings on spending are cited by participants to be a notable benefit to going green, as they are able to measure the difference in previous spending with conventional options and the saving made from the adoption of greener options as noted below:

"Yes, on the big one like electricity, the solar panels they are brilliant and I am just delighted with them because this business uses a lot of electricity. Our quarterly electricity bill should be about £3500, but we have managed to take it down to £1800 a quarter so that's a huge saving, thanks to the solar panels it's been slashed and hopefully it should improve significantly with the installation of LED lights" [RP10- Farm Activity Park]

Another participant confirms huge savings made for the business due to their adoption of Biomass stating:

"Well, the Biomass is an easy one, it just basically says we don't use kerosene, we now use wood chip, rather than spending £25000 a year on kerosene we now spend £5000 pounds on wood chip, so there's a financial benefit for a start" [RP11- Beef Farm Producer]

The use of an eco-tracking system enables some businesses to track and monitor their usage, helping them to be mindful of waste, which in-turn also saves money for the business:

> *"We have an eco-based system installed in the shop which does real time measure of our electric, gas and water, it's a pulse meter, and I have an app connected to it on my phone which tells me how much we are using per kilo watt and coverts it's to the price equivalent, so it can tell me I am using 50 pence an hour on water, or any of the other utilities, so then we can cut down where necessary on our usage and it also makes the staff mindful of how they use the utilities, we become more mindful of the our use and that if we make saving on the bills then their wages go up and everybody wants that" [RP13- Fish and Chip Shop]*

One participant considers the adoption of water saving cisterns to be hugely beneficial to their water saving initiative stating:

> "*We have all this eco water saving cisterns in the public toilets to help minimise and save water and that's something we've also adopted to help save on our water usage". [RP08- Hotel]*

An organic farm business notes the difference in flourishing wildlife and stocks on the farm to be a key benefit to its eco-adoption stating:

> *"The main difference is the rebound in the wildlife, you also get lots of other herbs and plants and flowers which is good for insects, which means the birdlife does well. So, because of the lack of intense grass growing the other wildlife do well, and in contrast to 15 years ago, we did not have them, they were pretty rare and not striving at all". [RP15- Organic Farm]*

In addition, the improved way of doing things and increasing waste consciousness is considered a benefit by businesses noting:

> *"People become better at their jobs, they look at their waste now before they throw it out, and there actually reducing their waste as well by doing this" [RP02- Food and drink catering services]*

6.8.4 Suggestions to Enhance Adoption

Having identified and considered the factors that encourage or discourage the adoption of eco-innovation by businesses within the food and drink industry, a word cloud of the key words used to suggest enhanced eco-adoption is depicted in figure 6.2. below.

Figure 6.2: Word Cloud of Suggestions

Source: Author generated

Discussions of ways suggested by participants to enhance the adoption process is considered and presented below.

While there might be sources of information, most participants still feel there is a need for proper education of the pros and cons of going green which is a much-needed action for the industry, therefore investing in green education is considered a useful way to enhance eco-adoption, as noted by some businesses:

> *"Education actually that you can be green without it costing you more, or without it having a negative impact on your bottom line, that you can add value immediately to your operation and what you do as a business" [RP01- Restaurant]*

> *"They are not informative enough for people, so people just to the point they use any bin and I don't think people know which cups go where, things like that, and so again it's about educating people, giving them the correct information for them to be able to complete the jobs for themselves" [RP02- Food and drink catering services]*

> *Well I think education, keep telling people or even showing people, demonstrating it, because it all comes down to money, at the end of the day a commercial fisherman is driven by money so I think you need to show that you can still make money if you have and environmental good practices, but that model needs to be demonstrated, using case studies of those who have successfully done it without affecting your profitability. [RP09- Primary Fish Producer]*

Providing support to fellow adopters and prospects, offering opportunity for interested adopters to observe and seeing result of eco-innovation being adopted and also an opportunity for engagement of concerns such businesses might have towards adoption, a participant notes his experience and the value gained from such opportunities:

> *"In my recent press release I said that anyone who is interested or keen gets in touch and we will be delighted to show them round. 3 or 5 years ago I would have been really pleased to go to someone's place and see it in practice, because the man in the shiny suit he will tell you anything so you cannot believe him, what you really want to do is go to a place where they've had these things for a few years, have gone through all the problems and all the difficulties and are operating well and that's a big plus to visit a place and get a customer's perspective as opposed to a sales man's perspective, and you never know what you could learn. "[RP10- Farm Activity Park]*

An increase in consumer demand for eco-innovation will force the manufacturers to think

green from the onset of their production and incorporate into their designs and processes. Most businesses feel that if the end-user demands it they will have no choice but to comply and supply that which the market requires as a participant notes:

> *"It comes back to force, it's going to have to be forced, you know encouraged, the customer is going to have to ask for it, the government will need to push it further, I think it's a mind-set change as well" [RP11- Beef Farm Producer]*

Some participants testify to the benefits they have reaped from winning green awards. It stands to reason that encouraging green awards in the industry will go a long way towards boosting the participation of more businesses as one business confirms:

> *"With me winning so many awards I found that other businesses have thought, that works and so they are trying it, or they have thought to win awards they might need to be doing these things and effectively yes you do" [RP13- Fish and Chip Shop]*

While appointing Green ambassadors in the workplace is commonplace for most large firms, this is not very popular among SME's, the idea of having someone lead the business further embeds green thinking internally for the business, as one participant notes:

> *I just think they should nominate somebody in the business and give them a task. If it is an employee doing it, it's even better rather than the business owner. I think then they could become green ambassadors and then we could do a green ambassador award. [RP08- Hotel]*

Having enforced legislation that results in businesses getting fined for non-compliance is considered by some participants to be a certain way to further adoption as most businesses would not want to lose money, so they will be forced to get in line and comply:

> *"to get folk to change, I think the information needs to be out there, it's good enough saying there is legislation but is it enforced, no I don't think so, it's the same old*

same. They will almost need someone to be fined for not putting food waste in a bin for it to be effective. It's quite difficult". [RP13- Fish and Chip Shop]

Participants consider the use of incentives a big way to further eco-adoption by businesses, especially if the incentives are monetised, this notion indicates that businesses are more likely to adopt green if there are extra benefits to be gained besides just doing right by the environment, as noted by some below:

"if there was encouragement from the top, so say the council or government say if you have a herb basket or garden outside your business, you'll get money off it, you need to encourage it, someone need to have a vision and say this is what we need and this is what the benefits are and I think that will help.[RP14- Restaurant]

I would like to see government or authorities putting more into it, it should be a thing that is done by everyone but if you do have incentive schemes or if you do have grants or interest free loans, they do help, and do encourage you to do things a bit more, it's a financial incentive I suppose is a driver for a lot of companies". [RP07- Dairy Producer]

Green campaigns, summits, conferences and eco- adverts are mediums by which some businesses get engaged with eco-innovation. However, participants consider the approach used by many of the green agents to be routine and boring, resulting in a less interested or captivated audience, therefore there is a need for more creative ways to highlight eco-adoption benefits using proper channels of engagement in order to gain interest in further adoption of eco-innovation by businesses, this point is emphasised by a participant below:

"Unfortunately, sometimes there is no common-sense approach which exhausts the minds, and I think we need to be far more creative, far more colourful and passionate to get the message through because there is huge lack of imagination in Aberdeen. I guess if I were to host a green festival about all the positives, and if you added as many creative things as possible it might be more appealing than if you have got

> *somebody in a suit standing across a board like a robot saying these are the benefits of green, I wouldn't even go. So I think there is a block, when it's such an important issue you need the right people involved, you need people who need to understand the whole circle of what it means on a day to day basis to people working within a place, what it means to customers, support and encouragement and reward when you excel." [RP14-Restaurant]*

The endorsements of products and ideas by celebrities has been used by so many markets and quite successfully. It stands to reason that this could also be successfully applied within the food and drink industry. Thus, it might be worth considering using popular celebrity chefs, or famous actors and actresses noted for their active participation in eco-friendly endeavours to create awareness and encourage further adoption by businesses. One participant relates how the endorsement of salmon by a celebrity chef greatly influenced the demand for the species stating:

> *"the chefs and their TV programs really help, curiously there is always a downside, one of the biggest problems that wild salmon have, one of the reasons they are now becoming endangered is because the foodies talked up how much more delicious salmon fish or wild fish is better for you, so now all the top restaurants want to be seen to be serving that and meeting the demand, which is ridiculous because they are going go extinct in the next 20 years if we don't slow down, so it's not always good but as a whole, as an educational tool, celebrity chefs on the TV have done a fantastic job." [RP15- Organic Farm]*

Some businesses especially the micro sized ones with limited capital stress the need for more shared resource facilities to be available to SMEs; this will enable them to manage their resources collectively and more efficiently as noted by one:

> *"Not all businesses are high growth which is definitely a good thing, so a shared resource will be very beneficial, everyone becomes a part of it, a contribution by each business by size or however, will encourage that shift, because then the businesses can stay there at whatever their size". [RP16- Brewery]*

Businesses advocate improved Infrastructure and practical solutions that can foster the adoption of greener innovations, this requires the government and councils to engage with businesses to better understand their needs in order to offer solutions that encourage their participation and enhance their adoption of eco-innovation:

> *"It's only recently that they introduced food waste recycling where I stay, whereas other areas have had it for a longer time so it's not just the council but it's the whole infrastructure that needs to be improved so that everybody can get involved." [RP17- Food Condiment Manufacturer]*

> *"I think government and councils have to provide an infrastructure to make it easy and practical to do the good things, you know if here wasn't easy recycling we would have a problem, but it is easy so that's a big positive, but there might be parts of the country where that's not the case". [RP03- Bottled water producer]*

The main objective of any business is to make a profit, therefore businesses looking to take on eco-adoption will need to know that their adoption of such innovations does not threaten the profitability of their venture rather it should save them cost and increase their margins, while some eco-innovation are easily adaptable by actions or compliance such as recycling, reduce, reuse etc. some eco-innovation come at a cost that is considered too high for certain businesses to afford, as such participants stress the need for cheaper, greener innovations stating:

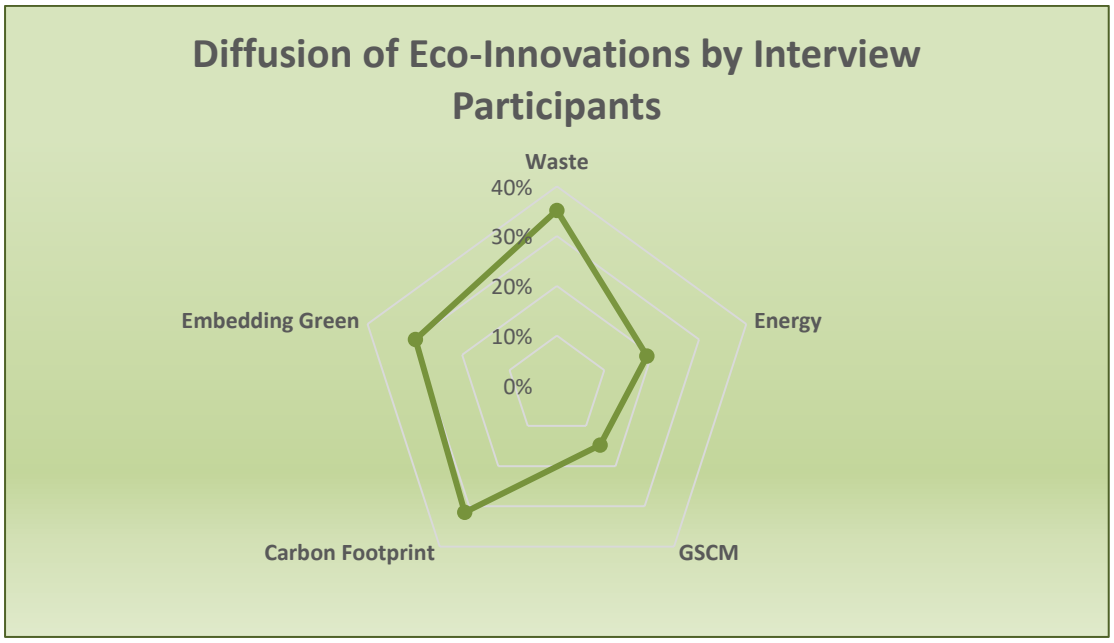
> *"If there were greener options more regularly available as opposed to cheaper options, for instance someone starting up a business if there are certain constraints,*

if the greener options were more regularly available and cheaper or at least if the cheaper options weren't so available" [RP04-Fish and Chip Shop]

6.9. Diffusion of Eco-Innovation Adopted by Interview Participants

Similar to the overview of the diffusion of eco-innovations by the web-businesses presented in chapter 5 figure 5.10, this section applies the same process to give an overall view of how eco-innovations established within the five key categories have been adopted and to show the extent of diffusion among businesses. Figure 6.3 provides a display of each eco-category, reflecting the extent of diffusion.

Figure 6.3: Diffusion of Eco-innovations by Interview Participants



Source: Author generated

While there is not a huge disparity between the distinct categories, it is evident from the graph that Waste innovation take the lead among the categories, followed by carbon footprint, then embedding green, with energy and GSCM showing results for the least diffused among the participants.

6.10 Summary

This chapter sought to explore the understanding of green by drawing on the definition of green by the participants, exploring their awareness-knowledge of eco-innovations along with the importance given to adopting eco- innovations by the businesses, identifying the barriers and motivators to eco- adoption and considering factors that could further enhance adoption of eco-innovation by businesses within the industry. The chapter applies the framework for adopter categories established within chapter 5 to identify the forms of eco-innovation adopted by the 18 businesses.

Many factors influence the success or failure of the adoption of eco- innovations; these factors were considered in line with the perceived attributes of adoption set out by Rogers (2003), to gain a better understanding among the participants of the eco- innovations being adopted. Overall, the Relative advantage, Compatibility, Trialability and Observability of eco-innovations where visible and possible go a long way towards fostering its adoption process, while the Complexity of an innovation could serve as a barrier towards its successful adoption by businesses.

Through in-depth engagement with the participants, the study was also able to draw on suggestions for actions that can enhance the adoption of eco- innovations for the food and drink industry. Prominent among the suggestions was the need for further education in “green”, the need for improved infrastructure and support for SMEs and how monetised incentives could encourage businesses to go green.

The findings identified within this chapter will be discussed in more detail within the next chapter.

CHAPTER SEVEN: DISCUSSION OF FINDINGS

7.1 Introduction

This chapter discusses and evaluates the findings of the study by considering the information obtained from the analysis of the respondents and what implications can be deduced from the conducted research. The discussions made within this chapter will relate the findings of the study to the reviewed literature in chapter two and the underpinnings of the theoretical framework applied in chapter three, seeking similarities or differences between the literature and the study's findings. As outlined in chapter one, the purpose of this study is to explore and understand the adoption of eco- innovations by Scottish food and drink SMEs, evaluating the extent to which these businesses are involved in incorporating environmental management innovations into their businesses as well as assessing the motivators and barriers to adopting these eco-innovations. Consequently, the aim of this research is **"**To investigate the adoption of eco-innovations by Scottish food and drink SMEs".

The objectives identified to meet the aim were as follows:

1. Assess the awareness of eco-innovations in Scottish food and drink sector SMEs.
2. Investigate the importance Scottish SMEs in the food and drink sector place on eco-innovations.
3. Identify the forms of eco-innovation adopted by the SMEs.
4. Identify and examine the motivators and barriers to eco-innovation adoption efforts by SMEs in the Scottish food and drink sector.
5. Generate a scale of greenness based on the forms of eco-innovations adopted by the SMEs.

To fulfil this aim and objectives, five research questions were developed:

Q1. How aware and informed are Scottish SMEs of the concept of eco-innovations? (Objective 1)

Q2. What level of importance is accorded to the adoption of eco-innovations by the Scottish food and drink SMEs? (Objective 2)

Q3. What forms of eco-innovation are adopted by the SMEs in the Scottish food and drink sector? (Objective 3)

Q4. What are the motivators or barriers food and drink businesses experience in the adoption of eco-innovations? (Objective 4)

Q5. What would a scale of greenness reflecting eco-innovation adoption comprise? (Objective 5)

The next section will now consider what the findings revealed on Scottish food and drink SMEs and their adoption of eco-innovations and seeking commonalities and differences with the existing literature. The findings will be discussed in relation to the following;

- The awareness and knowledge of eco-innovation by Scottish food and drink SMEs.
- The attitudes and importance of adopting eco-innovation by the Scottish food and drink SMEs.
- The forms of eco-innovation currently being adopted by the Scottish food and drink SMEs
- The motivators and barriers encountered by the Scottish food and drink SMEs to adoption of eco-innovations.
- Present a scale of greenness reflecting the adoption of eco-innovations by the businesses in the sector.

7.2 The Awareness and Knowledge of Eco- innovations

Using the elements deduced from Rogers stages to the innovation decision-process, the study explored three key aspects in relation to the respondents' awareness and knowledge of eco-innovation; these relate to the questions of What, How and Why? In exploring their

awareness of "green", the study considered what respondents know of "green", the themes explored within these were; the definition of "green", understanding of environmental impacts and knowledge of the types of eco-innovation.

7.2.1 Definition of Green

The findings in the respondents' views on eco-innovation can be summarised into two key classifications;

1. Eco-innovations are viewed as a means to conforming to moral principles and environmental obligations.
2. Eco-innovations are measures adopted to reduce waste and improve business efficiency.

Definitions associated with the first classification showed the use of terms like; *right thing to do (RP01), way of life (RP02), showing providence in actions (RP09), doing better for the environment and the people within (RP12), having peace of mind (RP13), full circle (RP14), not destroying the environment (RP15)* etc. These definitions and views of eco-innovation by the participants indicate a strong inclination towards perceiving eco-innovation from a moral and environmental responsibility point of view. The second classification had participants identifying with terms like; *being environmentally friendly (RP03), less waste (RP04), reducing carbon footprint, power consumption and saving money (RP05), recycling and little damage (RP06), efficiency in energy and waste (RP07), minimising environmental impact (RP17), environmental sensitivity (RP18)* etc. These keywords define how the participants see eco-innovations, those within the second category been some similarities with the OECD (2009) definition of eco-innovation which defines it as "the implementation of new or significantly improved products (goods or services) or processes that contribute to environmental improvements or a reduction of environmental impacts compared to other alternative practices".

The views from the second category associate eco-innovations with environmental improvement, waste reduction, energy efficiency and relate these to results obtained from eco-innovations used to cut down on environmental impacts. It was interesting to see how these two distinct groups emerge, one group of participants being somewhat general but centered on feelings and goodwill aspirations for achieving environmental sustainability and the other group relating their views to specific aspects that relate to their environmental impacts. The findings on the definitions established by the participants showed that the businesses within the study had a reasonable understanding which reflected from a very general point of view the specific opinions on what eco-innovations are and how it related to them as businesses.

It is important to point out that despite the existing literature on eco-innovation, there are few studies that take the participant views into account in the manner taken by this study, such as establishing the understanding of eco-innovation in the words of the participants. Studies that take into account the views of the participants in the form of survey and interview do not focus much on what the participants consider to be eco-innovation, this is therefore seen as a novel addition which the study has taken account of. This has also enabled the study to gain a general sense of what the participants consider to be eco-innovation and builds towards the study's further understanding of their awareness and knowledge of eco-innovation.

7.2.2 Understanding of Environmental Impacts

The second theme identified under the ***What-knowledge*** relates to the understanding of environmental impacts by the respondents. The study was able to establish how the businesses understand that their activities create negative impacts within the environment and went on to get the participants to identify what aspects they considered have the most negative environmental impact. In a sense, this was used to help the study gain a better

view of their awareness and knowledge of eco-innovation and how this could relate to their business as adopters of eco-innovation.

While participants identified a number of areas that generate negative impact, the findings suggest the key areas identified by most businesses to have their biggest environmental impacts to be within the areas of ***Packaging, Energy Use, Internal Business Waste and* Transportation**. The findings of this study have shown a substantial improvement from the existing studies on SMEs and their adoption of eco-innovation which indicated that most SMEs had very little knowledge on environmental issues (Holland and Gibbon 1997; Meritt 1998; Biondi et al 2000; Hillary 2000). For instance, Hillary (2000) found most SMEs to be ignorant and difficult to engage on issues relating to their environmental impact. However, in contrast, the participants in this study have provided suitable definitions to reflect their understanding and knowledge of eco-innovation and some are able to determine aspects of their businesses that generate negative environmental impacts. Though it might be worth noting that the existing literature is somewhat dated and as such changes in regulations and the changing nature of the business environment may have contributed to the improvements observed within this study, thus the new findings on awareness are reflected by this study to recognize the growing awareness and understanding of businesses towards eco-innovation.

7.2.3 Knowledge of the Types of Eco-innovation

The third theme identified from the findings in relation to awareness-knowledge was the understanding of the participant's knowledge of types of eco-innovation. The most popular forms of eco-innovation identified by the participants relate to ***waste minimisation and reduction innovations*.** When prompted on their knowledge on the types of eco-innovations the majority of participants were quick to mention; *recycling, reuse, composting* as forms of eco-innovation they are familiar with. Eco-innovations are also associated with carbon-footprint management such *low-product miles* and *logistics management* which were also identified by the participants as popular forms of eco-innovation. While the participants of the

study had earlier noted areas of high environmental impact to be associated with *packaging, energy and transportation*, they did not seem to indicate types of eco-innovation relating to energy management, a possible explanation for this could be due to some participants having very limited knowledge of eco-innovation applicable to energy management that could be adopted by their business.

To further obtain a better understanding of the SMEs awareness-knowledge of eco-innovation, the study considered the sources and communication channels for eco-innovation adoption in the food and drink sector. Rogers (2003) noted the relevance of these sources to the innovation adoption process, as they communicate information on the importance and usefulness of an innovation to members of the social unit. The participants indicated a variety of sources of communication for staying informed on eco-innovation, these included professional bodies for the industry such as the Chamber of commerce, the Scottish food and drink federation and Scottish Enterprise. They also noted other mediums like their local council newsletter and government notifications. The use of social media outlets was quite popular, particularly the use of Facebook, Twitter and TV networks, as sources for getting information on eco-innovation.

The study found limited references and connections between the businesses and the environmental organisations and agencies like; Waste and Resource Action Programme (WRAP), Netregs, The Carbon Trust and Scottish Environment Protection Agency (SEPA). These environmental agencies are set up with the purpose of fostering eco-innovation adoption by businesses however, the study found very little evidence to indicate the use of such green communication channels by the study participants, as they seemed more inclined to get their information from social media outlets instead. This finding corroborates the case of the study by Merritt (1998) that indicated a lack of awareness by SMEs in Croydon on environmental management systems like BS7750 and environmental agencies and support networks. Merritt noted that while the SMEs appeared to have a strong positive

attitude towards eco-innovation, their awareness of resources and developments in environmental management was limited.

In summarising the findings of this study in relation to the awareness-knowledge of the participants, there seems to be a strong and positive inclination by the participants towards the adoption of eco-innovation. This is exemplified by their ability to define the role of eco-innovations, identify aspects that generate the most negative environmental impacts by their business and identify types of eco-innovation used to reduce environmental impacts. There seems to be a limited use of environmental agencies and support networks by the participants as they seem to get information from other communication channels like social media outlets. The next section will discuss the findings of the study on the attitudes and importance of adopting eco-innovation.

7.3 Importance of and Attitudes to Adopting Eco-innovations

In examining the views of the participants and the importance held of the adoption of eco-innovation by the businesses and the industry, the study established two themes on the issue namely; the **positive attitude** and **sceptical attitude**. Participants within the positive attitude considered green environmental innovations relevant to their business and to the Scottish food and drink industry as a whole. The key factors associated with the relevance factored around the following for the positive attitude participants;

- **Eco-innovations are important due to the growing shift in the business environment**. This stresses the need for less negative impact by businesses and as such businesses need to be seen to be integrating greener innovations within their business processes.
- **The adoption of eco-innovations provides opportunities for businesses**. This attitude relates to benefits from funding schemes, grants and incentives, including other opportunities in the forms of awards and company recognition which can boost

the green image of the company, offering a competitive advantage and this can be highly attractive for businesses.

- **Eco-innovations are important and the responsibility of businesses**. This view relates to the need for accountability and the need for businesses to play their part in fostering and ensuring a more sustainable future and environment for society.

The views itemised within this group were held by participants with optimistic views and positive attitudes in general towards what eco-innovation means to them as individuals, to their businesses and also to their industry. The positive attitude expressed by these participants on the adoption of eco-innovation also complements the awareness and knowledge of eco-innovation, this has often not been the case within the literature as Merritt (1998) noted within his study of Croydon SMEs, that while businesses tended to portray positive attitudes towards the adoption of eco-innovation, they, however, seemed to be ignorant and lacking in their awareness of environmental issues which they also failed to reflect in their business practices. This attitude is perhaps better associated with the second theme classed as the “Sceptical” as they bear some similarities with the findings from Merritt’s survey.

While the general consensus on the attitude showed by the participants appears to be positive, with the businesses indicating why eco-innovation is relevant to them, there were those who noted this to be more of an individual based position than a collective industry approach, hence the decision of the study to label them as “Sceptical”. A summary of the factors associated with the attitudes held by the sceptics on the importance of eco-adoption suggests;

- **Environmental issues may exist and be a concern for the environment but in reality, people do not care**. This is evidenced by the daily attitudes of businesses towards polluting the environment and not seeking ways to cut down on their negative impact.

- **The businesses within the food and drink industry are not well informed on environmental issues**. This makes it difficult for the easy diffusion of eco-innovation. Despite legislation, there is a general lack of understanding on what they should be doing and how they should be doing it and this all comes down to the mindsets of the businesses as they fear what they perceive to be complex.
- **Consumers are just as responsible for the negative impact generated by the businesses**. Since the businesses respond to the needs of consumers, if the consumers were truly inclined towards environmental issues then the businesses would comply and integrate this.

The findings associated with this group reflect the issues identified within the existing literature on the difficulties associated with businesses and their adoption of eco-innovation (Hillary 2000; Tikka et al 2000; Hume 2010). It stands to reason that while a number of participants express optimistic and positive attitudes towards the adoption of eco-innovation, this might not really be reflected in the actual business activity, as the findings suggest there is not a strong correlation between being aware i.e. knowing about eco-innovation and doing i.e. the actual adoption of eco-innovation. While the act of knowing, and staying informed is useful and generates awareness, it does not necessarily translate into the adoption of eco-innovation as other factors may be at play which can influence or decrease the rate at which these factors get adopted. Therefore, the study highlights this as a possible area of concern for the food and drink industry.

In trying to understand the factors which might be linked to facilitating the adoption or might be responsible for inhibiting the successful adoption of eco-innovations, the study investigated the motivators and barriers to the adoption of eco-innovations and the findings are discussed in relation to the literature in the next section.

7.4 Scottish Food and Drink SMEs: Motivators and Barriers to eco-adoption

Despite the highly positive attitudes identified with the participants towards the adoption of eco-innovation it was interesting to note from the findings that there appears to be a higher number of barriers associated with the adoption of eco-innovation in comparison to the motivators driving the businesses to adopt such innovations.

7.4.1 Motivators to eco-innovation adoption

The key themes associated with motivating the business adoption of eco-innovations were identified as; Moral principles and beliefs, Eco-consumers, Cost savings, Legislation and Job creation. These themes will be discussed in the following sections and then related to the themes identified within the literature.

Moral principles and beliefs

The findings from the study indicate a strong sense of environmental responsibility on the part of the participants (RP01, RP03, PR07, RP08, RP09, RP14, RP15 and RP17). Participants noted their primary reason for adopting eco-innovation to be due to their moral conscience and their need to be seen as accountable businesses, ensuring they are able to conduct their activities at minimal impact with reduced negative effects on the environment in which they operate. While the participants cited other factors, which encouraged their decision to adopt and implement eco-innovations, it was however interesting to note that these participants attributed their first driver to adoption to be due to their genuine concern towards environmental welfare and the future sustainability of the business environment and securing a safer planet for future generations as the key motivator for going green and adopting eco-innovations. This motivator supports the findings from the literature which suggests a growing consciousness of SME managers about the state of the environment in which they operate (Environment Agency 2007).

Eco-consumers

The requirements of eco-consumers are also considered by the participants as a market that holds strong relative advantages for businesses that are adopting eco-innovation and considered “green”. Participants note that eco-consumers are loyal consumers and like to be associated with businesses noted for high adoption of eco-innovation, they further stressed that with eco-consumers price is not a factor they consider as they are primarily concerned with the environment (RP01). This fact has motivated some businesses to take advantage of this opportunity within the market by advertising their green credentials within the food and drink industry. Some participants further note that by satisfying their customer base that requires greener options and solutions from businesses, this also serves as a competitive advantage gained that sets them apart from other conventional non-adopters within the market and the food and drink industry (RP01, RP02, RP11, RP15). The participants also noted that with the growing concerns about environmental issues, regular consumers seem to be more receptive towards businesses that adopt eco-innovations, this has further increased their resolve to adopt eco-innovations and to appeal to the demands of their consumers.

Cost Savings

The findings within the study identified cost savings as a motivator but also identified cost within the barriers as an inhibitor. The participants indicated cost-savings to be one of the relative advantages to adopting eco-innovation and some indicated benefits relating to big savings following the adoption of certain eco-innovations (RP10). Some other participants indicated cost-savings achieved through waste disposal measures which translates into an increase in their bottom line income, echoing phrases like “less waste, means more savings” (RP03, RP05, RP07, RP10, RP11, RP15). These cost savings were associated with better use of materials and less energy.

Legislation

This emerged as a theme motivating the adoption of eco-innovation by the participants. This however, mostly relates to the laws passed on the recycling of food waste and the separation of general waste by businesses. Some participants noted legislation prompted them to take proactive measures towards adopting eco-innovation prior to the law being enforced; this was done to enable them to get ahead of the process and be fully adapted to the new changes in the system and how they operate. Legislation was also viewed by some participants as a coercive motivator and enforcer of eco-innovation; they noted that they really did not have a choice but to comply with the changes enforced by law (RP06). Other participants who indicated legislation noted that it also made them become more conscious and aware of their negative practices, thereby encouraging them to be more eco-conscious as businesses (RP02, RP04, RP06, RP13, RP14, RP16, RP18). Similarly, legislation is evidenced within the literature as a primary motivator for businesses to adopt eco-innovations as noted by Hillary (1995), Drake et al (2004) and Revell and Blackburn (2007).

Job Creation

The study found job creation as a motivator for the adoption of eco-innovation. This theme relates to the opportunities within the work-force that have opened up for businesses and individuals within the business environment to champion green causes and further enable the integration of environmental concerns within the business environment. This has resulted in the recognition of business efforts and created larger networks for the small businesses to be connected to on a larger scale. It has further opened the door to the creation of new roles and titles within the businesses for the employment of green champions and facilitators of eco-innovation, who ensure that the businesses are compliant with legislation and as well as generating awareness within the business and with their networks (including customers, supply chains etc.) to foster and promote eco-innovation (RP02, RP07).

The findings from the study on the motivators seem to be consistent with the existing literature on what motivates businesses to adopt eco-innovation. Drake et al (2004) found that businesses were driven to adopt eco-innovations based on regulatory compliance, this is consistent with the participants within this study who identified that legislation motivated their decision to adopt eco-innovation. In relation to those who identified with moral principles and beliefs, the findings can be related to the Environment Agency (2007) report that found SMEs considered that the most important driver for their adoption of eco-innovation was their concern for the environment. The same study identified regulation (legislation) and the need to reduce cost as additional drivers; all three factors are noted to be consistent with the findings from this study. Cost was also noted as an enabling factor in the adoption of eco-innovation within the same survey conducted by the Environmental Agency (2007) of UK SMEs. In addition, Hart (2005) found the adoption of eco-innovations directly leads to increased profits and improvement of business environmental performance. Green consumers were observed within the literature (Pujari 2006; Triguero et al 2013) to be an influential driver for businesses to adopt eco-innovation, this enabled the businesses to take advantage of their green image as a marketing strategy to gain competitive advantage. The only theme not identified within the literature is the emerging theme of job creation, this is considered within this study as a new motivator to the list of existing motivators identified to be consistent with the findings of the literature that motivate the adoption of eco-innovation. While Job creation has not been identified within the literature, it could be linked to the advantages achieved by the ability of the businesses to portray themselves as green, as existing studies have noted such benefits gained from the exploitation of a green image to enhance their bottom line. Job creation as a factor is considered important because it stresses businesses going beyond their standard operations and expanding their scope and opportunities to incorporate a conscious environmental workforce. These green champions have further awareness and promote the green agenda in the business in which they operate; this can also be seen as a marketing strategy which boosts the businesses image as well. In a nutshell, the key motivators identified within this study; moral principles, eco-

consumers, cost and legislation are consistent with the existing literature with the exception of an emerging factor of Job creation which all motivate businesses to adopt eco-innovation. The next section will now discuss the findings of the study on the barriers to eco-innovation adoption.

7.4.2 Barriers to eco-innovation adoption

The findings revealed a number of factors associated with negatively impacting on the decisions of businesses to adopt eco-innovation; these were presented as themes identified by the participants within the study. The key barriers to eco-innovation identified include: non-recyclable waste, non-compliance by suppliers, cost of adoption, credible and reliable sources, lack of interest, limited funding option, attitudes and behaviours, time constraints, lack of education and awareness. When compared with the motivators, the findings reveal a higher number of factors at play that inhibit the rate of adopting eco-innovation within the Scottish food and drink industry. These themes will now be discussed in the following sections in relation to the literature.

Non-recyclable waste

The findings suggest that participants looking to obtain a full circle of green credentials consider certain types of waste that are non-recyclable but yet are required for use within their business because there are no greener alternatives, to be a major barrier to the adoption of eco-innovation. Some of the non-recyclable waste identified by the participants are in forms of packaging material such as polystyrene used for storage of products and deliveries within the industry. The difficulty experienced by businesses is in the disposal of such material which cannot be recycled and as such will have to be disposed of by landfill. However, some participants try to mitigate this through re-use where possible in order to minimise the disposal to landfill, they however stress this as a temporary solution and recognise the need for a more permanent solution to such barriers to enable the businesses looking to exclude this limitation to their green status.

Non-compliance of Suppliers

Non-compliance by suppliers was found to be a barrier to the adoption of eco-innovation. Participants noted difficulties encountered in dealing with suppliers and communicating about their eco-innovation. Dealing with suppliers along the supply chain and getting them to collaborate can be challenging especially for SMEs who have very little control over the suppliers and can do very little to enforce their concerns on them, this is even noted as more challenging when the supplier is not interested in environmental concerns.

Packaging was identified as a critical area for the businesses in which they had difficulties persuading their suppliers to comply. Some participants stressed the need for suppliers to re-evaluate their packaging model as they were noted to be extremely wasteful. Participants also noted that as individual businesses raising such concerns to their suppliers, they were less likely to get results as opposed to taking this issue up collectively. They stressed the need for more businesses within the industry to recognise this issue and tackle it collectively.

Initial cost of adoption

The findings reveal that a number of participants considered cost to be a barrier to the adoption of eco-innovation. As noted earlier, cost seemed to play a dual-role within the study as it was identified as a motivator to adoption in relation to cost-savings and increasing the profitability of the business by the adoption of certain innovations relating to waste and energy. However, it was also identified by businesses to be an issue, particularly the high-tech innovations which cost a considerable amount and are considered as high-value investments like biomass, solar panels, wind turbines etc. Despite the grants, tariffs and incentive schemes set-up to enable businesses to adopt such innovations, the participants noted that they were still required to have certain set amounts for investment to be able to benefit from such schemes and this could be difficult for low-income businesses that are unable to meet the capital requirements.

Other issues raised in relation to cost indicate the time it takes for businesses to get a return on the investment in certain types of eco-innovation. The participants noted that in the case of high-value investment they mostly viewed these as long-term investments which take much longer for them to recover their cost as a business, and this is considered an issue when it affects their ability to profit as a business. Therefore, participants stressed that their desire to be green should not come at the expense of their business staying afloat and noted that the relative advantages associated with some eco-innovations especially when it comes to cost can be a huge impediment to their adoption of some eco-innovation.

In addition to this, participants also noted that most green products within the industry came at a much higher cost in comparison to conventional alternatives. Therefore, their decision to adopt such eco-innovations will need to be evaluated in the pricing of their product and services. For instance, if a food business made use of only compostable disposable products which are sold at a premium price unlike the non-green disposable, the business would require the demand for such eco-innovations to be equally high and the customers willing to pay the extra cost otherwise it may be counter-productive from a financial point of view for the business as this could result in a loss. This notion emphasises the need for more competitively priced greener innovations to enable businesses to tackle this notable barrier of cost.

Credible and reliable sources

The study found the issue of credibility and reliable sources of support to be a hindrance noted by the participants to the adoption of eco-innovation. Businesses relate to instances where scammers and fraudulent companies try to take advantage of their desire to adopt eco-innovation. This poses a serious issue for the trust and credibility of participants as they note the increasing difficulties they encounter when seeking assistance and the high likelihood of them falling victim to such exploitative scams. It is also clear from such findings that the businesses do not necessarily have proper information whom to contact for

information on eco-innovation, despite the availability of some of the key environmental organisations at their disposals like; Zero Waste Scotland, Carbon Trust, WRAP etc. the roles of some were briefly identified in chapter 2. These organisations are set-up to offer support and guidance to businesses and should be the main form of contact for these businesses. However, this finding indicates there appears to be some form of ignorance on the part of the businesses on the existence of such agencies and organisations.

Lack of interest

Participants further cited the lack of interest towards environmental issues as a barrier to the adoption of eco-innovation. They noted that while the industry may like the idea and notion of eco-innovation, the actual drive for it is limited in practice. This is related to the experiences they have encountered along the line within their industry in dealing with other businesses in the food and drink supply chain and in dealing with other customers as well.

Limited funding Options

The findings reveal concern among the study participants about the challenges encountered when trying to gain access to funding particularly for the purposes of enhancing their green status and fostering further adoption of eco-innovation. The participants note that a low level of support and access to funds are available from financial institutions for investing in eco-innovation; this poses a challenge for them as small and medium-sized enterprises with limited financial abilities. This limitation is identified in the overview provided in chapter 2 on the characteristics of SMEs; within the chapter the literature noted that due to the smaller workforce and nature of their businesses limited resources, SMEs tend to struggle with sufficient funds (McAdam et al., 2000) especially when compared to larger companies. Therefore, there is a need for better support and easier funding accessibility for businesses looking to invest in greener innovations within the food and drink sector.

Attitudes and Behaviours

Attitudes have previously been discussed in earlier sections within this chapter and related to the findings on the level of importance held by the participants towards the adoption of eco-innovations. However, it also emerged within the findings as one of the factors negatively impacting the rate of adoption. Participants suggested that negative attitude and behaviour are a hindrance to adoption; this is related to attitudes and behaviour within the workplace that indicate a lack of interest. Participants note a general sense of non-compliance especially when it comes to sorting out waste and they consider this a challenge to the successful implementation of the eco-innovations already adopted within the business. Some businesses also noted the artificial attitudes exhibited by customers and even made references to instances where some customers claim to be green consumers but their behaviour and action are not consistent with being green or environmentally conscious.

Logistical challenges

Some participants noted constraints and conflict when carrying out their business activities which generate environmental impact. This was in relation to logistical challenges that the businesses note make a huge negative impact on the environment, especially when considering the emissions from such activities. The issue of doubling back on deliveries and scheduling can be a complicated issue for businesses in the food and drink industry particularly when trying to ensure products are delivered on time and fresh to their customers. While this guarantees customer satisfaction, it however, poses a threat to the environment especially when considering the cumulative impact generated by polluting it further. The challenge this creates for businesses is finding the right balance between satisfying their customers and being environmentally sustainable.

Other participants identified encouraging employees to cycle or car-share and explore travel routes that reduce their foot-print, while this is not necessarily a direct business activity impact. This could foster a strong culture among participants and make them

environmentally conscious in their actions and thoughts, but some businesses find it challenging to embed such innovations within the workplace as most employees do not confirm because they consider it to be an inconvenience, despite the notable cost savings attributed to these greener modes of travel and commuting.

Lack of Education and Awareness

The study found that most participants felt there was a general lack of education and awareness within their industry on the relative advantages associated with adopting eco-innovation and these posed a barrier to further enhance the adoption rate of eco-innovations within the food and drink sector. It was established from the views of participants that there is a need for proper enlightenment as to the benefits and implications of eco-innovation. It was further stressed that due to the lack of awareness, some businesses assume that eco-innovations are complex and require a professional level of expertise to adopt, not to mention the excessive cost assumed to be associated with adopting such innovations. Participants noted that while there is a cost to “green”, as there is a cost to almost everything else including conventional options it might be helpful to highlight the differences between the types of innovation, why they matter and what distinguishes them from each other; this will raise awareness and educate the businesses on the attributes of eco-innovations. This is considered an important requirement to help address the wrong notions and perceptions held about eco-innovation.

The findings from the study on the barriers are consistent with the findings from existing literature on what motivates businesses to adopt eco-innovation. However, some new barriers not identified in the existing literature were identified by this study such as; non-recyclable waste, credible and reliable sources of information, limited funding options and logistical challenges. The most prominent issues raised within the literature relate to cost as a major barrier as identified within Simpson et al (2004) and Revell et al (2010), these studies noted that businesses considered environmental issues to be important but also felt

the cost associated with improving their environmental performance was too high and could not be passed on to the customers, thereby making it unlikely for the businesses to adopt. Similarly, the participants within this study identified cost to be a barrier particularly when trying to adopt high tech innovations like solar that are capital intensive and might not be cost effective for low income businesses.

The literature identified the lack of time and resources to be a major barrier for SMEs in their adoption of eco-innovation (Revell, Stokes and Chen 2010, Brammer et al. 2012). However, the findings from the participants within this study suggest otherwise as they seemed to have the time and noted to be willing to dedicate their resources to the adoption of eco-innovations. Instead, the lack of funding options was found to be more of a problem experienced by the participants as oppose to their ability to dedicate their time and resources to the adoption of eco-innovations. Other barriers found to be consistent with the literature include; the lack of interest which supports the findings from previous studies that identified the lack of consumer demand (Bianchi and Noci 1998; Merritt 1998; Verheul 1999; Drake et al. 2004; Revell, 2007). The lack of interest and low consumer demand also made it less attractive for businesses looking to go green. Also, the study identified the lack of education and awareness to be a barrier that still exists and affects the adoption of eco-innovation. Previous studies (Environmental Agency 2002; 2003 and 2005; Hillary 2000; Revell 2010) had identified this issue which they noted negatively impacted on the abilities of businesses to successful adopt environmental practices. Having discussed the motivators and barriers to eco-innovation adoption the next section discusses the findings on the adoption of eco-innovations by the participants.

7.5 The Adoption of Eco-innovations by Scottish Food and Drink SMEs

This section evaluates the findings of the study on three key aspects namely; the forms of eco-innovations adopted by the participants within the study, the perceived attributes to the

adoption of the identified forms of eco-innovations and the last aspect presents the scale of eco-adoption evidenced by the participants.

The section on the forms of eco-innovation is discussed in line with the five categories of eco-innovation established within this study presented in chapter five and applied to the eighteen participants detailed within this study. The next section discusses the study's findings in relation to Rogers (2003) perceived attributes to an innovation; these relate to the findings on the following; Relative advantage, Compatibility, Complexity, Trialability and Observability of eco-innovations as perceived by the Scottish food and drink SMEs. The final section provides a discussion of the findings, providing a snapshot of the profiles of the businesses illustrating the diffusion of their eco-innovation; this is followed by the case by case display of the participant's forms of eco-innovations which have been adopted which is used to display a scale of greenness and determine the level of innovativeness based on the participant's extent of eco-innovation adoption. This is further used to create a classification of eco-innovation adopters and the section concludes with a proposed model and toolbox to further enhance the adoption of eco-innovation by adopters and potential adopters of eco-innovation.

7.5.1 An Evaluation on the forms of eco-innovation adopted by Scottish food and drink SMEs

The study established five broad categories to capture the range of eco-innovation adopted by the eighteen participants of eco-innovation within the study. The categories were established based on the forms of eco-innovation identified after a web-survey was conducted on fifty-two (52) adopters of eco-innovation (see chapter 5 for details); the various types of innovation were then classed under five categories to capture the nature and form of innovation adopted within the industry, this categorisation is considered a novel contribution to this study as there is little evidence (if any) within the literature that

establishes a categorisation of eco-innovations as is done by this study. The findings in the five categories will now be considered and discussed below.

Waste Management Eco-innovations

The findings on the forms of waste management eco-innovations adopted by the Scottish food and drink business were identified within the study as *Reduce, Reuse, Recycling, Composting, Zero-landfill and Waste conversion*. These six forms of eco-innovation were found to be the most prominent innovations carried out by the business in relation to their waste improvements, minimisation and prevention activities. The study found that while the nature and extent to which these waste eco-innovations were being adopted by the participants varied to a reasonable degree as it appeared that some innovations were more popularly adopted by the participants than others. For instance; the study found that recycling was the most popular form of waste eco-innovation being adopted among the six forms of waste innovation, with methods of Reduce and innovations that achieve zero-landfill being the least popular forms adopted by the businesses. It would appear that the impact of legislation on recycling has ensured and fostered the results shown in the study; this is due to the fact that is now being enforced by law and businesses are at risk of facing a penalty for non-compliance. In addition, this service is conducted using external infrastructure that picks up the various sorted waste from the business premises. However, the other forms of waste eco-innovation are not enforced and are voluntarily being adopted by the businesses and require genuine commitment from the businesses to be implemented; this may explain why their adoption is not as easily diffused as the recycling.

The study also found that through the adoption of some of the waste eco-innovations the participants noted some additional benefits such as generating extra income through the disposal of waste. For instance, some participants noted the re-use of compacted and compressed cardboard to be sold in bales for extra cash that flows back into the business.

This study considered this a smart and innovative way for businesses to reduce their waste and also increase their profits through the adoption of this innovation.

Energy Management Eco-innovation

There were seven forms of energy eco-innovation identified within this study to be applicable to the participants. These innovations were in the forms of Heat recovery systems, Solar panels. Wind turbines, PIR sensors, Monitoring systems, Reduced consumption and LED lighting. When analysing the energy-related eco-innovation, the study found LED lighting to be the most widely adopted innovation among the participants. This was followed by eco-innovation processes that relate to monitoring of energy usage like tracking devices and methods to reduce consumption of energy by businesses (e.g. switching off appliances when not in use). It may be that these forms of eco-innovation are considered relatively easy to adopt by the participant and also less cost-intensive when compared to the adoption of other energy management eco-innovations like heat recovery systems, solar panels, wind turbines and PIR sensors. It had been noted earlier on within the discussions on motivators and barriers that the study found that participants indicated experiencing difficulties with access to funding for certain types of eco-innovation and this mostly related to high-tech value eco-innovation such as the solar and wind turbines. This could explain why those innovations had the least numbers of adopters within the study despite the earlier comments which indicate participants were generally aware and knowledgeable about these forms of energy management innovation.

GSCM Eco-innovations

Six forms of eco-innovation relating to green supply chain management were found to be adopted by the participants in this study. These were; local sourcing, sustainable packaging, traceability, supplier/customer engagement, ethical sourcing and green purchasing. The study found that while these forms were identified within some businesses, there appears to be a slow diffusion on most of the GSCM eco-innovations by the participants. While local

sourcing and sustainable packaging seemed to be gaining attention within the food and drink industry the study found little evidence to show these were widely adopted eco-innovations by the businesses. The least adopted forms under GSCM were identified as Traceability, and Supplier/ Customer Engagements. While Traceability could be considered a complex and difficult innovation to integrate by the businesses within their processes, the ability to engage with suppliers and customers should be easier to adopt if the customers indicate interest in the environmental activities of the business. There is limited evidence of such engagements found within the study with the exception of one participant (RP01) who actively discussed how they considered such engagement necessary for their green business to be successful. The study also found evidence of participant's adoption of Ethical sourcing and Green purchasing as with the other forms, these were also sparsely diffused among the participants. It might be worth considering further why participants considered local sourcing easier to adopt in comparison to ethical sourcing or green purchasing. These could relate to the perceived attributes associated with these innovations and also be reflective of the participants understanding of these innovations which could inform their decisions to adopt these eco-innovations.

Carbon-footprint Eco-innovations

The study found three eco-innovations associated with carbon-footprint management, namely logistics management, eco-efficiency and low product miles. These innovations were linked to eco-innovations being adopted by businesses in a bid to reduce their carbon-footprint and emissions. Eco-innovations in the form of logistics management were related to routing, planning and scheduling to avoid double-backs and the use of bulk transportation of goods and services, all of which are key elements of logistics management. Eco-efficient innovations were found to be related to measures taken by businesses to access and improve their internal process and overall business impact. Some participants were found to set limits on their carbon-footprints for instance; the decision not to go beyond a 50-mile radius when dealing with suppliers. Additionally, some participants noted the decision to cut

down the delivery process by picking up their goods themselves while conducting business-related activities, this effort helps businesses eliminate the emissions created by the delivery service, and while this eco-efficient measure might not be applicable in all cases, it was worth noting the substantial and little measures adopted by businesses as a means to cutting down their carbon footprint. Low product miles were found to be the most prominent eco-innovations being adopted by businesses within the food and drink industry. They emphasised the overall distance travelled, and their effort to support local businesses by limiting their transactions within their regions and also supporting local businesses as well.

Embedding Eco- innovations

Embedding eco-innovations within this study captures two key themes; the first relates to the **Position, Stance and Ethos** of the participants on eco-innovations and the second theme is classed under **Engagements and Internal**. Both themes were further broken down to capture subthemes namely; *Green policy, Statements and Values* for the first theme and *Employee training, Outreach, Accreditations/ Certifications and Green awards* as sub-themes under the second. All themes and sub-themes reflect the extent to which the participants have embedded and integrated their adoption of eco-innovation. These relate to the actions taken by businesses to evidence their implementation and confirmation of such adoptions associated with the efforts taken and the results of such adoption.

Position, Stance, Ethos

The findings indicate that a number of businesses have green policies which were mostly evident on their websites; these policies in most cases provide the reader with information on what the business is doing to cut down its emissions. The decision to have an environmental policy is a useful guide taken by the participants to showcase their eco-innovations and also serves as a marketing tool to advertise the business and enhance their green image and reputation.

While some businesses clearly had written out environmental policies, some others made use of environmental statements which were briefer and simply identified with the business philosophy or stance on green issues. So, in many cases where participants were found to have an environmental statement, these mostly confirmed that the business was committed to adopting environmental practices which reduce their environmental impact. The study however found the use of an environmental statement to be a bit misleading sometimes, especially when no clear indication was given of the action being taken to reduce environmental impact. The findings further revealed that most participants valued the adoption of eco-innovation; these were related back to the findings of the motivators to adopt eco-innovation and the level of importance placed on their adoption of such innovation.

Engagement and Internal

The findings on the forms of engagement and internal activities that further embed eco-innovations were considered and the study found that while some businesses showed evidence and discussed ways in which these eco-innovations were embedded through the forms of employee training, outreach to other businesses and customers, some businesses noted going through external organisations to get certified and accredited, and there were those who confirmed earning awards and recognition within and outside the food and drink industry for their eco-innovation efforts. It was however clear from the findings that eco-innovations relating to engagements and internal embedment are not widely adopted by the participants. For instance, very few businesses indicated their engagement in employee training as a means of ensuring proper integration of the adopted eco-innovation. Outreach was also seen to be adopted by only a few participants despite the relevance of using this form as a means to generate awareness and interest in the business eco-activities. This could easily be done through the use of popular social media forums like Facebook and Twitter which the study found to be an active source of communication for most businesses within the industry.

Certification and accreditation relating to environmental issues identified within the study were linked to ISO, linking environment and farming (LEAF), Marine Stewardship council (MSC), Soil associations and Quality management systems (QMS). It was also interesting to note from the findings that businesses that had obtained some form of accreditation/certification also achieved some form of recognition or awards for their eco-innovation efforts. The participants with awards noted that this also helped them gain competitive advantage and was a very useful way to foster their green status with customers

7.5.2 Attributes of Eco-Innovation Adoption

Drawing from Rogers (2003) attributes to the adoption of an innovation, the study explored the attributes associated with adopting eco-innovation by the participants and the findings found per attributes are summarized below:

Perceived relative advantage- the study found most participants associated the direct and indirect benefits obtained from their adoption to be the relative advantage of their adoption of eco-innovation. Such instances of direct benefits cited from the participants were increased profitability, reduced cost, reduced waste etc. and instances of indirect benefits were associated with social benefits attained with adoption, like an improved business image and reputation which made the businesses gain competitive advantage and become more valuable to their customers. Other factors noted to be advantageous to adoption was to be considered as the best practice businesses within the industry. This translated into the businesses gaining recognition and green awards for their eco-innovation efforts and further enhanced the business green image.

Perceived Compatibility of Eco-innovations

In evaluating the extent to which participants indicated eco-innovation to be compatible with their business values and needs, the study found that most participants considered most eco-innovations to be compatible. These were related to the eco-innovation ability to meet

the business desire to cut down on their waste, minimise their energy use, reducing the business overall costs, improving the environmental image of the business and lowering the overall environmental impact of the business. It was observed by the study that most businesses seeking to boost their green credentials considered their adoption of eco-innovations to be aligned to meeting their needs.

Perceived Complexity of Eco-innovations

The study found few indications of participants experiencing difficulties that may have influenced the rate at which they adopted eco-innovations. There were those though who noted initial difficulty when trying to adopt high-tech eco-innovations like heat-recovery systems. They noted been discouraged by contractors who stressed that such innovations were complex and difficult to use. However, despite the reluctance and initial difficulties experienced in trying to adopt some innovations these businesses were able to find more reputable and credible agents of eco-innovations to help them achieve adoption. In this case, the study found that complexity was not necessarily attributed by the participants to the innovation being adopted but the perception and behaviour of third parties towards the ease to which the innovation could be adopted and implemented by the business. This finding further highlights the relevance of using the right communication channels to gain information and assistance for businesses looking to adopt eco-innovation.

Perceived Trialability of Eco-innovations

The findings from the study suggest Energy management innovations were considered by participants as the most suitable forms of innovation to be adopted on a trial basis to determine its suitability and results within the business before expanding the adoption on a larger scale to full implementation within the business. LED lights and PIR sensors were the most cited types of eco-energy which the participants perceived suitable for trialability. In general, most participants were not too inclined to partial adoption, though this could be as a result of the difficulty associated with trial adoption of certain innovations, this corroborates

Rogers' (2003) observation of adopters that suggests that while it was possible for some innovations to be partially adopted on a trial basis, not many innovations offered this attribute. He further suggested that the possibility of trial-adoption enhanced the rate at which an innovation was adopted. This was observed within this study as LED lights were found to be the most adopted form of energy eco-innovation by the participants in comparison to the other forms of energy innovation.

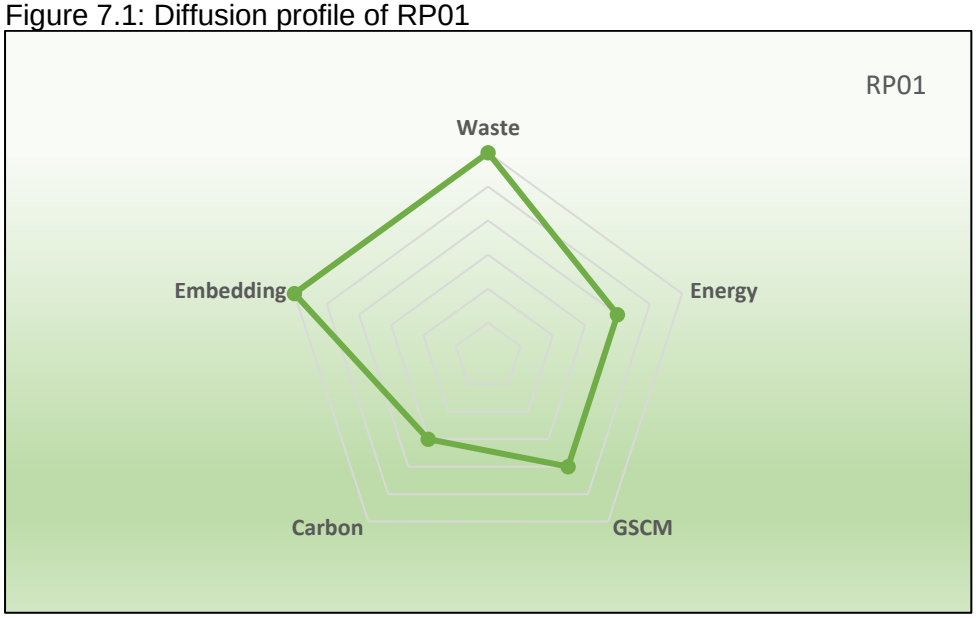
Perceived Observability of Eco-innovations

The findings reveal participants showed mixed views of what they considered to be the observable results from their adoption of eco-innovation. Some participants related the results reflected to be in the form of the waste management innovations which were predominantly recycling, re-use, reduce and cited the adoption of such eco-innovations to have effectively cut down their waste and reduced their environmental impact. Other participants suggested their perceived observability in form of financial returns and in some cases noted these to be medium to long term and not immediate particularly when relating to energy innovation though they expressed confidence in the end-results of such timelines for the business.

7.5.3 Profile of Eco-Innovation Adoption

This section briefly illustrates the profiles of the businesses using diagrams to reflect their adoption and diffusion of eco-innovation in relation to the five categories of eco-innovation established by the study (waste, energy, GSCM, carbon and embedding). A sample profile on research participant 01 is used in figure 7.1, while figure 7.2 displays mini-snapshots on the diffusion of each category of eco-innovation adopted by the other participants. A detailed version of each profile is presented in the appendix VII.

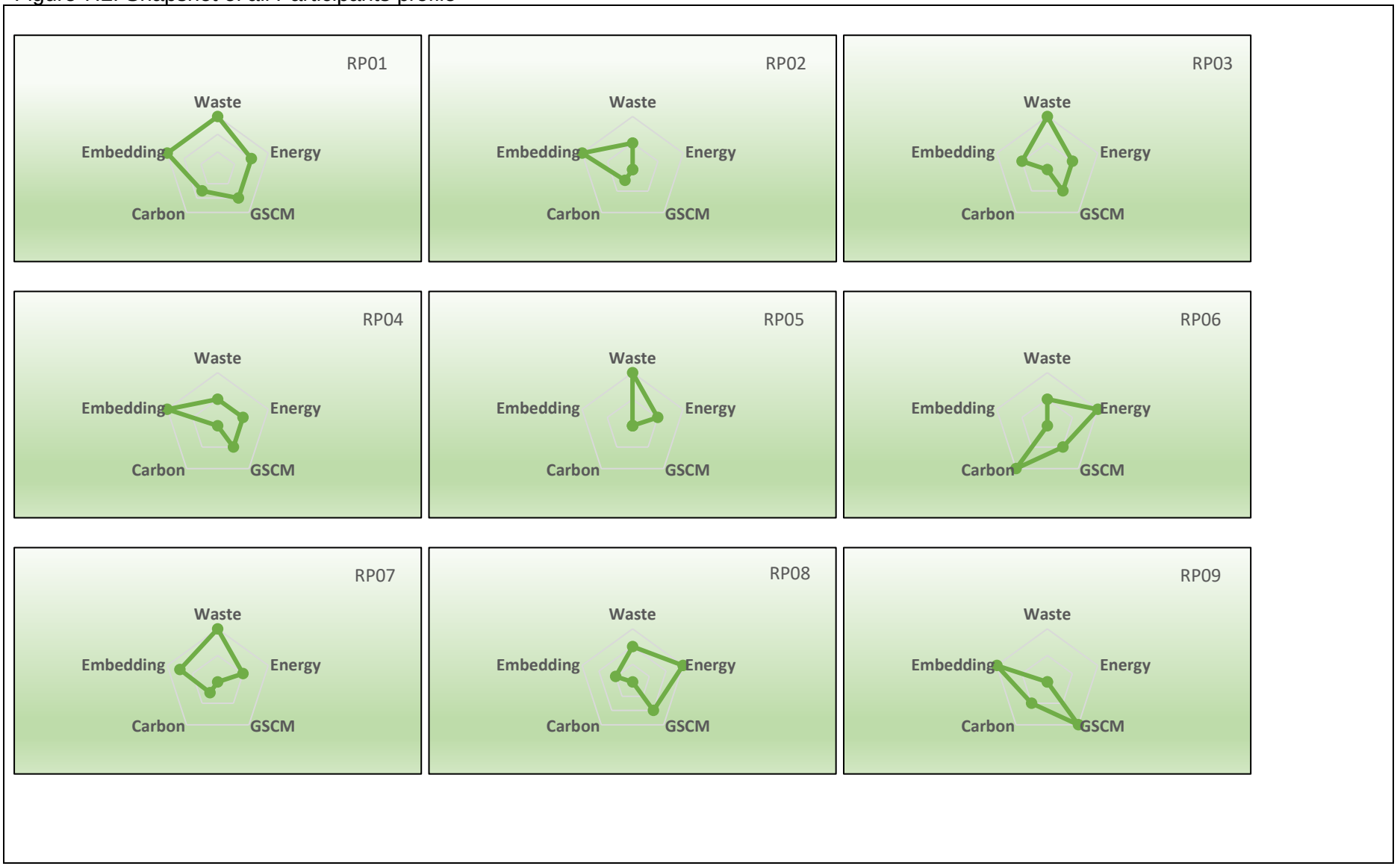
Figure 7.1: Diffusion profile of RP01

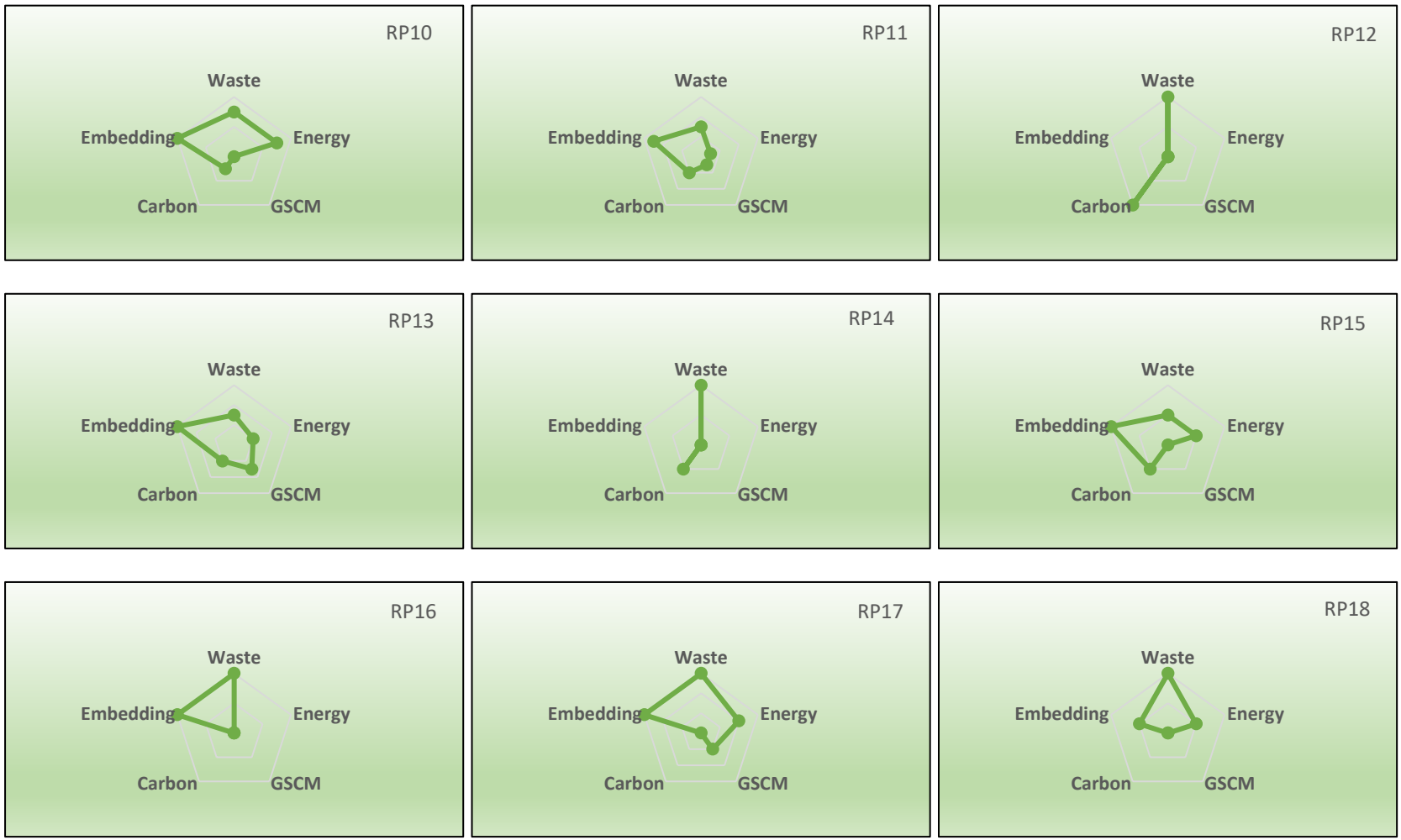


Source: Author

The diffusion profile is considered a useful tool that allows comparison between adopters of eco-innovation and further enables individual businesses looking to visualize and understand the rate and extent of their adoption by showing where they are more active and where they are less active and require improvements. Having created this tool, it is considered an important aspect of the study's contribution which is discussed in detail in chapter 8.

Figure 7.2: Snapshot of all Participants profile





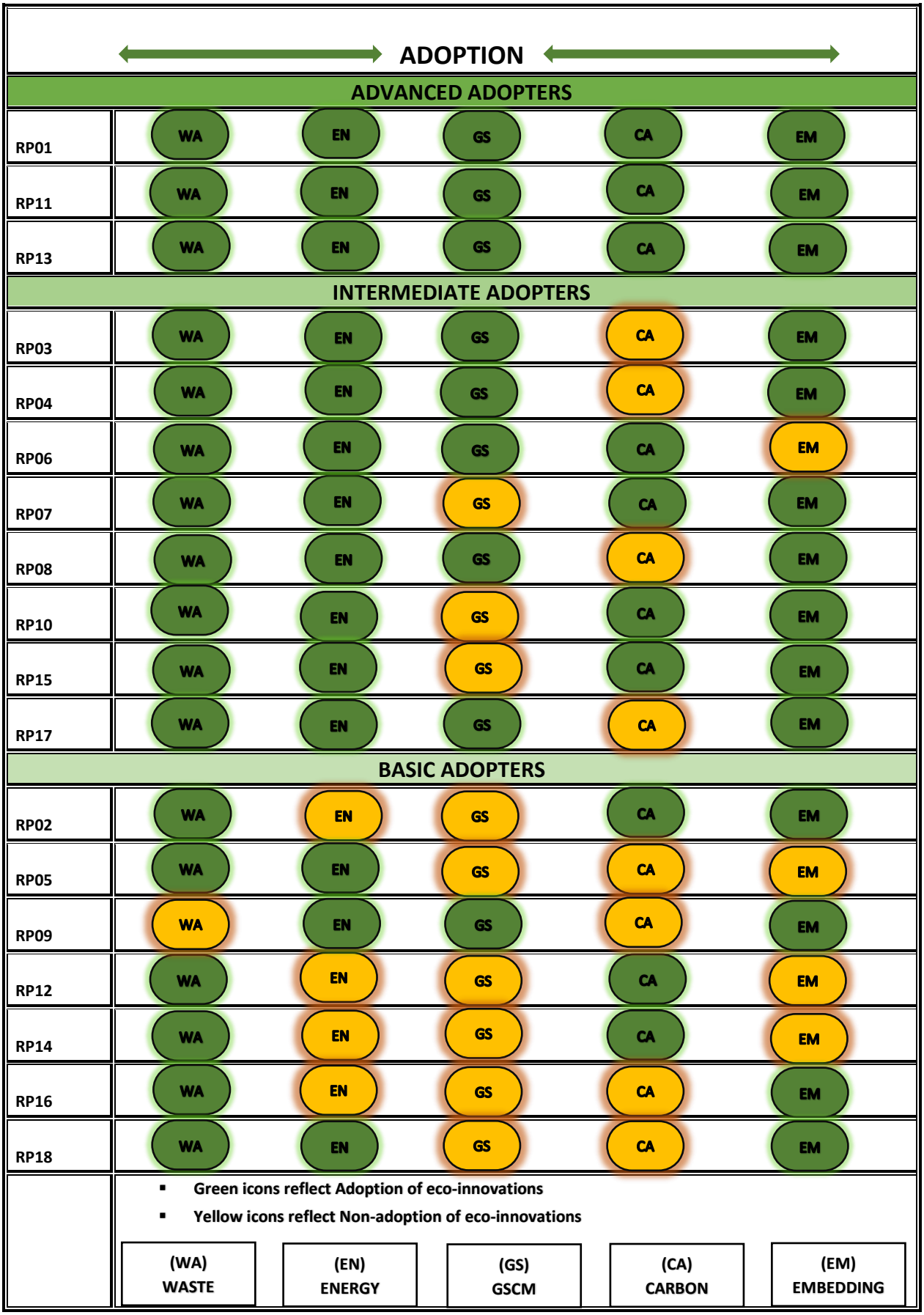
Source: Author generated

To show diffusion, points were assigned to the various sub-categories under each main eco-innovation category and each participant was given a score on the eco-innovations adopted and the aggregate was then assigned to the 5 main categories and displayed to reflect the extent of diffusion of each category of eco-innovation by the business. From the diagram in figure 7.1 the spread of each category can be seen from the most diffused categories to the least diffused. For instance; the profile of participant 01 reveals waste and embedding to be the most fully diffused categories, followed by energy, GSCM and lastly carbon. It is however, evidenced from the diagram that the participant is an adopter of all the eco-innovation categories. While figure 7.2 provides, a snapshot capturing the diffusion evidenced by the other participants within the study a full overview of each participant profile is presented in the study's appendix VII.

7.5.4 Model of eco-adoption

As mentioned earlier, one of the objectives set out by the study was to establish a scale of greenness that reflects the eco-innovations adopted by the participants within the study. From the findings of the survey, the study was able to establish the categories of eco-innovation which were applied to each of the interviewed eighteen participants and the various eco-innovations adopted per participant were captured to generate the scale of greenness depicted in figure 7.3 below. The findings showed that all participants were adopting some form of eco-innovation from the established categories. However, the study distinguished the adopters by reflecting the extent of their eco-innovation adoption; this enabled the study further to establish the categories of adopters applicable within the study; this was done taking into consideration the inability of the study to reflect the time element applied by Roger (2003) to establish his categories of adopters.

Figure 7.3: Scale of greenness



Source: Author generated

As shown on the scale in figure 7.3, the findings reveal that almost all participants were adopters of some form of waste innovation with the exception of RP09 who was found to be a non-adopter of waste innovation but however adopted innovations on carbon, embedding and GSCM. The findings therefore established waste innovation to be the most prominently diffused eco-innovation of the five categories by the food and drink businesses. This could partly be due to the legislation relating to recycling which enforces this eco-innovation and makes a requirement of the adoption of this innovation and compliance by businesses. As a result of this, by default, businesses are seen as adopters of waste innovations. However, recycling was not the only form of eco-innovation categorised under waste innovation within this study; there were businesses which showed themselves adopters of a number of other waste eco-innovations, which was purely influenced by different motivators and the perceived attributes relating to the innovation they were found to be adopting. Cassells et al (2011) notes businesses tend to adopt waste and energy eco-innovations due to the cost benefits associated with them.

The findings from the scale further reveal a mix of eco-innovation by the participant; there were only three participants within the study found to be adopting innovations relating to all five eco-innovation categories, while the rest of the participants indicated adopting a combination of two or more of the eco-categories. Using the categories of eco-innovations established by the study, participants can identify where they fall on the scale based on their eco-innovation practices in comparison to their fellow businesses within the industry. It further presents a snapshot of the level of greenness by the Scottish food and drink businesses and identifies key eco-innovation areas that indicate that the businesses seem to be struggling to adopt some eco-innovations. Overall, the scale reflects the extent of eco-innovativeness applicable to the study participants and identifies three (3) types of adoption based on the participants adoption level. This typology of eco-innovation adopters and some of their key features are presented and discussed in the next section.

7.5.4.1 Eco-innovation Adoption Types

Using the information established from the scale of greenness, the study split the participants into three key categories namely; Advanced, Intermediate and Basic adopters of eco-innovation. This was done on the premise of the five categories of eco-innovations which represent aspects to which businesses can deploy innovations to tackle their negative environmental impact and improve the state of the business environment in which they operate. These categories of adopters are illustrated in table 7.1. The criteria applied by the study, as discussed in previous chapters three and four, is the degree of innovativeness, identified within Rogers (2003) but adapted to suit the nature of this study, rather than applying the time factor which is more suitable for longitudinal studies as it takes into consideration the time element of when an adopter becomes aware of an innovation and establishes their adopter category based on when the innovation is then adopted by the potential- adopter. However, this study focuses on the adopters and the extent to which they adopt the eco-innovations based on the five categories of eco-innovation established, using this to establish their extent of eco-innovativeness and also classify them under the three main groups found in the study. Therefore, it is important to stress that the general idea of the adopter types is driven by the theory i.e. Rogers diffusion of innovation, without taking in the time element by which Rogers classifies his innovation adopters. However, this study was able to generate a typology of eco-innovation adopters focusing on their adoption of the identified forms of eco-innovation categories and their general features as they relate to adoption.

This typology created by the study also serves as a tool that places the various adopters within one of the three identified types of adopters and encourages them to move to the next stage in order to achieve maximum adoption and diffusion. The concept can also be applied to other studies looking to classify their participants according to their key features as opposed to using time as an element to distinguish the types of adopters of an innovation.

Table 7.1: Eco-innovation Adopters Types

KEY FEATURES	**TYPE OF ADOPTER**		
	Advanced	**Intermediate**	**Basic**
Strategy+ Approach	Proactive Voluntary	Active	Reactive Compelled/ Obliged/ legislation
Knowledge	Extensive *Implied-Broad- Deep*	Moderate	Minimal *Implied-Narrow and Shallow*
Awareness	High level	Medium level	Low level *Implied*-Restricted awareness
Perception	Highly important	Partly important	Not importance
Value + principles	Core value	Mixed	Peripheral
Motivation	High	Medium	Low
Embedding in business processes	Highly embedded	Partially embedded	Barely / *Scarcely* embedded *Implied- limited*
Outreach + Engagement Promotion +Ambassadors	Active promoters +advocates	Moderate promoters	Minimal promoters *Implied- low involvement*
Self-Promotion Defining marketing + Promotion	Core to their defining	Middle point	Peripheral to their defining

Source: Author generated

As shown in figure 7.4 the four adopter categories will be discussed in line with the attributes as established by the study below.

Advanced Adopters: The study defines advanced adopters as those at the highest level of eco-innovation adoption within this study. They were found to be extensive adopters of the five categories of eco-innovation i.e. Waste, Energy, GSCM, Carbon, and Embedding. From the 18 interviewed participants, the study established 3 advanced adopters of eco-innovations. The study also found these active innovators shared similar attributes and opinions in relation to their eco-innovation. For instance, in terms of their strategy and approach to eco-adoption, the advanced adopters were found to be highly proactive and most of the eco-innovations were voluntarily adopted. They generally showed a deep and extensive understanding of their knowledge of eco-innovation, with a high awareness of environmental issues and appeared to be extremely keen and passionate about the integration of such eco-innovation within their business, which indicated that it was at the core of their business values and principles. The advanced adopters were found to be highly motivated towards eco-innovation adoption and also took steps to ensure the innovations were properly embedded within their businesses. It was evident from the discussions with these adopters that they were eager and active promoters for the adoption of eco-innovations within their industry and stood out among all the other categories of adopters based on their ability to identify and adopt all forms of eco-innovation considered relevant and applicable to their business and industry as a whole. They also showed themselves to be advocates and reliable sources of contact and role models for other potential adopters within their industry and had engaged in collaborative efforts with eco-agents of change based on their active adoption of eco-innovation.

The participants within this group were found to bear some similarities with Rogers (2003) Innovators and Early adopters. They seemed to mix some of the attributes associated with these two adopter categories established by Rogers. For instance, the innovators as explained by Rogers had a deep understanding and knowledge of the innovations and were also considered pioneers in the adoption of the innovations within their social system; the active adopters classed within this study were found to exhibit similar traits to that identified

to Rogers innovators. However, they were also found to share some of the traits associated with the early adopters who are typically considered as role-models to potential adopters. They are also used by agents of change to speed up the diffusion process on innovation and are respected and recognised for their role in the adoption of innovation. Similarly, the study found such unique traits to be associated with the advanced adopters as they indicated instances where they served as references and helped their peers to make informed decisions on eco-innovation. They were also noted to have gained recognition for their efforts within their industry through winning eco-awards and engaging in outreach that informed their customers and suppliers on their eco-innovation systems.

Intermediate Adopters: These represent the next level of adopters identified within the study and are next in line after the advanced adopters based on their adoption of the forms of eco-innovation. Within the context of this study an intermediate adopter is seen to be moderate in their adoption of eco-innovation, some of which they sought to adopt by choice and some were driven by legislation. Typically, the study found that participants within these groups did not adopt all five categories of eco-innovations but were seen to be involved in at least four different forms of eco-innovations though these were not as extensive as the advanced adopters. While the nature of adopters within this group their efforts varied, they were classified based on the extent of their eco-innovativeness, and were found to be active adopters of some form of waste and energy eco-innovation. These group of adopters were found to have the highest level of participants within the study with a total of eight (8) participants falling into this category of adopters.

Similar traits and features were identified with those within this group. For instance, they were found to be active in their approach towards eco-innovation adoption, showed a good understanding and knowledge of eco-innovation which appeared to be moderate as they were not as in-depth and knowledgeable as the advanced adopters, they also seem to share

moderate positive views on the adoption of eco-innovation and were not actively seeking new ideas which indicated they shared mixed views towards adoption and considered it partly important to their business and the environment in which they operate, this suggested their motivation to be moderately placed. In addition, they were seen to be partially embedding eco-innovations within their businesses, which further indicated it was not placed at the core of their business, their external efforts and engagements were also found to be moderate as they were occasionally found promoting some form of eco-innovation but not regularly. The study also found their ability to adopt more eco-innovation was mostly dependent on the relative advantages associated with the innovation. In most cases these related to cost savings and the competitive edge gained from adoption. The intermediate adopters are therefore seen as those who engage moderately in the adoption of eco-innovations; they are active in adoption but not deeply involved.

The participants within this group bear some semblance to the early majority identified by Rogers (2003), while this study cannot factor in the time relating to their adoption process (i.e. when they became aware of eco-innovations and when they decided to adopt the eco-innovation). However, there are a few characteristics they seem to share. For instance, the intermediate adopters were found within this study to represent the vast majority of the participants, within Rogers the early majority make up one-third of the adopters which places them in a unique position when it comes to the diffusion of innovations. The study found that while the intermediate adopters have shown some knowledge and understanding of the innovation, they are not keen to be at the forefront of such eco-innovations i.e. to be considered as leaders, they almost exhibit some form of modesty when relating to their views of the adoption of eco-innovation. This is similar to the role of the early majority who are noted to have good social interaction within their social system but seldom hold leadership roles or positions within their business environment, though the respondents are all owners and this makes them leaders of their businesses by default.

Basic adopters: represent the least form of eco-innovation adopters based on their level of innovativeness. The study classes basic adopters as those who generally do not do much and tend to be reactive and more driven by legislation. As a result, they are seen to adopt the most basic and bare minimal forms of eco-innovation within their business environment. These represent a group of seven (7) participants found to adopt a minimal number of eco-innovations out of the five categories of eco-innovation; they combined two or more basic forms of eco-innovation which represent the extent of their innovativeness.

The attributes associated with these participants showed they exhibited minimal knowledge and limited understanding of eco-innovation; they considered it relevant but did not seem to be doing much in comparison to the advanced and intermediate adopters, and were also limited in their awareness of environmental issues and how it relates to their business activities. It would appear from the findings that the strategy and approach to adoption for participants within this group was mostly reactive and heavily influenced by legislation which was found to be the main factor associated with their decision to adopt. Most of the eco-innovations adopted by such participants were found to require minimal effort on their part and were already popularly adopted and diffused by other businesses within the industry, taking some of these attributes into consideration the study found them to be reactive in their strategy towards integration of environmental innovations within their businesses. The minimal efforts shown by participants within this group towards adoption indicate their motivation towards adoption as low, and it was also found to be peripheral to the core values and principles of their business.

While they acknowledge eco-innovation to be an increasingly important topic for the business environment in which they operate, they did not seem particularly keen on the adoption of such innovations and barely embedded the adopted eco-innovations within their business. Waste related innovation specifically recycling, was the most predominant form associated with participants within this group and these were combined with innovations

from one other eco-innovation category, resulting in them being classed as the least innovative of the adopter types.

Basic adopters identified by the study bear some similarity to the late majority and laggard adopters within Rogers (2003) classification. These attributes mostly relate to their ability to adopt innovation due to certain triggers. For example, the late majority respond to economic triggers and external pressures as factors that influence their adoption process, similarly, the basic adopters were found to respond to external pressures from legislation. Late majority adopters are also noted to be cautious and seen to be in favour of an innovation when it has been widely accepted and adopted within their social system. In a similar manner, the basic adopters within this study were noted to adopt eco-innovations that were widely diffused and popular among other adopters and within their industry (e.g. waste eco-innovations).

In comparing the basic adopters to laggards from Rogers (2003) the study found these two groups exhibited a few commonalities in their traits. For example, both categories of adopters reveal limited knowledge and understanding of the innovations they adopt, and can be viewed as traditionalist due to the extended process taken towards adoption. Despite the growing attention towards eco-innovation, the participants within this group were found to be the least innovative of the forms of eco-innovation applicable to their industry.

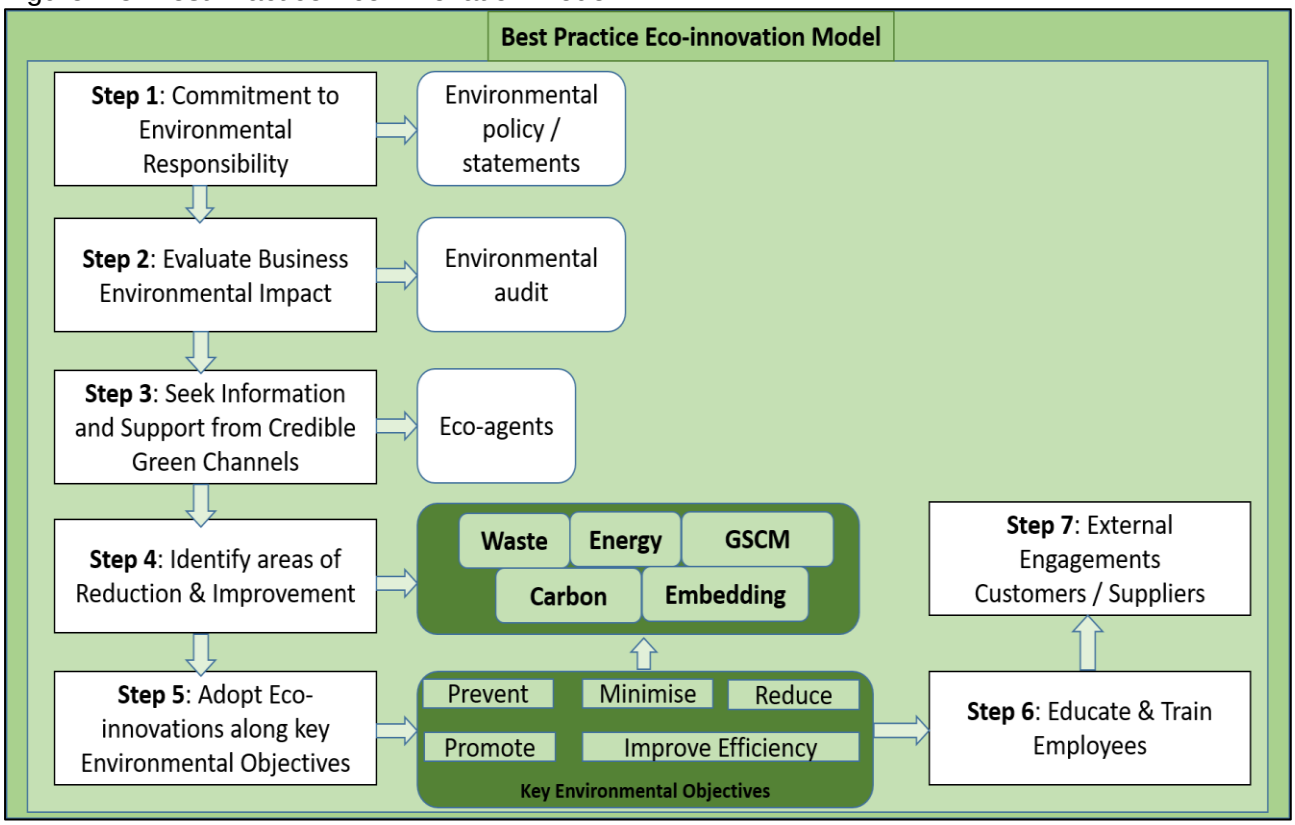
Following the classification of eco-innovation adopters established based on the findings of the study, the next section will present a model to enhance the adoption of eco-innovation.

7.5.4.2 Eco-innovation Model

Having established the scale of greenness and identified the four key categories of eco-adopters applicable within the study, it is evident from the findings that despite the growing awareness and importance placed on eco-innovations, the diffusion and adoption of such innovations still appear to be limited. The study has considered factors associated with motivating eco-innovation adoption and also those inhibiting adoption (i.e. challenges and

barriers), and in a bid to address some of the issues raised by the study, the study proposes the use of a best practice model illustrated in figure 7.5. as the way to positively influence the adoption of eco-innovation and facilitate the diffusion of such innovations by current adopters and potential adopters within the food and drink industry. The model is presented and discussed in the sub-sections below.

Figure 7.5: Best Practice Eco-innovation Model



Source: Author generated

Commitment to Environmental Responsibility

The study identifies the need for businesses to commit to being environmentally responsible as a necessary step towards reducing their negative environmental impact. From the findings, the study found that eco-innovation adopters who had a clear position and stance on environmental issues fell within the active and moderate adopters of eco-innovation. Commitments can be made through the use of an environmental policy or statement which dictates the way the business feels towards the environment and identifies areas in which the business has adopted eco-innovations and will continue to improve their environmental

impact and status. Therefore, making an environmental commitment is considered a practical way for businesses to enhance their adoption of eco-innovation.

Evaluate Business Environmental Impact

The next step proposed requires businesses to evaluate their environmental impact. This is considered a useful way to foster consciousness towards negative impact and encourage the businesses to expand their knowledge and understanding of environmental issues. One effective method that can be applied by the businesses is conducting environmental audits; this could be done internally or through the use of an external auditor. The advantage of conducting an audit is that it can help the business identify areas within their processes that hold the most negative impact.

Seek Information and Support from Credible Green Channels

Once the business has evaluated its environmental impact, the next step will be to seek information and support from credible channels and sources such as the eco-agents who are most suited to advise businesses on what measures and eco-innovations can be adopted to tackle the negative impact of their business. These sources are also helpful towards helping the businesses gain access to grants and schemes which could reduce the cost associated with the adoption of some of the eco-innovations. They also serve as a guide to gaining a better understanding of the applicable innovations, making it easier for the potential - adopters to evaluate the perceived attributes of such innovations i.e. the relative advantages, compatibility, complexity, trialability and observability to adopting the innovation. Eco-agents provide the guidance and support required to foster and enhance the rate at which businesses adopt eco-innovation.

Identify Areas of Reduction and Improvement

Following the information obtained from the eco-agents, the businesses are equipped to identify applicable areas within their processes that they can make practical environmental reductions and improvements. The study proposes the areas to consider be in line with the 5

categories of eco-innovation namely; Waste, Energy, GSCM, Carbon and Embedding established by the study as this makes it easier for businesses to follow. Adopting eco-innovations relating to each of these categories will ensure proper integration of the environment and business and also serves as a guideline that ensures areas with high environmental impact are not overlooked when adopting and implementing the eco-innovations.

Adopt Eco-innovations on Key Environmental Objectives

This step complements the activity of the previous step as it highlights for the businesses key environmental objectives they need to bear in mind when adopting eco-innovations. These relate to the need for prevention of environmental impact where possible and in cases where it cannot be avoided the other objectives to consider will be to adopt innovations that enable businesses to minimise and reduce as much as possible, promote the use of such eco-innovations and look for ways to improve the efficiency of their eco-innovation methods once adopted. These objectives are also linked to the categories of waste, energy, GSCM, carbon and embedding as the businesses are required to bear these in mind when deciding on the appropriate innovations that can help them achieve their environmental objectives.

Educate and Train Employees

From the findings it was revealed that not many businesses engage in educating and training their employees about their eco-innovations. Some challenges were identified by some of the businesses when it came to dealing with attitudes and compliance by staff. The need to educate and train employees is considered a necessary step towards sustaining and fostering the adoption of eco-innovations; this ensures the employees become aware of their actions and also encourages them to cut down on activities and action that can help improve the environmental status and credentials of the business; it guarantees the proper embedding of eco-innovations internally for the business.

External Engagements of Customers and Suppliers

The final step to the eco-innovation adoption model identifies the need for businesses to be more involved and engaging about their eco-innovations when dealing with their customers and suppliers. This helps the business embed their environmental philosophy internally and externally. The study found a limited number of businesses were actively communicating their environmental commitments to their customers and suppliers. Engagements on environmental concerns with customers can help promote the business and image which can result in higher patronage and loyalty on the part of the customers. Engagements with suppliers along the supply chain is necessary to enable businesses to achieve alignments of their environmental objectives and also ensure that their suppliers are complying with such environmental concerns.

7.5.4.3 Toolbox and Guide for the Adoption of Eco-innovations

Having identified and discussed the proposed eco-innovation model, the next section provides a basic toolbox and guide that businesses can apply in their adoption of eco-innovations based on the five categories of waste, energy, GSCM, carbon and embedding (see Table 7.2).

Table 7.2: Toolbox and Guide for the Adoption of Eco-innovations

ECO-INNOVATION CATEGORIES	OBJECTIVE/ TARGET	APPLICABLE INNOVATION	OUTCOME
Waste	**ELIMINATE** **PREVENT** **MINIMISE**	Reuse, Recycling, Composting, Waste Conversion methods, Zero-landfill	**Maximum Resource Efficiency**
Energy	**REDUCE** **CONSERVE** **MONITOR**	Renewable Energy- e.g. Biomass, Solar, Wind, Hydro. Reduce consumption, Monitoring e.g. Smart trackers. Energy Sensors, LED Lights	**Maximum Energy Efficiency**
GSCM	**SUPPORT** **MONITOR** **REDUCE** **IMPROVE** **COMPLY**	Local sourcing, Ethical sourcing, Green purchasing, Sustainable packaging, Traceability (Product and Services), Supplier /Customer engagement	**Eco-efficient Green Supply Chain Management**
Carbon Footprint	**REDUCE** **MONITOR** **IMPROVE**	Logistics management e.g. planning and scheduling transport, combined transport, Alternative mode of transport, Low product/ service miles, Eco-efficient	**Minimal pollution on emission and greenhouse gases**

		process e.g. Set target, Track and Monitor	
Embedding	**COMMIT** **EDUCATE** **REVIEW** **MONITOR** **PARTICIPATE**	Detailed Environmental Policy / Statement, Team Engagement and Training, Outreach and Support e.g. Green Agents and Organisations, Eco-audits (Certifications and Accreditation), Eco awards and Eco-recognitions	**Sustainable Eco-Business Integration**
IMPROVED BUSINESS, MINIMAL ENVIRONMENTAL IMPACT			

Source: Author generated

Table 7.2 is a guide proposed by the study to further the adoption and diffusion of eco-innovations within the industry based on the issues identified and serves as a practical tool to enable businesses to integrate environmental sustainability within their business activities. As depicted in table 7.2, the toolbox captures the eco-innovation categories, the objective or target as it relates to each category, examples of applicable innovation that can be adopted to cover that category and the expected outcome of the successful adoption of the eco-innovation. The guide is briefly explained below.

Waste- Adopters and potential-adopters of eco-innovation should focus on measures that seek to ***eliminate*** waste where possible. These could be adopting eco-innovations that relate to achieving zero-landfill (that is no waste from the business gets sent to landfill). This could also be achieved through the use of waste conversion methods. In addition, encouraging reduction and reuse are easy innovations that can be adopted to manage waste generated by the business as well and also help ***prevent*** further waste from being generated. The third objective suggests the adoption of eco-innovations that ***minimise*** the waste generated by the businesses, such efforts can be applied to ensure the business manages waste generated in a manner that poses minimal impact to the business environment in which they operate. Businesses are encouraged to actively take on eco-innovations that help eliminate, prevent and minimise their environmental impact. Some applicable eco-innovations suitable to food and drink businesses such as reuse, recycling, and composting are easy to adopt eco-innovations that go a long way to foster waste management and achieve maximum resource efficiency for the businesses that adopt these eco-innovations and the environment in which they operate.

Energy- When considering eco-innovations on energy management, businesses should target adopting eco-innovations that enable them to ***reduce***, ***conserve*** and ***monitor*** their energy use efficiently. Taking the conscious effort to generate some level of awareness on energy usage and its consumption within the business will enable the business cut-down on

the misuse of energy which could be in form of habits where appliances are left on even when they are not in use. It is important for businesses to conserve and monitor their energy use as a practical way of reducing negative impacts and also saving them cost which translates into an increase in profit for the business. The most applicable eco-innovations that can help adopters/potential adopters meet their energy objectives are renewable energy solutions e.g. biomass, the adoption of smart meters which enable the businesses track and monitor their energy usage, and the adoption of energy sensors and led lights which help conserve energy for when it is required and are also long-lasting. Through the adoption of energy eco-innovations, businesses can achieve maximum energy efficiency and minimise the negative impacts of their energy-related activities.

GSCM- the growing interest in the environmental impact of the activities that occur along the supply chain places businesses in a position where they are expected to be environmentally accountable and responsible for how they conduct their activities. Customers are more conscious and interested in the environmental impact of the businesses and their products and are expected to show some transparency in their supply chain processes and the efforts they take to reduce the negative impact generated along the supply chain. Some objectives identified by the study to help businesses towards managing their GSCM involve showing ***support,*** for instance, towards local businesses by adopting local sourcing as a measure to ***reduce*** the negative impact and distance travelled by their products. They are also encouraged to ***monitor*** the efforts of other businesses they transact with e.g. their suppliers by encouraging them to evaluate their methods which are inefficient, for instance, they can reduce unnecessary packaging and ***improve*** the quality and quantity of material used for their products e.g. sustainable packaging. Businesses can further foster adoption of GSCM innovations when they ***comply*** with the environmental efforts along the supply chain by actively engaging in supplier and customer engagement and showing product and process traceability, which tells the buyer where the product has come from and discloses its

environmental impact. The innovations adopted by the businesses will help achieve an eco-efficient green supply chain.

Carbon Footprint- Global efforts such as the climate change agreement (European Commission 2018b) put pressure on countries and the businesses within those countries to cut down their carbon-footprint and aid in the transition from a high carbon economy to a low carbon economy to help curb the risk and growing exposure encountered from global warming. The study suggests eco-innovations that relate to carbon footprint management. The objectives the adopters and potential adopters of such should be to ***reduce***, to ***monitor*** and ***improve*** the emissions of their product and process activities. These could be done through the effective adoption of logistics management through planning and scheduling of transportation, the use of combined transport or bulk shipping or even exploring alternative modes of transport for low quantity goods, all of which help to reduce emissions released into the atmosphere as a consequence of the business activities. Businesses can also cut down on the long-distance mileage associated with their products and services by adopting low mileage products and services. Eco-innovations adopted by the businesses to reduce and cut down their consumption will help achieve minimal pollution and result in operational efficiency and a lower risk of the business and the world to the dangers associated with climate change.

Embedding- The adoption of eco-innovations by businesses requires some level of integration by the adopters for it to be sustainable; within this study this is referred to as Embedding eco-innovations. For businesses to successfully embed their eco-innovations they should be willing to commit, educate, review, monitor and participate in activities that reflect their environmental innovation. This could be done by committing to the actions detailed within their environmental policy or statement, ensuring the employees are properly educated and trained in line with such which also fosters continuity once they understand the relevance and importance to the adoption of eco-innovations. This could also be extended

forms of external engagement like making use of outreach and support networks that exist in the form green agents. The businesses can further adopt certification that relates to environmental issues. These will ensure they adhere to set guidelines and encourage regular reviews and monitoring of their eco-systems and processes in place to ensure compliance through eco-audits. Having adopted eco-innovations successfully businesses can use these to boost their image by participating in awards and gaining recognition for their environmental efforts.

The overall outcome obtained through the application of the eco-tool is an improved business with minimal environmental impact.

7.6 Summary

In summary, this chapter has presented a discussion of the findings of the study of the adoption of eco-innovations by Scottish food and drink SMEs which was investigated using the theoretical underpinning of the diffusion of innovation theory (Rogers 2003). The study set out to explore four key aspects relating to eco-innovation adoption by the businesses namely; their awareness-knowledge of eco-innovations, the importance placed towards eco-adoption, the barriers and motivators to eco-innovation adoption and to identify the forms of eco-innovations adopted in order to create a scale of greenness reflecting the adoption and diffusion of eco-innovations considered within the study.

By evaluating the forms of eco-innovations adopted, the study emerged with a profiling tool that uses the five (5) categories of eco-innovation to illustrate the extent of eco-innovation diffusion showing where adoption is highest and lowest. In addition, the study identified adopter types based on the forms of eco-innovation and key traits associated with the adopters within the study these types emerged as; Advanced, Intermediate and Basic adopters. Finally, the study concludes with a best practice eco-innovation model and tool guide to facilitate and enhance the adoption of eco-innovation by businesses.

The next chapter addresses the research objectives set and presents the study's contributions to the body of knowledge and concludes with recommendations for policy, practice and further research.

CHAPTER EIGHT- CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

The study has explored eco-innovation adoption and the extent of its diffusion among Scottish food and drink SMEs. It has considered the awareness of these businesses on their environmental impact and the relevance they place on the adoption of eco-innovation in a bid to reduce and prevent further negative environmental impact created by their business activities. The study further identified the forms of eco-innovation applicable to the businesses within the industry, including the factors influencing the ease of eco-innovation adoption and factors inhibiting the adoption of such eco-innovations were identified and discussed. In addition, a scale of greenness based on categories of eco-innovation established by the study is presented. This is applied to identify a typology of eco-innovation adopters within the study and to further illustrate the diffusion of eco-innovation adopted by businesses. By drawing on Rogers' diffusion of innovation theory, the study was able to answer the research questions using the appropriate methodological approach best suited to conduct the research and achieve the aim and objectives set. This chapter addresses how the study has met its research objectives, summarises the contributions of the study to the body of knowledge, highlights the limitations of the study and suggests further areas for research.

8.2 Addressing the Research Objectives

The overall aim of the study was to **"**To investigate the adoption of eco-innovations by Scottish food and drink SMEs". To achieve this aim five research objectives were identified in line with five research questions. The objectives identified to meet the aim were as follows:

1. Assess the awareness of eco-innovations in Scottish food and drink sector SMEs.
2. Investigate the importance Scottish SMEs in the food and drink sector place on eco-innovations.

3. Identify the forms of eco-innovation adopted by the SMEs.
4. Identify and examine the motivators and barriers to eco-innovation adoption efforts by SMEs in the Scottish food and drink sector.
5. Generate a scale of greenness based on the forms of eco-innovations adopted by the SMEs.

The next section details and summarises how the study met its research objectives and addressed the questions identified in line with each objective.

8.2.1 Objective 1

Assess the awareness of eco-innovations in Scottish food and drink sector SMEs. To meet this objective the study sought to answer the question; *How aware and informed are Scottish SMEs on the concept of eco-innovations? (RQ1)*. This question mirrors the purpose of objective 1 and was used to gain insights into the awareness- knowledge of the participants within the industry. By applying the elements of the stages to innovation diffusion process (Rogers 2003) the study was able to gain understanding of what the participants know of eco-innovation; how they know of eco-innovation and why they know of eco-innovation. These aspects were covered through establishing a definition of “green”, an understanding of environmental impacts and knowledge of the types of eco-innovation.

The definition of “green”- In seeking to understand their awareness-knowledge the study found two distinct definitions emerged from the various views given by the participants these related to the following:

Moral definition- *Eco-innovations are viewed as a means of conforming to moral principles and environmental obligations.*

Environmental definition- *Eco-innovations are measures adopted to reduce waste and improve business efficiency.*

It became apparent from the definitions given by the participants that they generally viewed eco-innovation from a moral perspective (where the participants were found to relate to; *doing the right thing, peace of mind, providence* etc.) or from the environmental perspective (where they related it to more practical environmental issues like *waste, recycling, saving energy, reducing carbon footprint*).

In exploring the participants' understanding of environmental impact, the findings found most participants were able to identify areas within their businesses that generated negative impact to the environment and most of the areas related to Packaging, Energy use, Business waste and Transportation. This finding established the acknowledgement and consciousness of the businesses towards their activities and how it relates to the environment.

On the investigation of their knowledge of the types of eco-innovation and how they became aware of such eco-innovation the study found most waste and reduction eco-innovation to be the most prominently identified types mentioned by the businesses. These were mostly in the forms of recycling, reuse, composting, low product miles and logistics management. Interestingly, despite the participant's recognition of energy use as an area of significant negative impact, very few participants made mention of eco-innovation relating to Energy. This could be as a result of limited knowledge and understanding in relation to types of energy management eco-innovation. This could also be as a result of where the businesses obtain their information i.e. the sources and communication channels that facilitate the adoption of eco-innovation. It was found that most businesses were more involved with getting information from social media outlets such as Facebook, Twitter and Snapchat etc, rather than being in touch with associations and agencies responsible for fostering their adoption of eco-innovation. As a matter of fact, very little reference was made to such agencies like: Resource Efficient Scotland, SEPA, and Carbon Trust etc. This clearly showed a disconnect between the businesses and green communication channels.

It was concluded from the findings on research question 1 that most businesses within the food and drink sector were aware of eco-innovation, though the extent of awareness varied among the distinct participants with some exhibiting extensive knowledge to those who showed moderate knowledge and to very minimal knowledge of eco-innovation, therefore the study was able to successfully investigate and meet research objective 1.

8.2.2 Objective 2

Investigate the importance Scottish SMEs in the food and drink sector place on eco-innovations. To meet this objective, the study set to answer the question: *What level of importance is accorded to the adoption of eco-innovations by the Scottish food and drink SMEs? (RQ2).* The reason for this mirrored question phrased in line with the objective was to determine the usefulness and value the food and drink businesses set on the adoption of eco-innovation and to their industry in general. From the findings there emerged two themes capturing the participant's perception on eco-innovation adoption, these were the positive and the sceptical.

The positive group were found to consider eco-innovations to be very important particularly due to the growing concerns globally on negative environmental impacts. These participants opined that businesses had a moral obligation to be responsible within the environment in which they operate and should be expected to integrate greener options with less environmental impact into their activities. They also considered it an opportunity to exploit alternative options that could also be seen as beneficial and more sustainable for their business and the environment.

The sceptics were found to share a contrary point of view, they acknowledge that environmental issues do exist but felt it was not of high importance due to the negative attitudes expressed by some within the industry. In their opinion, very little was being done to

curb the negative impact and they felt there was very little information relating to eco-innovation adoption to foster its diffusion within the industry. They further noted that the adoption of eco-innovations should be a collective effort by both the businesses and their customers and the responsibility of adoption should be shared through patronage and support.

The study was able to successfully investigate and meet the 2nd objective set and the conclusion drawn from the findings indicate that businesses consider eco-innovations to be relevant and important and a notable step necessary for businesses to secure a more sustainable environment to operate. However, there are concerns that relate to negative attitudes and actions that do not encourage businesses to adopt eco-innovations. The next objective sought to identify the forms of eco-innovation.

8.2.3 Objective 3

Identify the forms of eco-innovation adopted by the SMEs. in line with this objective, the study sought to answer the question*; What forms of eco-innovations are adopted by the SMEs in the Scottish food and drink sector? (RQ3).* Within the literature, it was found that several forms of eco-innovation exist. However, they do not seem to be based on a classification but are listed by authors in generic sets, also the study wanted to capture the eco-innovations specific to the businesses within the food and drink sector, therefore a suitable methodological approach was taken to capture the nature of eco-innovation by the businesses as detailed in chapter 4. From the findings of the web-survey of food and drink businesses, a categorisation of eco-innovations was established (presented in chapter 5), the study found various types of practices relating to efforts that could be grouped into 5 main categories namely; Waste, Energy, GSCM, Carbon and Embedding, this was seen as a more useful and tidy way to represent adoption rather than simply providing a broad list of various eco-innovations adopted by the participants.

Using the established categories of eco-innovation, a profile on the extent of the diffusion of these eco-innovations by the businesses was also presented. From the analysis, the study found that waste eco-innovations were the most widely adopted and diffused among the participants, followed by embedding and energy eco-innovation, with GSCM and carbon eco-innovations as the least adopted eco-innovations. The categorisation established within this objective was then applied in the analysis of the interview data to meet the fifth objective of the study.

8.2.4 Objective 4

Identify and examine the motivators and barriers to eco-innovation adoption efforts by SMEs in the Scottish food and drink sector. To meet this objective, the study sought to answer the question; *What are the motivators or barriers food and drink businesses experience in the adoption of eco-innovations? (RQ 4)*. Based on the findings the key motivators identified by the participants to encourage their adoption of eco-innovations related to five main factors namely: *Moral principles and beliefs, Eco-consumers, Cost savings, Legislation and Job creation*. On the barriers to eco-innovation adoption the study found 9 factors namely: *Non-recyclable waste, non-compliance by suppliers, cost of adoption, credible and reliable sources, lack of interest, limited funding option, attitudes and behaviours, time constraints, lack of education and awareness*.

The motivators to eco-innovation were found to relate to both internal (within the business) and external factors (outside the business) that influence business decisions to adopt or reject eco-innovation. Participants seemed to place their principles and beliefs as a major factor which relates to them feeling obligated and responsible for their business activities in the environment in which they operate, such participants considered it fundamental to the core of their value and the image they project within their industry and this could be linked to

objective 2 which relates to businesses that considered eco-innovation to be highly relevant and important to them and their industry. Factors like eco-consumers, cost savings and job creation were found to be some of the relative advantages associated with the adoption of eco-innovation as they related to not only improving the green image of the business but were associated with measures that could result in increased profitability for the business. Legislation was found a motivator which mostly related to the waste related innovation of recycling and the separation of forms of waste generated by the business. While some participants adopted eco-innovations on the premise of legislation, the study found participants who indicated they had adopted it even before the legislation was enforced, such participants were found to be extensive and moderate adopters of various types of eco-innovation.

The barriers to eco-innovation were found to be considerably more than the motivators as the study tried to capture the views of the participants. Similar to the motivators these factors were also internally and externally related. Some businesses indicated some level of frustration with being limited to non-recyclable waste which made it impossible for them to recycle. They also expressed difficulties encountered in engaging their suppliers to conform to their green demands, noting the general lack of interest encountered within the industry and challenges when seeking credible and reliable sources of information with some noting being exposed to frauds and scams while seeking information on eco-innovation. This factor however, reflected the varied levels of awareness-knowledge the participants had as they clearly were not in touch with the right sources or using the right communication channels for eco-innovation. Financial issues related to cost of adoption and limited funding options indicated that businesses were still experiencing difficulties, despite the existing access to certain schemes and incentives by the government to encourage the adoption of eco-innovation.

The study was able to investigate and meet its 4th objective and the conclusion drawn from the findings suggests that there are more barriers to the adoption of eco-innovation when compared to the motivators. It also appears that most businesses within the food and drink sector consider these issues an impediment to their successful adoption of eco-innovation.

8.2.5 Objective 5

Generate a scale of greenness based on the forms of eco-innovations adopted by SMEs in the Scottish food and drink sector. To meet this objective, the study sought to answer the question; *What would a scale of greenness reflecting eco-innovation adoption comprise? (RQ 5)*. This objective sought to generate a scale representing the adoption and diffusion of the eco-innovations implemented by businesses within the food and drink industry.

From the categories of eco-innovations that emerged within objective 4, the study was able to apply this to the participants and reflect their extent of innovativeness which was depicted in figure 7.2. which indicated how each participant was adopting eco-innovations. From the findings, there emerged three types of eco-innovation adopters labelled as the advanced, intermediate and basic adopters. The findings revealed the advanced adopters to be the most innovative and active adopters of the three groups. They exhibited an extensive knowledge and understanding of eco-innovation and this was further reflected within their core business. The intermediate adopters were found to be inbetweeners as they adopted some of the categories of eco-innovation. They also showed a reasonable knowledge and understanding of eco-innovation and were seen to be moderate in adoption and reflect eco-innovation in some instances within their businesses, they however were not as driven or as excited as the advanced adopters. The basic adopters were found to be the least innovative of the three types, they reflected adoption very scarcely and appeared to be the least knowledgeable of all adopters. They only seemed to be involved in adopting eco-innovations

that were considered necessary or showing clear relative advantage and it appeared to be barely embedded within their business values.

The objective set by the study was clearly met and by answering the research question in line with the objective i.e. scale of greenness, the study was able to illustrate the status of eco-innovation adoption within the Scottish food and drink sector. The conclusion drawn from the analysis shows that there is a need for more businesses within the industry to enhance their eco-innovation and aim to be an advanced adopter of eco-innovation. This will go a long way to reducing the negative impact of such businesses and the industry as a whole.

Having discussed the objectives of the study and how these were met, the next section will present the contributions of the study.

8.3 Contributions to the Body of Knowledge

Eco-innovation adoption is still a topical issue and remains high on the government's agenda and public debate so there is a need for a transition from high negative impact economic based activities to more sustainable economic activities integrated with environmental friendly innovations (Jakobsen and Clausen, 2016; Foxon, 2011) This supports the need for continuous research in the field and why the study conducted remains relevant.

From the application of Rogers (2003) model as the underpinning theory, this enabled the study to conduct a methodological categorisation of eco-innovation. This further led the study to come up with a model for enhancing eco-innovation adoption which can be a digitalized tool for practice. The details of each contribution made by the study are presented in relation to theory, methodology and practice; these contributions are summarised below.

8.3.1 Contributions to theory

The study has contributed to theory through the useful applications of Rogers (2003) theory and constructs to capture eco-innovation adoption and its diffusion among Scottish food and drink businesses by the adaptation of Rogers diffusion theory to create a snapshot of eco-innovation adoption and the extent of its diffusion. The study has provided another way of looking at adoption without taking in the time element particularly since Rogers model uses time as a key construct to capture innovativeness.

It was noted earlier in chapter 3, that there are four elements to Rogers (DOI) theory namely: innovation, communication channels, time and social system and explained that while these constructs would serve to investigate the research questions the element of time would not be applied due to certain challenges associated with it. These relate to the need for it to be conducted via a longitudinal study (which is not possible due to the timeframe allocated for a PhD study) and, also the reliance on the participants ability to recall activities that happened years ago which might not be accurate. However, time was applied within Rogers to capture innovativeness and distinguish between the adopter types. Therefore, this study decided to explore other options and adapt the concept of innovativeness, particularly since this was relevant to the fourth research objective i.e. to generate a scale of greenness. As a result, the DOI model was adapted to capture innovativeness based on the extent of adoption evidenced by the businesses as opposed to using the time element. This modification of the concept of innovativeness can be viewed as a useful addition to the use of the diffusion model, especially for short term studies that are unable to take in the time element, particularly since this is vaguely flawed and heavily reliant on people's memory and ability to look back in time.

One way to mitigate this limitation of depending on recollection and conducting the need for a longitudinal study is to be able to get people to reflect more honestly in time on their

adoption of eco-innovation. The adapted model can be backtracked and used to capture innovativeness based on Rogers original model. For instance, the current model proposed by this study could be used to capture the present state of adoption (i.e. what the businesses are currently doing now as it relates to the five categories of eco-innovation) and can be used to explore what they were doing in the past. An example of such an application would be asking a participant this is 2017, *what eco-innovations are you currently adopting in the forms of Waste management, Energy management, GSCM, Carbon management and Embedding?* A follow up to this would be; *What were you doing in 2015?* And a further follow-up would be *What were you doing in 2013?* This approach will offer different snapshots on the adoption of eco-innovation of the business along different timelines and further reflect the extent of diffusion applicable to the various timescales, and can be used to illustrate progress made over time based on adoption.

This can be further applied to create a comparative study on the adoption of eco-innovation by the various businesses and can be used to capture the five categories according to Rogers original model; Innovators, early adopters, early majority, late majority, and laggards, therefore by using the collection of snapshots created by this study, the various businesses can be labelled based on the time element regardless of the timeframe allocated to the research.

In addition, through the changes applied to Rogers theory of diffusion along with the ability of the study to establish a category of eco-innovations, the study was able to classify the participants based on a typology that did not necessitate the time element but based on their eco-innovativeness and their characteristics, some similarities and comparisons were also made in chapter 7 between the traits associated with the study's adopters labelled as; advanced, intermediate and basic and Rogers adopters known as the innovators, early adopters, early majority, late majority and laggards. By so doing, the study has also found ways to apply Rogers and reflect the different types of adopters without being restricted by

the time element but exploring other constructs that relate to the characteristics of the participants and their evidenced forms of adoption.

8.3.2 Contributions to Methodology

Through the application of the underpinning theory to the study, an eco-innovation novelty based on a systematic categorisation of eco-innovation emerged and this is considered a contribution to the methodology. This was achieved through the website analysis which enabled the study to establish a set category of eco-innovations namely Waste, Energy, GSCM, Carbon and Embedding. The analysis of the website served as a useful way for the study to find out the forms of eco-innovation applicable to the businesses within the food and drink industry and rather than provide a lengthy list of various eco-innovations, the study sought to categorise the various types of eco-innovation found under main categories, thereby grouping them into sub-categories, under main categories, this further enabled the study to generate the typology of eco-innovations that associated the various adopters to their extent of adoption.

By undertaking research on the adoption and diffusion of eco-innovations by Scottish food and drink businesses this study has provided a better understanding of the topic and the use of a qualitative approach has provided further knowledge and value to the literature. The researcher considers the findings and the methodology taken to be useful contributions that have enabled ways to depict useful models reflecting: diffusion of eco-innovations, scale of greenness, eco-innovation adopter categories and the eco-innovation tool as proposed within this study and it is hoped that this can be further expanded upon in further studies.

The researcher will also like to highlight the fact that at the initial stage of the research there was some difficulty getting respondents to participate and it had to explore innovative ways to collect data. It became obvious from observation that the sector was closely niche, but

were however very active in terms of social media, as a result a twitter account was registered as a means of getting access to the Scottish food and drink network, and with the help of contacts from the Chamber of Commerce, other methods of engagement explored include attending events such as the taste of Grampian and the farmers market (Aberdeen, Banchory and Stonehaven) as a way to get acquainted with the businesses and encourage them to participate in the research. This turned out to be quite useful as it enabled the author to familiarise with the sector and gain the interest of prospects by using tweets, and also attending their events. The effort paid off as the study eventually yielded a number of participants and was able to conduct an in-depth research into the adoption of eco-innovations within the food and drink industry.

8.3.3 Contributions to Practice

In terms of practice, the contributions made are also derived from the changes applied by the study to Rogers model that can be seen as a useful guide and tool for practice through the following ways detailed below:

The application of the best practice model and tool on eco-innovation adoption- The findings established within this study show that there is a need for the proper engagement of businesses beyond the adoption of waste related eco-innovation in order to improve on the current state of adoption and increase the rate at which other eco-innovations relating to Energy, GSCM, Carbon and Embedding are diffused. As such the study has emerged with a best practice model which is considered a useful way to encourage businesses to enhance their adoption of eco-innovations. This model is further complemented with a tool guide which highlights key objectives for businesses looking to improve their environmental status to bear in mind when adopting eco-innovations.

In addition, a further contribution to practice is achieved by the application of the scale of greenness. This is seen as a useful way for businesses to audit themselves (internally) and identify ways to fully adopt all five categories of eco-innovation. The scale is a useful tool proposed by this study to show businesses how green they are (i.e. current state of adoption) and how green they can be, through the application of the tool, businesses are able to see where they are doing well, and the aspects where they need to improve. It is also considered a relevant way of ensuring evidenced based greenness which other studies within the field have not considered.

Finally, a digital app could be also generated from the proposed tool to help guide SMEs into measuring their eco-innovation adoption and determine the extent of their eco-innovativeness based on their adoption, therefore identifying them as an advanced, intermediate or a basic adopter. This could serve as a robust and objective tool that could be applied to diverse industries and can be seen as a practical way to enable businesses to evidence their adoption of eco-innovation and further mitigate the risk of been seen as a green-washer (i.e. the act of pretending to be green or eco-friendly through un-substantiated claims and not actually adopting said green practices).

8.4 Limitations of the study

Most studies regardless of their contributions are likely to have limitations, and this should be acknowledged. The main limitation of this study relates to its scope, which is location and industry specific and as a result the findings may not be generalised. While the study considers SMEs, it is location specific and focuses on Scotland and is also sector specific as it further narrows its focus to the food and drink sector. While the five categories of eco-innovation (waste, energy, GSCM, carbon and embedding) established within the study can be generalised on a broader scale to SMEs from other industries, some of the eco-innovations sub-categories captured under each main category might differ. However, it was

useful to capture industry specific data particularly for such a vital sector as the Scottish food and drink which was also noted to be lacking in eco-innovation literature. Following the process applied in this study, the scope can be expanded to capture other sectors and reflect the adoption and diffusion of eco-innovations.

It is also important to note that this was a qualitative based study which further restricts the ability to generalise the findings obtained from this study. This single approach is mostly due to the fact that it was initially difficult to get access to participants, therefore the possibility of a mixed method using quantitative survey was restricted and as such the study had to explore innovative ways to collect data without being over-reliant on the ability of participants to participate. This resulted in the development of a website based survey and the use of interviews to gain a deeper understanding and inform the research findings. As such these limitations are as a result of circumstances beyond the control of the research but recommended as areas to conduct further research based on the findings revealed within this study.

8.5 Conclusions and Recommendations

The application of DOI theory (Rogers 2003) has provided a useful guide for exploring the adoption and diffusion of eco-innovations by Scottish food and drink SMEs. The findings indicated most businesses are increasingly more aware and knowledgeable of environmental issues and are adopting more eco-innovations beyond the legislative requirements to reduce their negative impact on the environment.

Despite the growing interest in eco-innovation adoption, the extent of diffusion seems to be low, with just a few businesses standing out as actively adopting, while the majority seem to be struggling. As such a few recommendations are noted by the study to further the drive

towards eco-innovation adoption. These are split into three i.e. recommendations for policy makers, recommendations for practice and recommendations for further research.

Recommendations for policy

1. Accessible eco-innovation grants and schemes - The study found that while there are few schemes and grants available to businesses looking to adopt certain type eco-innovations, particularly energy related, most of the businesses do not consider these very attractive and in some cases, have noted that the process is not as accessible as advertised and is highly priced for the budget of most SMEs. It is therefore recommended that policy makers and relevant government agencies review some of the existing grants and consider making them more accessible to businesses looking to adopt such eco-innovations.

2. The use of monetised incentives- The study also found that more businesses will likely engage in the adoption of eco-innovation beyond those which are mandated by legislation if there were more incentives, particularly monetised incentives which can serve as a way to encourage the businesses towards further adoption. Some businesses within the study have noted that this will go a long way to fostering their decision to adopt and it is worth considering by policy makers.

3. Incentives for manufacturers of eco-innovative products- One of the major challenges found by the study to be a barrier to eco-innovation adoption was there are very limited eco-innovation products when compared to the conventional range of options. There is also the issue of cost comparison which makes it difficult in some cases for the consumer to patronise the greener option as it may be much more expensive. However, if more manufacturers produced more greener options in their products this will create competition and a variety of options will be available to the consumers, policy makers are strongly advised to consider ways such as the use of incentives to

encourage manufacturers to produce more greener alternatives that are competitively priced.

4. Exploring the use of more creative mediums to enhance adoption- It was evident from the findings of the study that most businesses felt the infrastructure and support available to them was inadequate, and there appeared to be a disconnect between the businesses and their sources of information. It is recommended that policy makers, eco-agents and agencies should consider exploring the use of creative approaches to their eco-campaigns, conferences and adverts that are less technically inclined and more engaging and driven by demonstrations of the benefits and advantages to eco-innovation adoption. This will stir up more interest and facilitate the eco-innovation agenda. Another medium worth exploring is the use of celebrity endorsements and as eco-ambassadors to further motivate interest.

5. Promotions through awards and recognition- The study found that businesses are keen to be distinguished and recognised for their efforts, therefore policy makers should consider the use of eco-awards and recognition as a way to get more businesses engaged and actively involved in the adoption of eco-innovation.

Recommendations for practice (SMEs)

The following recommendations made by the study are based on the findings and considered useful to facilitate full scale adoption of eco-innovation by small and medium sized enterprises particularly within the food and drink industry.

1. Businesses are advised to take proactive measures that show a commitment to being environmentally responsible. This can be shown through a written policy or statement that clearly details what and how the business is environmentally responsible; by detailing the eco-innovations adopted the businesses also eliminate the risk of being accused of green-washing (as the study also found some evidence of vague and un-

substantiated claims made by some businesses, without any evidence of eco-innovation they were adopting). It is therefore important for businesses to ensure their environmental policies are clear and detailed on their forms of adoption.

2. Conducting regular environmental audits is also considered a useful way for businesses to understand their negative impact and adopt innovations that help curb such negative impact. This will also generate a working environment that is conscious and aware of aspects of the business that require improvements and help businesses to track and measure their environmental measures effectively.

3. Businesses are strongly advised to seek information from the right sources and channels. The study found that more businesses are actively involved in social media and tend to get most of their information from Blogs, Twitter, Facebook and related outlets. Businesses looking to adopt eco-innovations are strongly advised to be more conscious of where they get information and should deal with the main sources such as the agencies and associations set-up for the purpose of facilitating their adoption of eco-innovation. This will reduce the risk and exposure encountered by some businesses to scams and frauds. It is therefore important to get information from reputable green sources.

4. The best practice model (figure 7.5) and guide (table 7.1) suggested should be used as a practical guide to enhance their adoption of eco-innovation. The steps can enable the businesses identify aspects that relate to waste, energy, carbon, gscm and embedding and help businesses focus on ways to eliminate and minimise their negative impacts in relation to these key categories of eco-innovation identified by the study.

5. Finally, it is essential for businesses to encourage internal and external engagement on eco-innovations by embedding the need and usefulness of eco-innovation to their staff, suppliers and customers. This is essential for the continuous sustainability of the adopted eco-innovation and the diffusion of such eco-innovation within the business environment.

Recommendations for Further Research

Though the objectives and questions set out by this study have been adequately fulfilled and answered, there are some considerations provided towards areas for further research to enhance the growing body of knowledge in the research area, these mostly relate to the following:

1. Applying the study's model to capture the time element to the adoption of eco-innovations- It was noted earlier that a unique contribution of the study was the ability to capture elements of Rogers model without being restricted by the time element due to the issues associated with capturing this element. However, with the current model applied within this study, the challenge of capturing time has been simplified and can be captured within non-longitudinal studies, therefore future research can make use of the exemplified model to reflect diffusion in businesses over time and see if certain categories of eco-innovation adoption may have diffused earlier than others for instance waste eco-innovation over the energy etc. This is particularly useful since the current study only captures the rate and extent of diffusion but does not consider the order taken in adoption of these eco-innovations by businesses. This can also be used to capture the adopter types identified by Rogers based on the time element namely; Innovators, early adopters, early majority, late majority and laggards.

2. Using the snapshot model to capture past, present and future eco-innovations adoption trend- In addition to short term studies being able to capture the time element a further recommendation will be to use the model to capture the current state of adoption and conduct future studies in line with the categories to see how the businesses have improved or changed in their adoption of eco-innovations. This could be used to reflect not only the past and present adoption trends but also project future adoption based on the pattern established by the businesses towards their adoption of eco-innovations. This could also give indications of what businesses consider to be the easiest eco-innovation to adopt and the most complex.

3. Conducting a quantitative based study – As a result of the findings established from the qualitative study, a category of eco-innovation emerged, along with a model on adoption and diffusion reflecting three (3) adopter types. This makes it possible to conduct a quantitative based study using the typology of eco-innovation adopters established within this study. Therefore, a more extensive quantitative based study can be generated to help confirm the study findings, since it is a qualitative study and small scale (based on the North of Scotland) which might be difficult to generalise to the whole of Scotland or all of the UK. However, a large scale can be applied using the work undertaken by this study to conduct further research on adoption and diffusion. For example, surveys can be established based on the eco-innovation categories and types of adopters to identify whether the respondent is an advanced, intermediate or basic adopter, this was not possible to do due the lack of a practical categorisation of eco-innovation.

4. Engagements through social media and events- Finally, other areas to consider by further studies can be to explore the use of social media and attending events as an innovative approach to getting respondents. One of the major challenges encountered by researchers is getting data, particularly when dealing with

businesses. This study was able to solve this challenge of gaining access to data by engaging the potential respondents through an alternative communication channel like Twitter and attending events such as the food and drink forum and marketplace, which made it easier to gain their interest and get them to participate in the study, therefore future studies can consider exploring such areas.

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APPENDIX

APPENDIX I: PARTICIPANT INFORMATION SHEET

ROBERT GORDON UNIVERSITY ABERDEEN

Research Participant Information Sheet

Research Title: The adoption of eco-innovations: a study of SMEs in the Scottish food and drink sector

Invitation to participate

Sustainability has become a strategic imperative for all businesses in the 21st century. The Scottish government is aiming to reduce its emissions to 42% by 2020 and 80% by 2050. As a result, companies are being encouraged to adopt environmentally friendly innovations across their business processes and supply chains. This can present SMEs with a range of challenges and dilemmas. The researcher proposes to undertake an empirical study of Scottish food and drink SMEs and would like to invite you to take part in the interview. You are being asked to take part in this research because your business is under the food and drink sector and you can provide important information which will be useful for the research. Please read this information sheet for further details and what it means to participate in the study.

Purpose of the study

This research aims to explore and understand the adoption of eco-innovations by Scottish Food and drink businesses. The researcher hopes to gain insights on; your perspective of Green, eco- innovation adoption, extent of eco- adoption and the impact of eco- adoption.

Interview Process

The researcher will want to interview you. This should take no longer than *40-60 minutes* and will take place at your business premises. The researcher may ask for relevant documents or sources accessible for this research (optional). The interview will be recorded and you will be asked to give consent prior to the interview.

Disadvantages of participating

You will need to spare 40-60mins of your time for the interview. The researcher values and appreciates your willingness to participate and assures you that all responses to questions and information provided will be kept anonymous and only members of the research team will have access to the information provided.

Benefits of participating

At the conclusion of the study, a summary of the findings will be provided to the participants, the information might be a useful guide with tips on best practice within your sector. It is also anticipated that the study will provide useful recommendations on issues raised that might influence policy change towards the adoption of eco-innovations.

What will happen to the information collected?

All information collected will be stored anonymously. The analysis of the information will be undertaken by the researcher at the Robert Gordon's University. Only the research team will be privy to the notes, documents, recordings and the report on the findings. Afterwards, notes and documents will be destroyed and recordings erased. The researcher will keep transcriptions of the recordings and a copy of the paper but will treat them with the strictest confidentiality. No participants will be identified in future publications and every effort will be made to disguise their identity.

Declaration to participants

If you take part in the study, you have the right to:

- Refuse to answer any particular question, and to withdraw from the study at any time (including after the interview has been completed).
- Ask any further questions about the study that occurs to you during your participation.
- Be given access to a summary of findings from the study when it is concluded.

Who is responsible?

If you have any questions or concerns about the project, either now or in the future, please feel free to contact either:

Researcher: Karan Dakup (Aberdeen Business School, RGU) E: 1002090@rgu.ac.uk, T: 01224 263950

Professor Heather Fulford (Centre for Entrepreneurship, Aberdeen Business School, RGU), T: 01224 263869

APPENDIX II: PARTICIPANT CONSENT FORM

The adoption of eco-innovations: a study of SMEs in the Scottish food and drink sector

Consent Form for Participants

I have read the **Participant Information Sheet** for this study and have had the details of the study explained to me. My questions about the study have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I also understand that I am free to withdraw from the study at any time, or to decline to answer any particular questions in the study. I understand I can withdraw any information I have provided up until the researcher has commenced analysis on my data. I agree to provide information to the researchers under the conditions of confidentiality set out on the **Participant Information Sheet**.

I agree to participate in this study under the conditions set out in the **Participant Information Sheet**.

Signed: _____

Name: _____

Date: _____

Research contact information

Researcher: Karan Dakup (Aberdeen Business School, RGU) E:1002090@rgu.ac.uk
T: 01224 263950

Professor Heather Fulford (Centre for Entrepreneurship, Aberdeen Business School, RGU)
T: 01224 263869

APPENDIX III: INTERVIEW PROTOCOL GUIDE

Interview Protocol Guide

The interview process is being developed on the basis of reviewed literature and discussions with supervisors and colleagues. Businesses to be interviewed are SMEs within the Scottish food and drink industry. Questions are semi-structured to provide directions and focus during the interview while maintaining flexibility. The main focus of the study is to understand the adoption of eco-innovations in Scottish food and drink SMEs. The unit of analysis for the study will be the "food and drink SMEs".

Purpose: *General (The purpose of the questions in this section is to introduce the respondent and generate a characterisation of the respondent's business)*

1. What does your business do / what kind of products do you produce?
2. What is your job description/ role within the business?
3. How many people do you employ?
4. Who are your target customers?
5. Can you give an estimate of your annual turnover?
6. How long has this business existed?

RQ1 *Eco- Innovation Awareness (The questions set in this section will assess the awareness level of the respondents on eco-innovations)*

1. What does being green mean to your business?
2. What forms of green activities/ practices are you aware of?
3. When did you first hear of green?
4. Which aspects of your business have negative environmental impact?

RQ2 Importance (*Below questions will be used to determine the importance of adopting eco-innovations by the businesses*)

1. Has your business been motivated to adopt green practices (eco-innovations)?
2. Could you discuss how green environmental issues have integrated with your business values?
3. In what ways is your business trying to be more environmentally sustainable?
4. What sort of training is available for your employees towards better environmental performance?
5. Are you registered with or certified by any environmental organizations? (e.g. ISO 14001, EMAS, etc)
6. How do you stay informed on green practices (eco-innovations) that can be adopted to improve your environmental performance as a business?

RQ3a Motivators *(the drivers to adoption of eco-innovations)*

1. What are your reasons for adopting green practices (eco-innovations)? Or what were the driving forces behind the adoption? (e.g. legislative compliance, costs, reputation, market expectations, move towards sustainability, etc.)
2. What benefits would you say green practices (eco- innovation adoption) has brought to your business? (e.g. higher financial returns, social values, customer loyalty, boosts company image, environmentally responsible)
3. How have you determined (measured) the benefits of adopting such innovations?

RQ3b Inhibitors *(This section identifies the inhibitors to adoption of eco-innovations)*

1. What are the difficulties/ challenges encountered in implementing green practices (eco-innovations)?
2. Where do you think your biggest challenge is to greening your business?

3. How would you describe the efforts required when training employees on green activities?
4. How are you able to balance between these challenges and keeping your business profitable?
5. Do you feel adequate support and infrastructure have been made available to support the adoption of green (eco-innovations) by business?

RQ4 Forms of green adoption *(eco-innovations)* (*Questions will be* used *to establish/ evidence eco-innovations adopted by the businesses*)

1. Could you discuss the specific areas of the business in which you adopt green practices? Or can you describe how green practices are being carried out within your business?
2. When did you begin to implement/adopt such initiatives?
3. What form of training is available to your staff for this?
4. How do you save on your electricity usage?
5. Can you discuss the aspects of your business that generate waste?
6. In terms of recycling, what areas of your activities get recycled and how often do you recycle?

Green Washing *(The following questions will be an extension under forms of eco-innovation adoption and will be used to identify if green washing exists among the businesses)*

1. What are your views on the promotion of local business with environmentally friendly suppliers?
2. How does your business publicize or market your environmental performances to customers?
3. Are you involved in any environmental partnership, collaborative initiatives or certified by any of the environmental management organisations?
4. How are you able to measure your on-going green adoption performance?

5. How do you track/document your environmental activities?
6. Do you consider your business to be green?

Questions are structured to cover the following areas:
1. Profiling and characterization of the business
2. Business perspective on eco-innovations
3. Awareness knowledge of Eco innovation by the business
4. Evidenced forms of eco-innovation adopted by the businesses
5. Factors impacting the adoption of eco-innovations

APPENDIX IV: INTERVIEW DESIGN SHEET

Title: The adoption of eco-innovations: a study of SMEs in the Scottish food and drink sector

Main RQ: How are food and drink businesses adopting green initiatives?

Q1. How aware and informed are Scottish SMEs about the concept of eco-innovations?

Q2. What level of importance is accorded to the adoption of eco-innovations by the Scottish food and drink SMEs?

Q3. What forms of eco-innovations are adopted by the SMEs in the Scottish food and drink sector?

Q4. What are the motivators or barriers food and drink businesses experience in the adoption of eco-innovations?

Q5. What would a scale of greenness reflecting eco-innovation adoption comprise?

Interview questions	Specific probes or follow-up	General Prompts	Role of questions	Emergent themes	Other
1. Tell me about your business	-What does your business do / what kind of products do you produce? -How long has this business existed? -What is your role within the business? -How many people do you employ? -Who are your target customers? -Can you give an estimate of your annual turnover?		General introduction and business characterisation	-Profiling and classification	Request for background documents, brochures annual reviews etc
Interview questions	**Probes or follow-up**	**General prompts**	**Role of questions**	**Emergent themes**	**Other**
1. What does being green mean to you? 2. When you think of green, what sort of practices comes to mind?	-When did you first hear of green? -Which aspects of your business have an environmental impact? e.g. *Packaging- polystyrenes Transportation, etc*	Can you give an example? Can you explain what you mean by that?	-To assess knowledge and awareness of eco-innovations -Establish understanding of eco-innovation -Linked to RQ1	- Definition of green -Awareness-knowledge of eco-innovation -Extent of awareness	Observation of business conduct Evidence of green promotions

				-Environmental impact of business	
Interview questions	**Specific Probes or follow-up**	**General prompts**	**Role of questions**	**Emergent themes**	**Other**
1. In what ways do you think green adoption is a concern for the Scottish food and drink sector*?* *Or In what ways do you think green adoption is relevant to the Scottish food and drink sector?*	Waste and energy consumption are often cited in publications as key problem areas for the food and drink industry, why do you think this continues to be an issue for your industry? Are there any other reasons?		To determine the importance placed on eco-innovation by businesses and industry -Linked to RQ2	-Attitudes, beliefs and values -Strategy (importance vs place) Adoption Classification/ Types -Promotion/ communication	
Interview questions	**Probes or follow-up**	**General prompts**	**Role of questions**	**Emergent themes**	**Other**
1. How would you describe an environmentally friendly business? 2. Do you consider your business to be environmentally friendly? 3. In which areas of the business have you adopted green practices? 4. How do you stay informed on green innovations that can be adopted to improve your environmental performance as a business?	- Yes- in what ways? -No- are you considering adoption in the future? - are there specific practices you plan to adopt? When did you begin adoption? -In what ways is your business trying to be more environmentally sustainable? -Are you registered with or certified by any environmental organizations? (e.g. ISO 14001, EMAS, etc) -Do you have an environmental policy? -What aspects of your activities gets recycled and how often? How do you measure or track your	-Why have you taken this approach? -How did you initiate these? -How did you roll this out across the company/among staff? (*Have you done any training/ How regular are the trainings?)* -Are you involved in any green partnerships or collaborations? -How does your business publicize or market your environmental performances to	To understand how the business adopts eco-innovation -Linked to RQ4	-Forms of green adoption -Green washing (likely evidenced through a mismatch in attitude and values, motivation for adoption and ongoing adoption) -Scale of greenness - Diffusion profile	

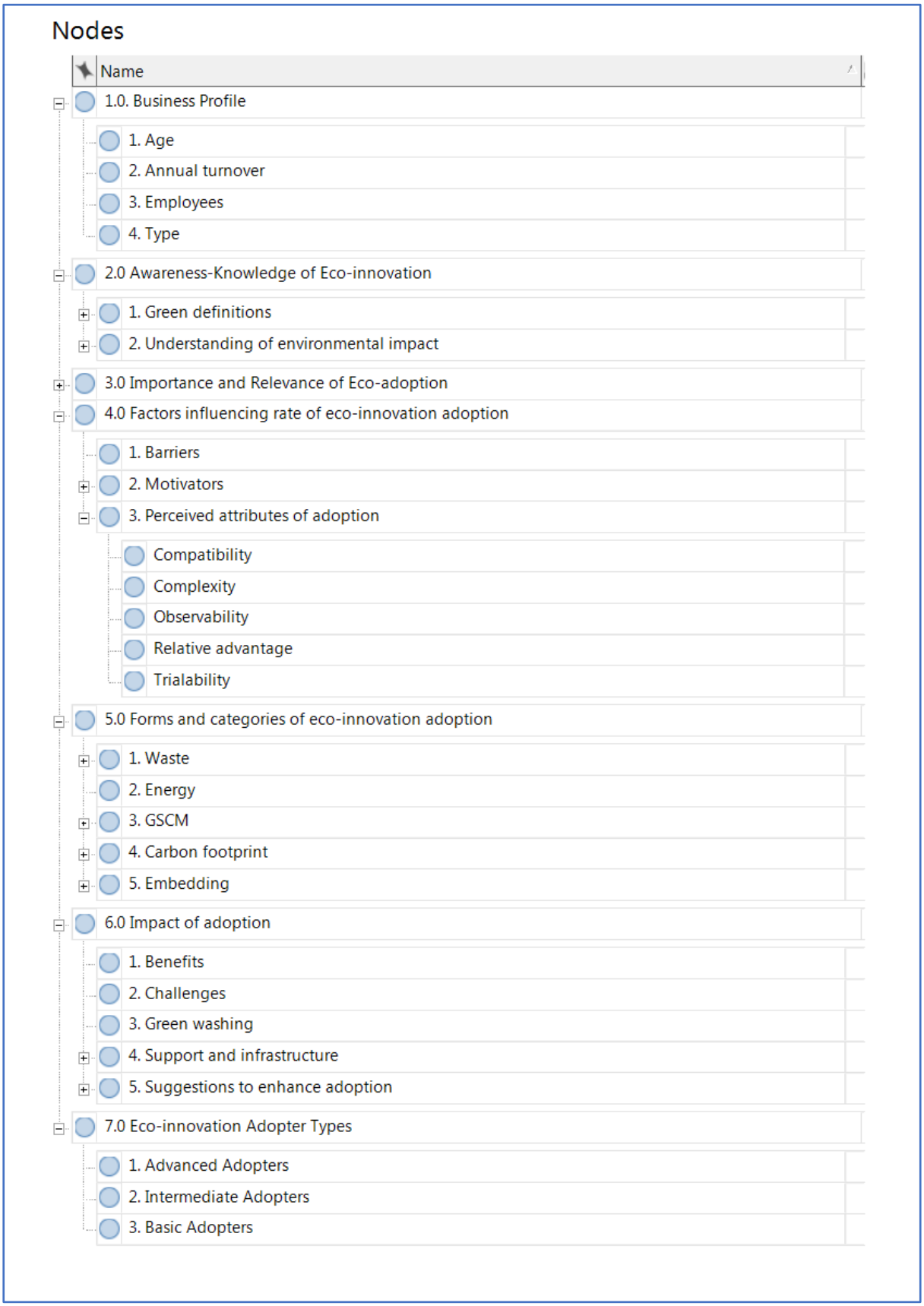
	environmental performance?	customers?			
Interview questions	**Probes or follow-up**	**General prompts**	**Role of questions**	**Emergent themes**	**Other**
1. Why did you decide to adopt green initiatives? Why have you chosen not to adopt green initiatives? 2. What changes/differences would you say green adoption has brought to your business? 3. How has the decision to adopt impacted on your business? 4. What do you think can be done to further enhance increase green adoption by businesses in your sector? 5. Is there anything else you would like to share on the topic	- Are there any challenges to green adoption? ***and benefits*** **-**What are the key problem areas? -What about waste/ energy? -How have you measured (determined) these benefits? -Do the challenges impact the profitability your business? -Do you feel adequate support and infrastructure have been made available to support the adoption of green initiatives by business?	Where do you think your biggest challenge is? Are there any other reasons? Can you give an example? Can you explain what you mean by that?	To determine the drivers and inhibitors to adoption -Linked to RQ3	- Eco-innovation motivators - Eco-innovation barriers Conditions- - *Needs/Problems* *-Innovativeness* *-Societal norms* -Perceived attributes of eco-innovation adoption *-Relative advantage* *-Compatibility* *-Complexity* *-Trialability* *-Observability*	Evidence of such benefits (e.g. higher financial returns, social values, customer loyalty, boosts company image, environmentally responsible)

APPENDIX V: SUMMARY OF NVIVO AUTO-CODED RESPONSES

Auto-coded responses

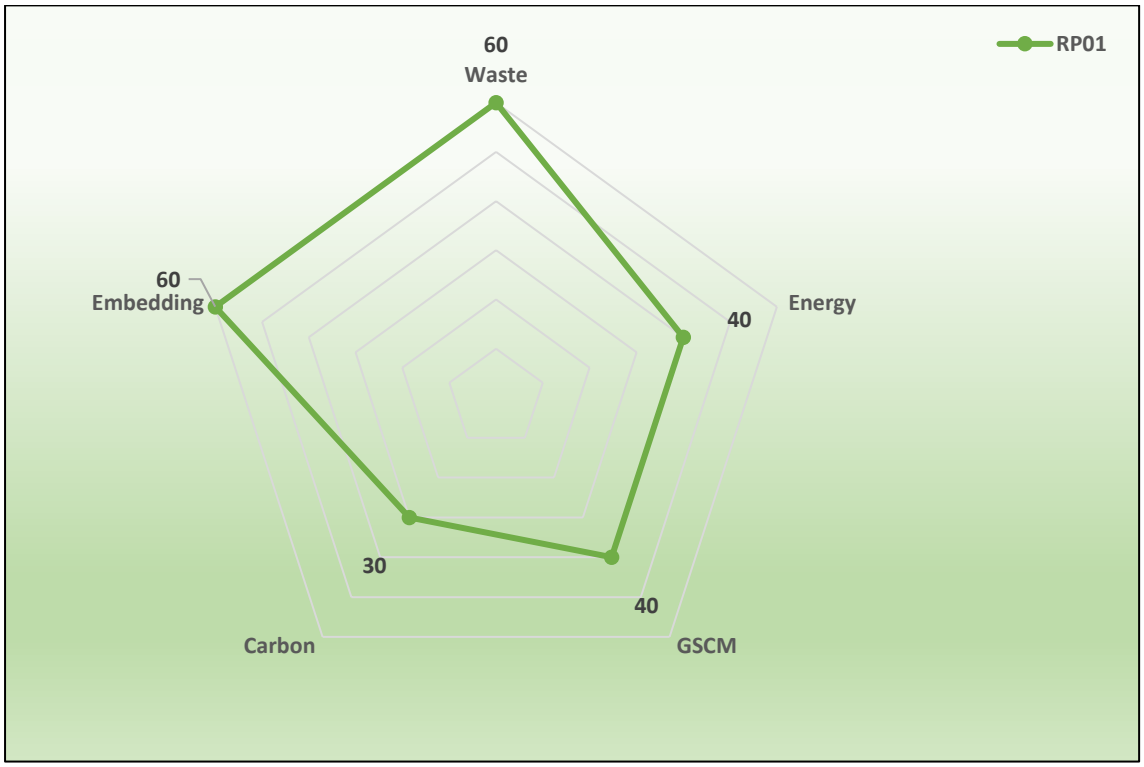
Name	Sources	References
Interview questions	0	0
Q.1. Profiling and Characterisation	19	47
Q.2. Definition of green and understanding	19	118
Q.3. Eco-innovation Awareness-knowledge and Importance	19	52
Q.4. Forms of eco-innovation adoption	19	89
Q.5. Motivators and Barriers to adoption	19	79

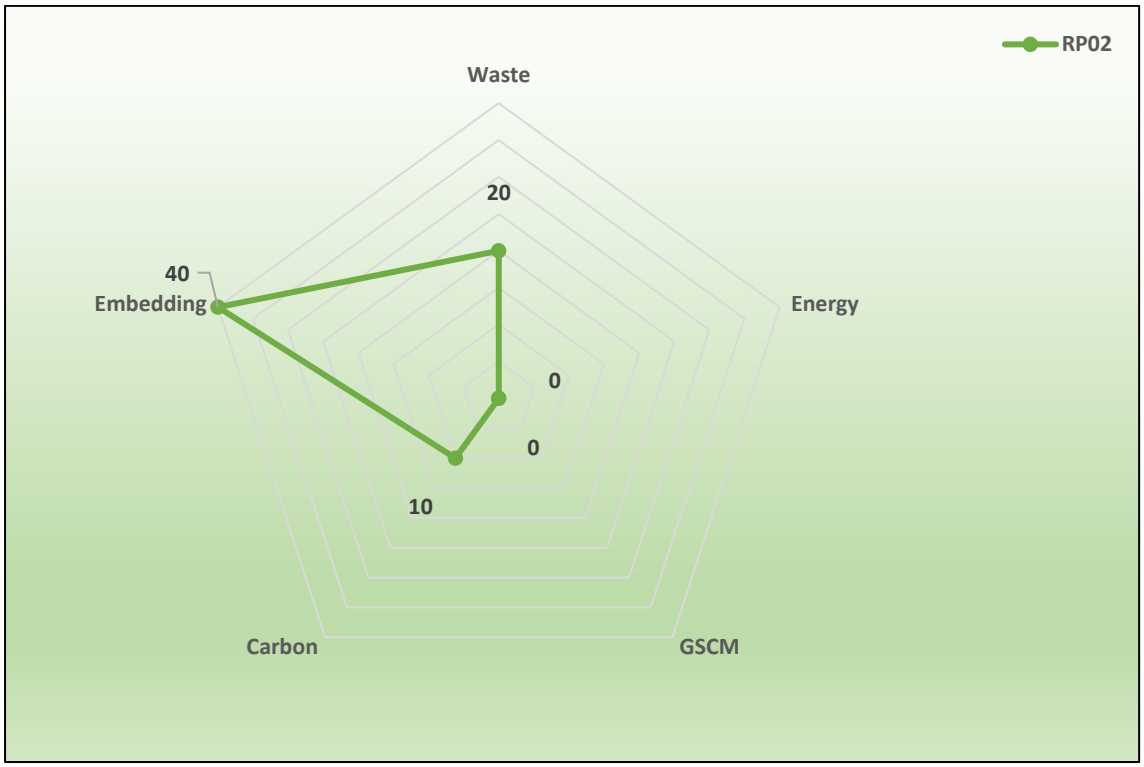
APPENDIX VI: NVIVO ANALYSIS NODES

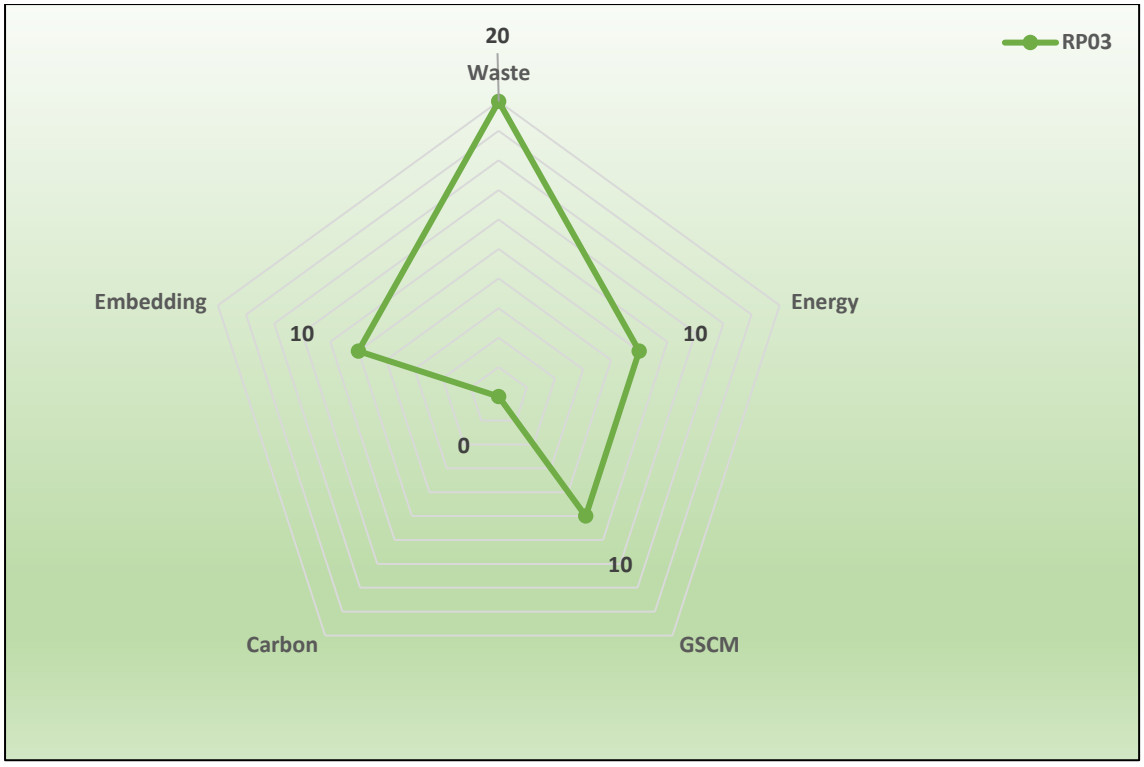


APPENDIX VII: ECO-INNOVATION ADOPTION AND DIFFUSION PROFILE DISPLAY

RESEARCH PARTICIPANT (RP) 1 – 18



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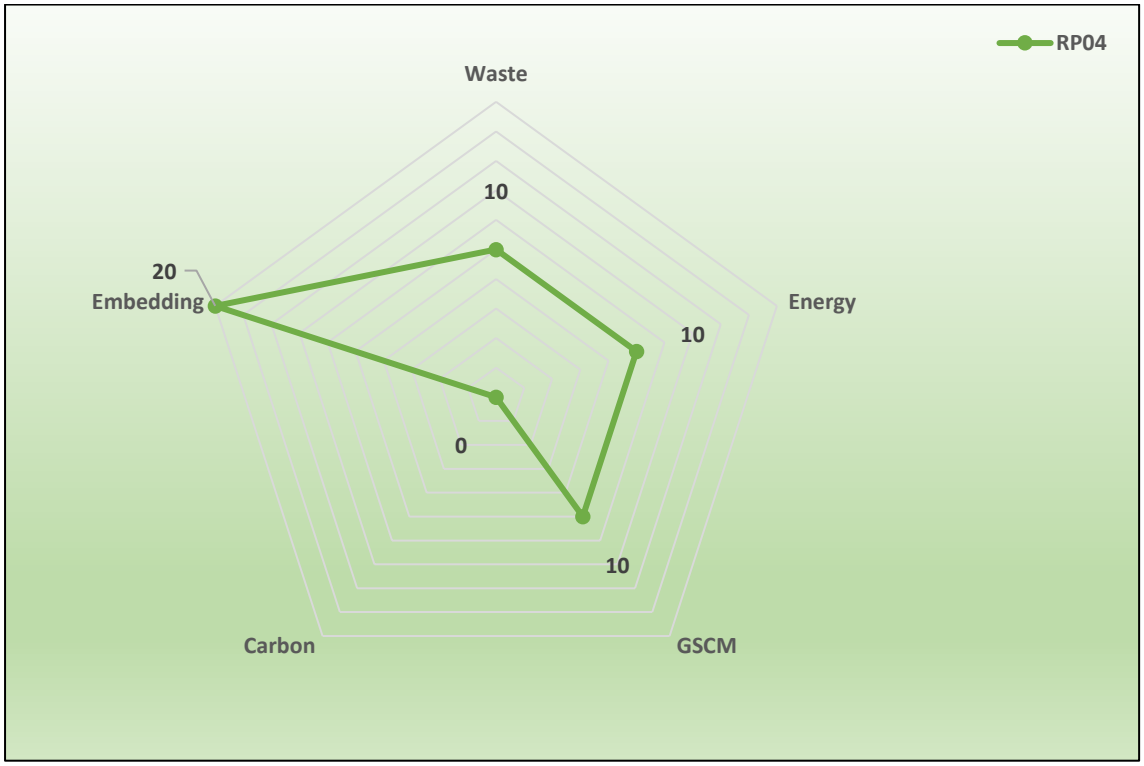
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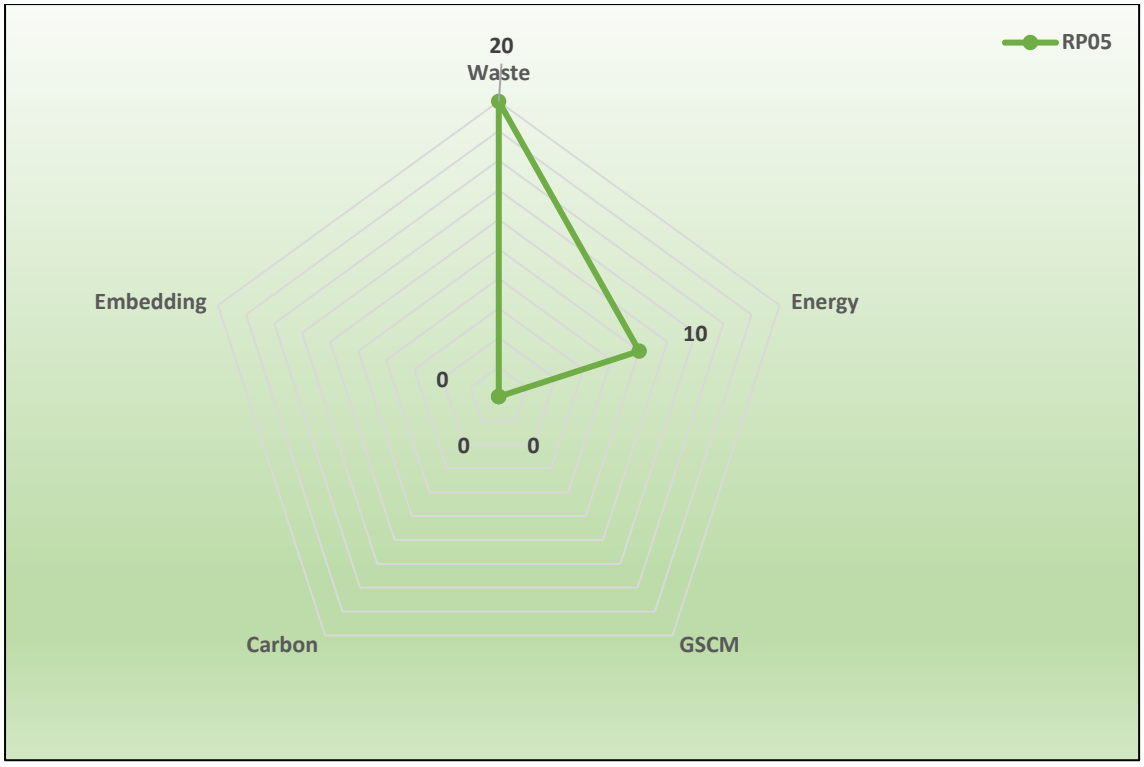
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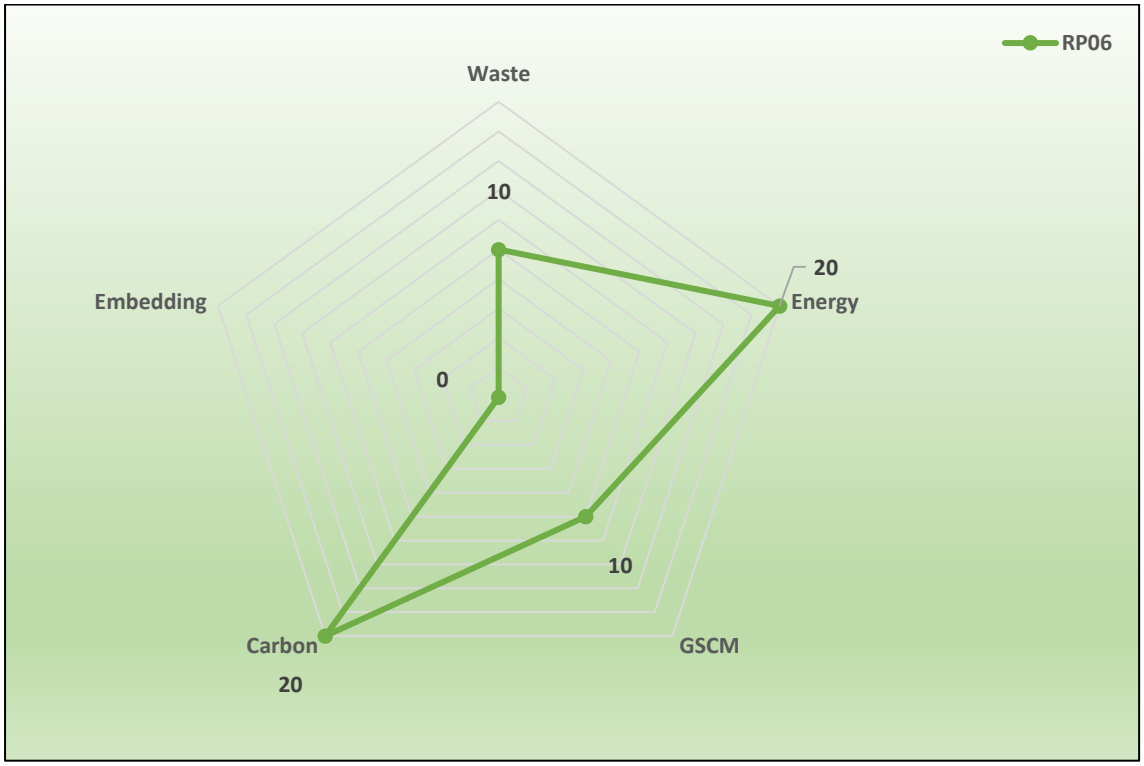
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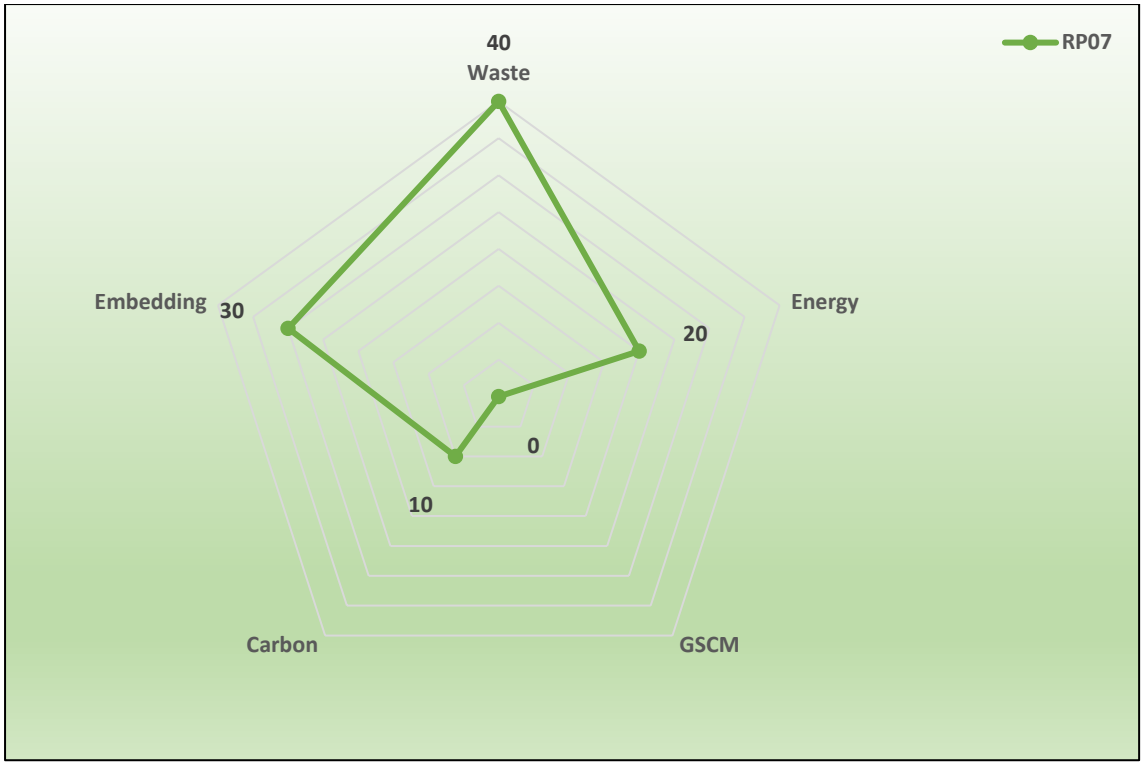
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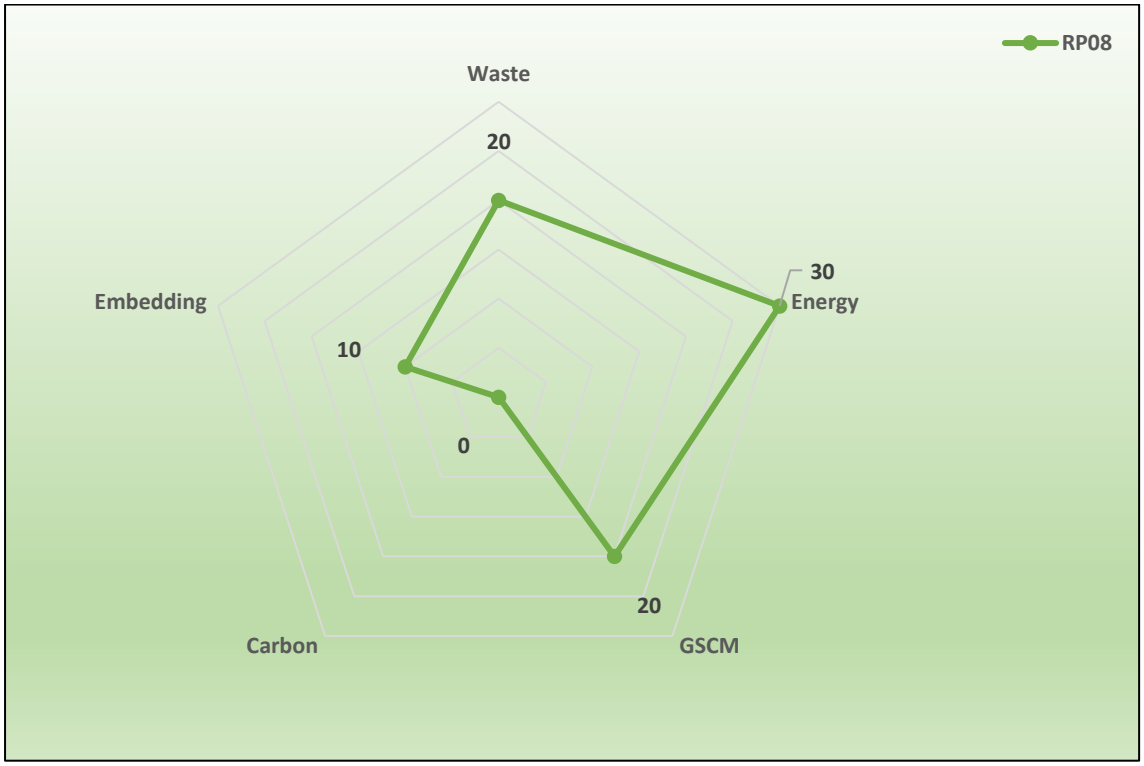
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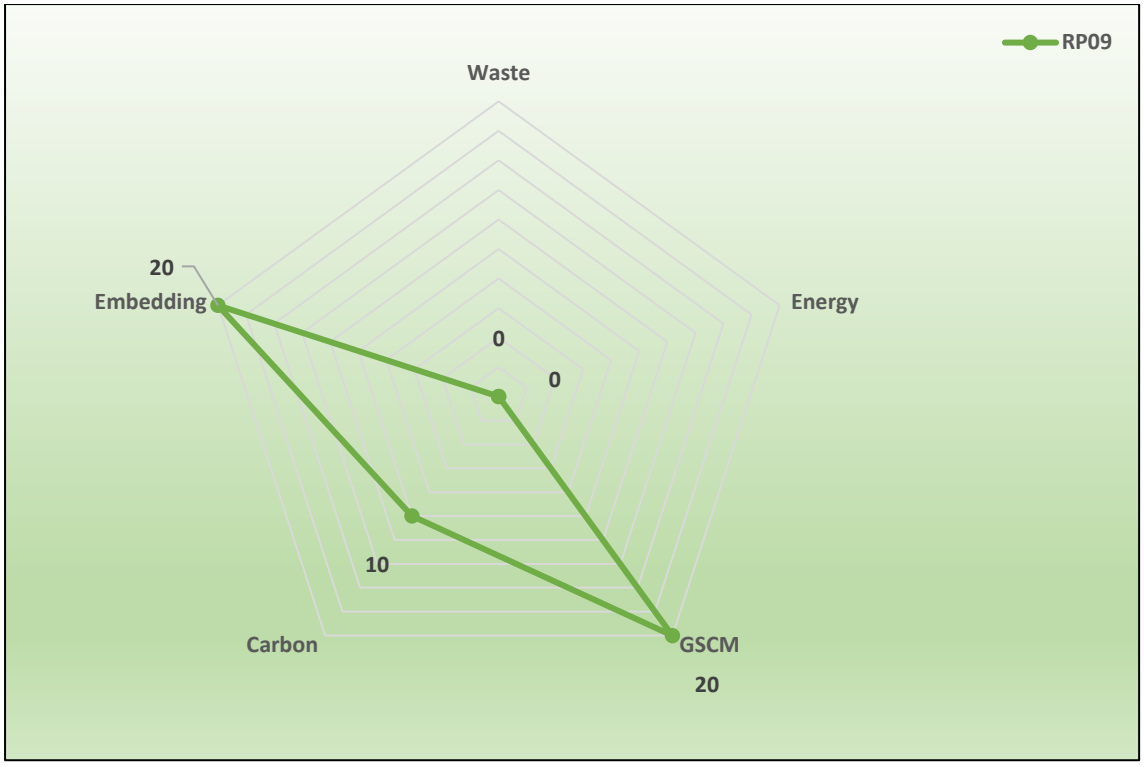
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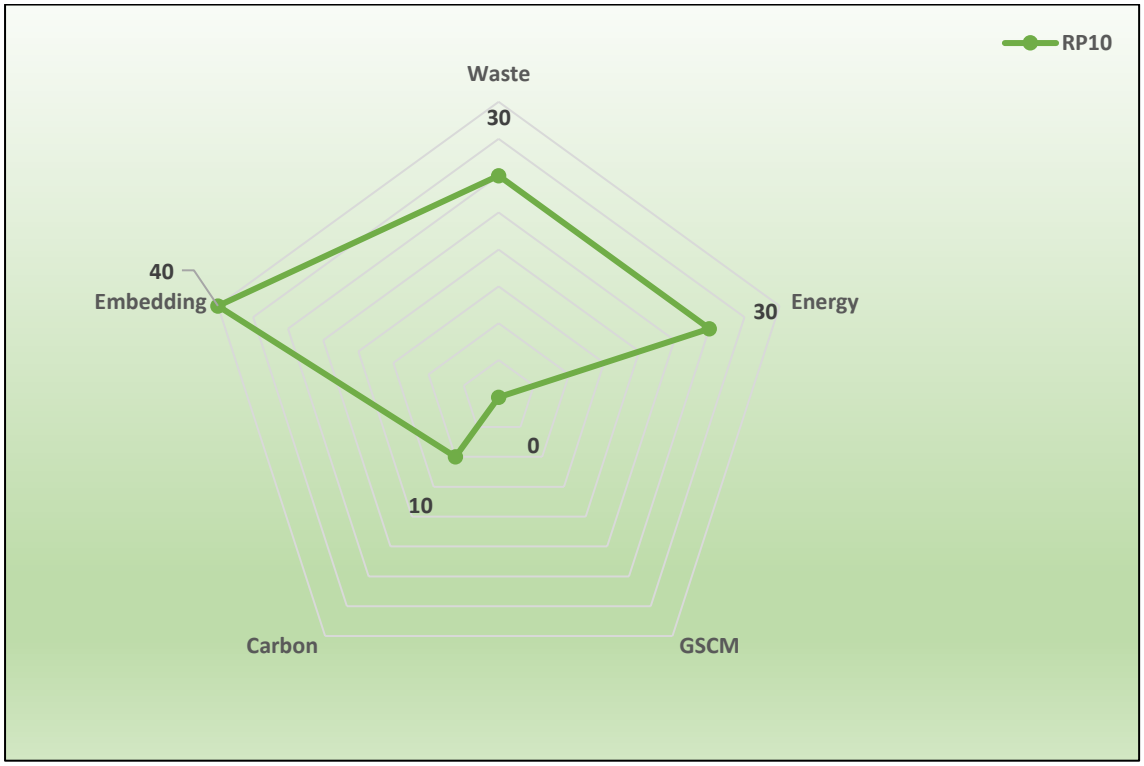
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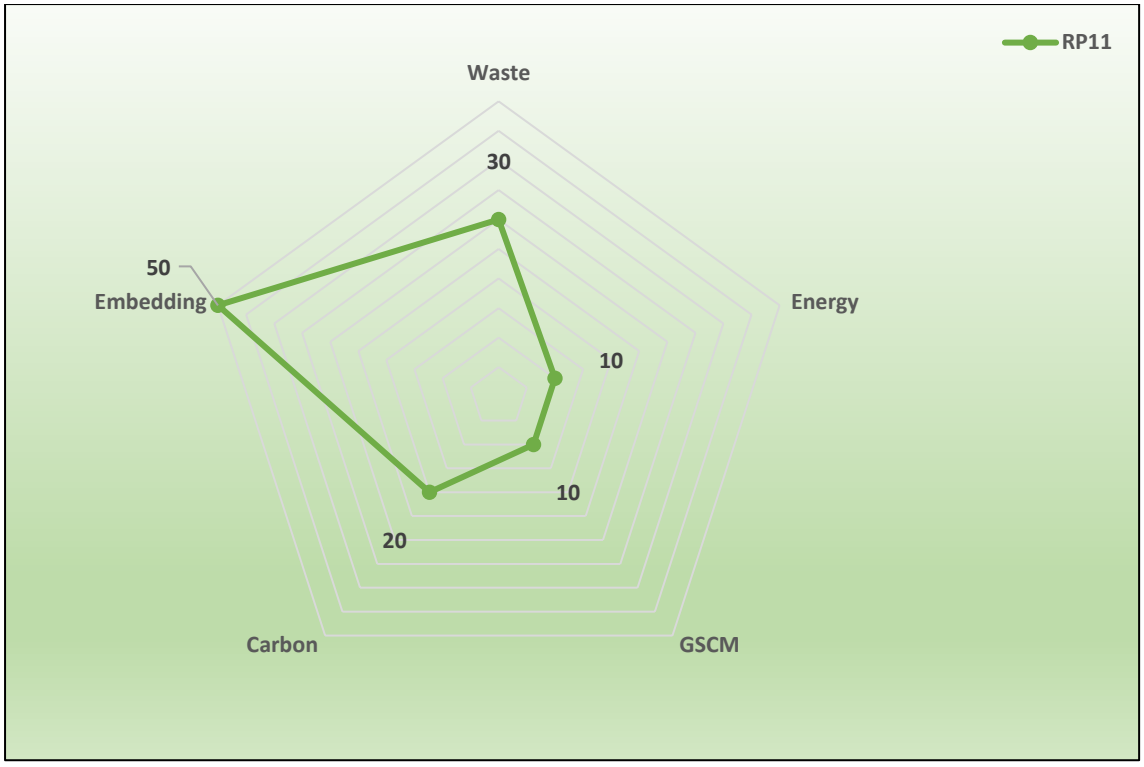
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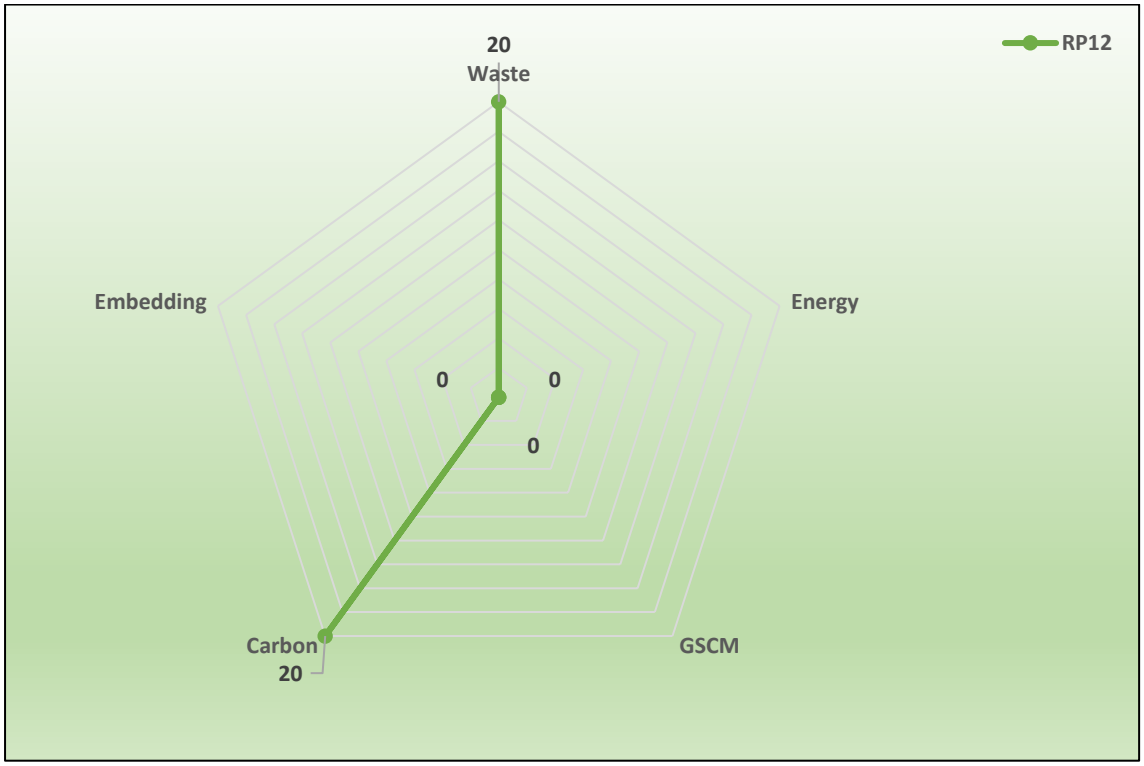
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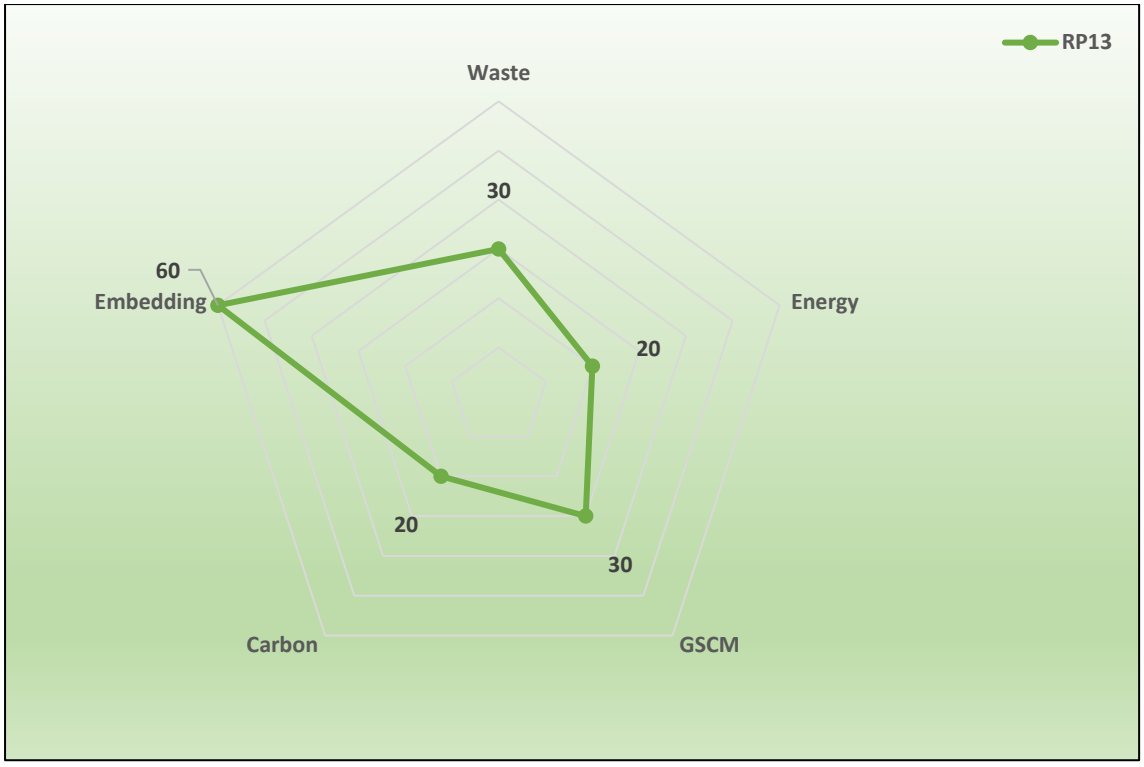
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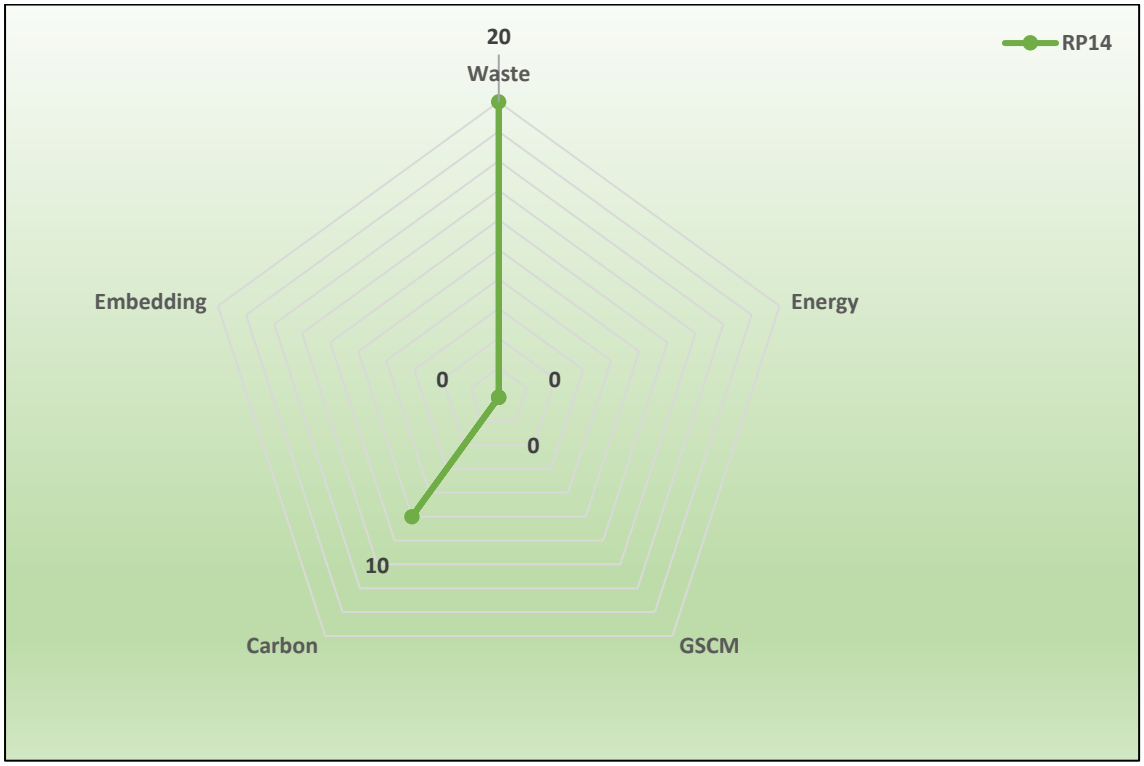
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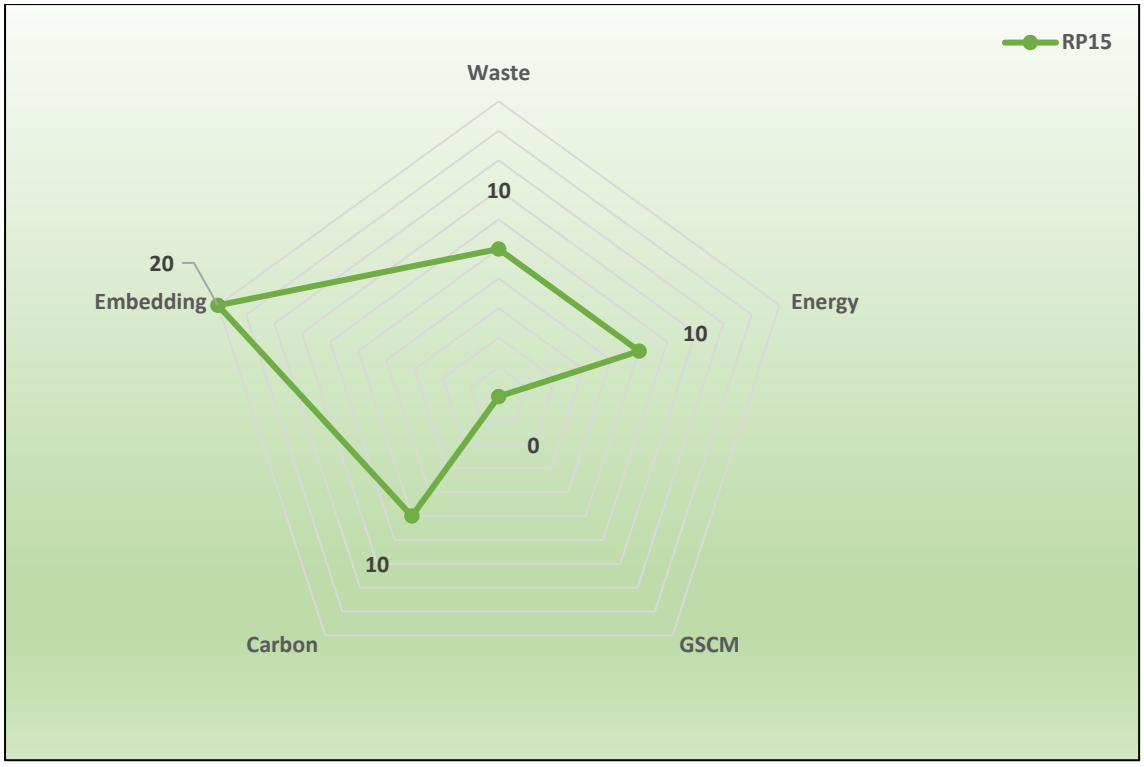
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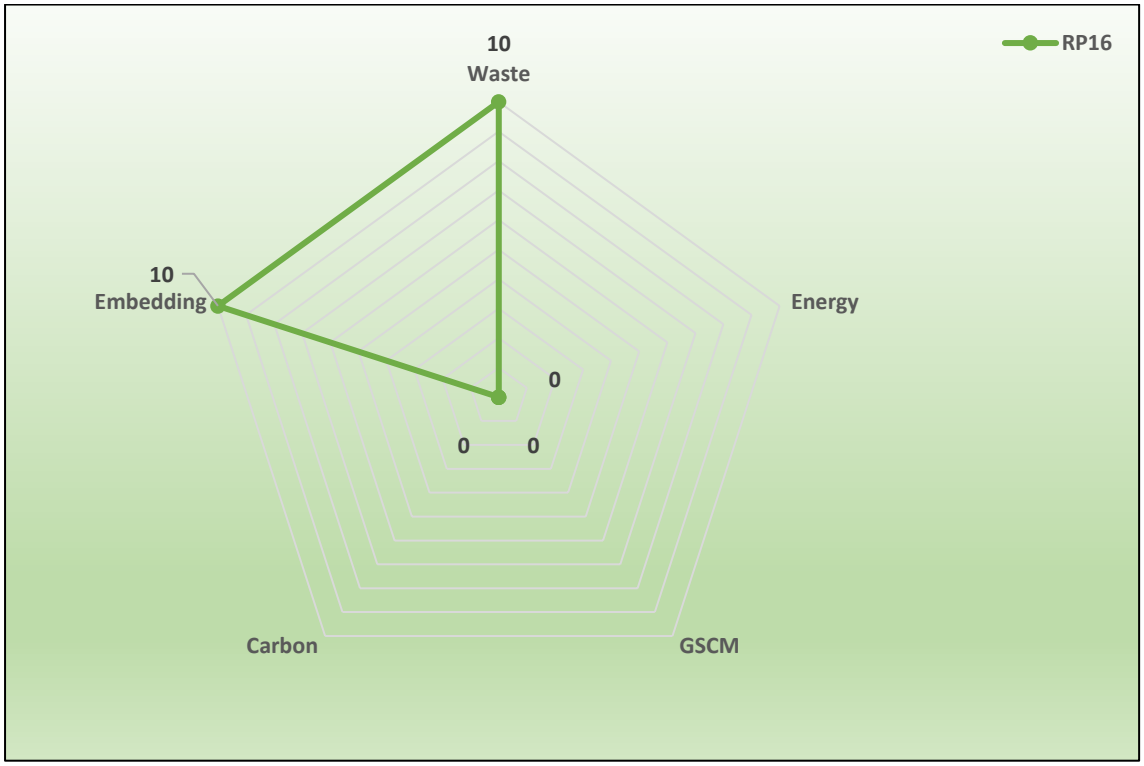
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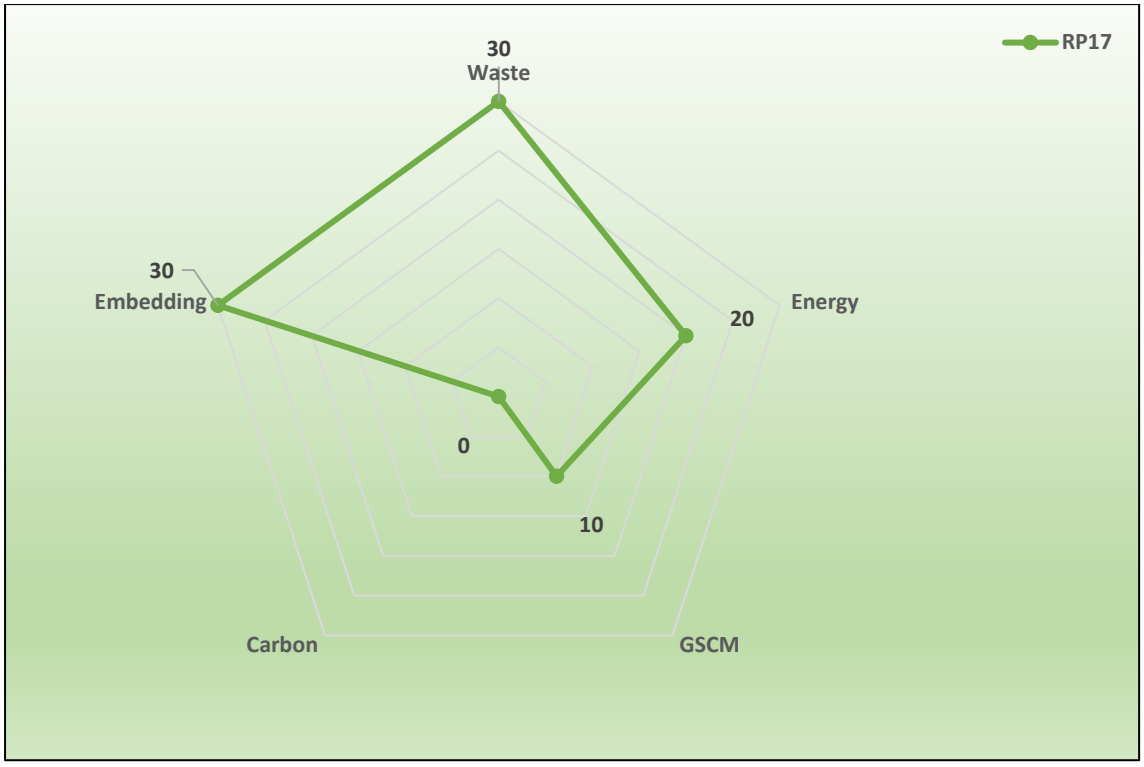
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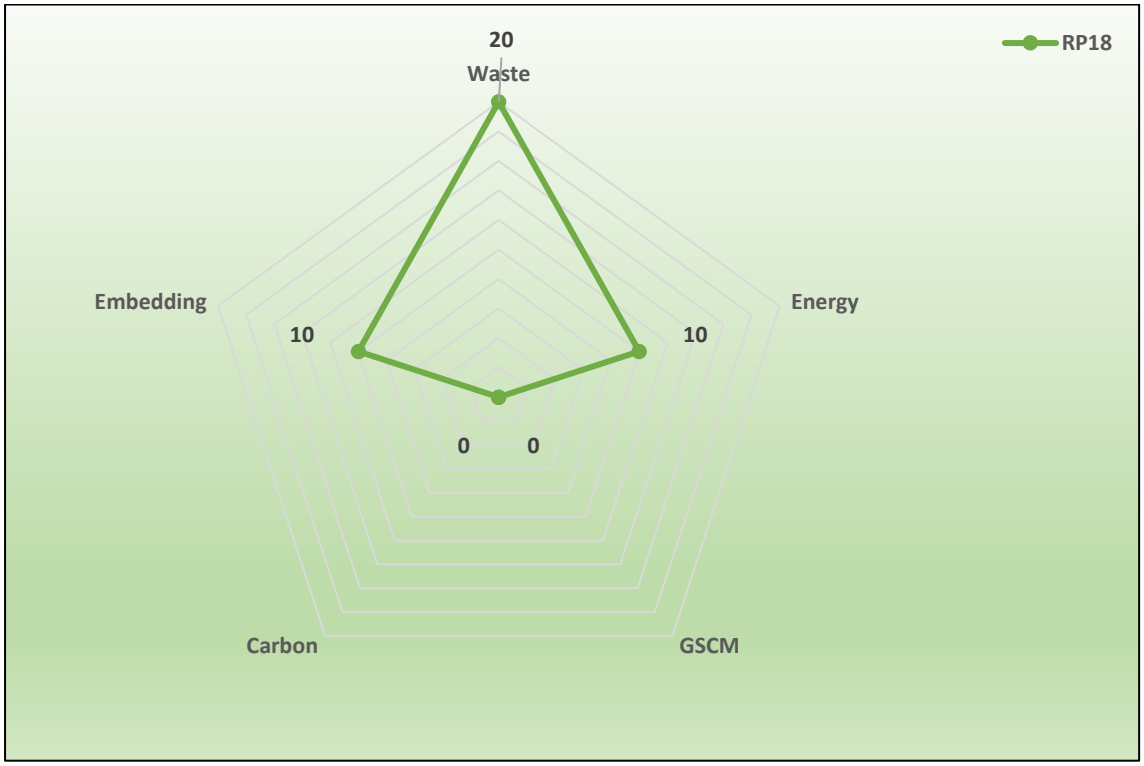
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APPENDIX VIII: ARTICLE SUBMITTED FOR ECIE CONFERENCE

Won Best Paper Award- 9th European Conference on Innovation and Entrepreneurship (ECIE) Belfast,18th- 19th September 2014.

TITLE: INVESTIGATING THE ADOPTION OF SUSTAINABLE GREEN INITIATIVES IN SCOTTISH FOOD AND DRINK SMEs

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Abstract

Increasing concerns towards environmental issues (transportation emissions, global warming, depletion of natural resources) in today's global economy has resulted in the need for businesses to be more environmentally friendly and act in an environmentally responsible manner. Like most developed nations, the UK has placed significant importance on the need for more sustainable business operations. However the smooth adoption and implementation of these green practices by businesses is slow due to challenges such as lack of awareness, cost, resourcing, legislation, and incorporation into existing business processes. Green practices are often assumed by SMEs to involve significant expense, and in some cases even unaffordable. Particularly during the recent time of recession, focus has been on keeping SMEs afloat rather than making substantial investment in what are perceived to be "nice to have" green initiatives. SMEs sometimes also cite lack of knowledge of how to implement green initiatives and lack of support for such activity.

The focus of this research is Scottish food and drink sector, which plays a vital role contributing nearly £10bn yearly to the economy. However, this positive contribution of the sector to the economy sits in tension with the fact it also generates a substantial amount of waste (estimated to generate 2 million tonnes of waste annually), and thus has costly negative impacts on the environment.

This paper forms part of a larger doctoral study on green supply chain initiatives in Scottish SMEs. Specifically, the research has been set up to explore the various factors motivating and inhibiting the adoption of green initiatives by food and drink businesses. In this paper, the focus is on a review of the literature that was undertaken to establish some initial motivators and inhibitors among SMEs across a range of sectors. These were then explored further in a pilot study among six small firms in the food and drink sector Scotland. This qualitative pilot study was undertaken using semi-structured interviews with the owner-managers. Arising from the findings of the pilot study, a scale of "green-ness" was devised to chart the extent to which the firms have innovated by incorporating green practices into their business processes. A more extensive study is now being designed to test and refine the scale with a view to creating a model to assist small businesses in their planning and strategizing in relation to introducing green practices. The paper reports on the early stages of this research, including the pilot study and the creation of the "green-ness" scale.

Keywords: Sustainability, Green, Environment, Food and Drink, Green supply chain management, SMEs

Introduction

Sustainability is defined by (Linton et al. 2007) as " using resources to meet the needs of the present without compromising the ability of future generations to meet their own needs". The Global introduction to sustainability concerns started in the 1970's, with the need to integrate environmental concerns with business strategy. The late 1980's saw a shift to research in organizational green and the internalization of the concept of sustainability by businesses to their core values (Starik and Marcus 2000; Winn 1995), by the 1990's, the sustainability focus became; Green marketing, with the introduction of preventative green management and production measures (Schmidheiny 1992; Porter and van der Linde 1995; Sharma et al. 2010; Teixeira et al. 2012), by the 21st century sustainability had evolved to be included into the activities of the supply chain, integrating issues that related to supplier selection, product life cycle, packaging and recycling, regulations and compliance, waste minimization etc (Starik and Marcus 2000). This integration of sustainability thinking in the supply chain is popularly referred to as "Green supply chain management". Green sustainability is an important issue evidenced by the on-going number of prominent conferences and events for the last 50 years or so that relate to world business sustainability for example in 1968 the UN Economic and Social council held a summit on "Environmental issues in global consciousness" and in 2013 the UN conference was on " the reduction of greenhouse gas emissions.

The focus of this study is SMEs in the Scottish food and drink sector; the study chose this sector because it holds a vital economic importance to the UK economy and international supply chain. Despite this positive attribute, total food waste in the UK is estimated at around 16million tonnes, however this research is narrowed to focus on Scottish food and drink SMEs, this sector is noted to produce over 2 million tonnes of food waste annually (Food and Drink Report 2013). Individually food and drink SMEs may not have a huge impact, but collectively they play a vital role within the industry and are highly critical to many large supply chains as well as to achieving industry sustainability and meeting the green ambition target. Improving the business environmental sustainability enhances the business resilience in the long-term and also mitigates against shortage risks along the supply chain. This is of particular interest to the research as it seeks to investigate how the food and drink companies are implementing green initiatives within their business activities to reduce the environmental impact generated by the industry as a whole.

This paper presents the findings from a pilot undertaken as part of a pilot study of 6 small businesses in the Scottish food and drink sector. The overall aim of the pilot was to explore the case respondents knowledge on the adoption of green practices within their businesses. The paper begins by considering existing literature in the field, followed by a description of the context and approach of the study, the key findings are presented and discussed and ends with a conclusion on the future considerations for further work. Though the paper and main study is focused on Scottish food and drink, the need for greener and sustainable activities is faced by most industries; the findings should therefore be of interest to other fields working on SMEs.

Relevant literature

The increasing focus on supply management has resulted in an integration between green environmental issues and supply management, hence the use of terms like green supply chain management (GSCM), which focuses on ever increasing concerns on how to maximize value from existing business supply chains while yet minimizing its environmental impact in an efficient and sustainable way (Bowen et al. 2001). The green component to supply chain enhances the influence between the environment and supply chain management (Zhu et al 2008) Some examples of GSCM practices include; waste reduction and packaging, assessing suppliers on their environmental performance, eco-friendly products, and reducing Co2 emissions arising from goods transportation. Other initiatives that also seek to address environmental issues at the source include the use of an environmental management system by the company for example lean management practices, kaizen, ISO 14001 etc).

It has been noted that despite the popularity and interest generated within this field there still exists a lack of clarity and standards on issues of sustainability (Berns et al. 2009). Also, of particular interest to the context of this research is the acknowledgment of the gap between implementing green initiatives in practice by businesses, for example an emerging barrier to the implementation of green practices is "green washing", this term is associated with companies who pretend to support and

advocate for green sustainability without actually making any real commitments within their business (Sarkis et al. 2011; Gnoni et al. 2011; Bergenwall et al. 2012; Liu et al. 2012). This research attempts to contribute to this gap with the emphasis on identifying green initiative issues and subsequently investigating the relevant and appropriate strategies to overcome these inhibitors.

The Research Context and Approach: exploratory case studies

The overall aim of this PhD research is to conduct an empirical assessment of on-going green supply chain initiatives adopted by the Scottish food and drink SMEs, evaluating the extent to which these SME's are involved in incorporating green environmental management practices into their business supply chains, as well as assessing the impact of the adoption. However, this paper is confined to the specific aim of assessing the awareness of adopting green practices by food and drink businesses. The objectives in line with this aim were to:

- Assess the awareness of green practices to the businesses in the sector
- Identify the forms of green initiatives adopted by the SMEs
- Identify the motivators and barriers to green efforts by SMEs in the Scottish food and drink sector

The objectives were met by conducting an exploratory pilot of 6 case studies within the sector. A qualitative method is adopted for the study to enable an in-depth approach to investigating the adoption of green initiatives by Scottish food and drink SMEs. Qualitative research studies have been noted to seek to illuminate, comprehend and explore situations, without manipulating the phenomenon of interest (Carter and Easton 2011). The methodology adopted by the study draws on the design of a multiple case study; this is representative of the research case (multiple food and drink SMEs) and the issue of focus (the adoption of green initiatives). This design will enable the research illustrate various perspective on the issue from looking at multiple case studies and doing cross case analysis (i.e. the difference between companies investigated), this is a form of qualitative research design that focuses on issues with individual cases, as it builds on a detailed understanding of the case through multiple sources of information such as interviews, documents and reports (Yin 2003).

Interviews served as the main source of data for the pilot, the respondent's details were obtained from the UK food and drink directory called "Food and Drink Federation" which contains updated information of companies within the industry (www.fdf.org.uk). The interviews were semi-structured, this was found appropriate due to the individual nature of the respondent firms and the potential of this method to generate rich data for the research to explore. Interview topics and questions include details of the company, annual income and expenditure, knowledge and awareness of green initiatives, decisions to foster such initiatives, existing initiatives carried out by the company, drivers and barriers to such green initiatives. Interviews were digitally recorded and transcribed by the researcher. The data was further analysed by identifying key themes of interest, grouping the similarities and dissimilarities and carrying out a comparison between the findings and existing literature.

Six companies are investigated in this study, table 1, presents some of the information about these companies with particular reference to their size, activity, green awareness level and adopted green practices. At the moment, the research maintains a wide scale using the food and drink sector, though the pilot was mainly focused on businesses based in North- east Scotland, the research is still being shaped and yet to be narrowed down to specific sector (i.e. producers, manufacturers, wholesalers, retailers). The researcher has maintained this broad sector outlook at the moment to see where the study is likely to get the most responses.

Table 1: Characteristics of case companies

Characteristics	Company A	Company B	Company C	Company D	Company E	Company F
Market	Bar and Restaurant	Bar	Meat, Game and Poultry production	Bar and Restaurant	Alcoholic Beverages production	Organic Fruit and Vegetable Farm
Employees	40	5	2	13	5	7
Annual turnover	450- 500K	350-450K	100-200K	200-300K	250-350K	100-200K
Awareness of Green	Low	Low	Low	Medium	High	High
Green Initiatives	Recycling	Recycling	Recycling	- Recycling -Low food miles -Supplier selection	-Product redesign, -Low energy equipment	-Recycling -Low logistics miles
Location	Aberdeen	Aberdeen	Shetland	Aberdeen	Glasgow	Edinburgh

Results obtained from the pilot are presented in the following sections.

Findings and Discussion

The result obtained from the empirical analysis are presented and discussed in this section.

Green Awareness

All case companies acknowledged to be aware of green initiatives, however the level of awareness differed. For instance; company A, B and C for noted the popularity of green initiatives and mostly associated it with eco-marketing and adverts but when asked to elaborate with details of practices they became highly unfamiliar.

Motivators and On-going practices

Since the case companies confirmed their awareness of green initiatives, the study went further to investigate the factors fostering the adoption of such green practices and the extent to which these practices are adopted and deemed important by the business owners. Zhu and Sarkis (2006) found that firms in different industries have different drivers and practices, this clearly suggests that drivers and barriers to green are likely to be industry specific and cannot be generalised, thus the need for the study to gather industry specific data from food and drink businesses on the motivators to green initiatives. The study adopts a narrative style in presenting the findings from the respective SMEs.

Company A: is a bar and restaurant business with over 40 employees, the key driver for the firm towards green initiatives here is legislation. At the moment the initiatives adopted is recycling which is restricted to glass and cardboards, this is attributed to the challenge of costs, according to the

respondent "*the cost of having to allocate different recycling to different companies and different rates requires time, effort and money. I remember the days when you got money for recycling stuff, but it's all changed so much now".* Despite this the owner notes a generous amount of waste is generated by their process, and is looking to adopt more particularly in the areas of food waste minimization and more energy efficient practices. The company currently has no green initiative strategy or programs in place for the business but acknowledges the importance of green initiatives and looks to do better in the future.

Company B is also driven by legislation to recycle. The particular green practice adopted here is recycling cardboards, though they generate a huge volume of bottles due to the nature of the business they are not involved in bottle recycled, however they agree it is important by stating " *I think it would be good to recycle our glassware but we need to have a system as well that is easy to recycle".* Other areas they would like to improve and adopt more efficient processes include cutting down on their water use and saving on energy.

Company C: Is not driven by any particular reason to adopt green initiatives, the business is however involved in recycling on occasion but not very consistent. The owner stresses on the need to keep the business afloat and stay profitable and feels including other activities will have cost implications that the business cannot afford to bear and stay profitable.

Company D: is inclined to adopt green initiatives as a business value, the business owners strongly supports the relevance of green initiatives as a means of reducing their impact as a business on the environment. Stating, " *I think the food and drink industry is very wasteful and very difficult to manage".* They are currently involved in lowering carbon-footprints by procuring products from local environmentally friendly suppliers, recycling glass and minimizing the travel miles of the business in general.

Company E: attributes their desire to be green to the need to meet their customers demand, to improve on their process, quality and the efficiency of the business stating" *We work with our producers to make sure that we try to be as green as we can, we also source locally to reduce our carbon-footprint. We also try to ensure we produce in the most efficient way by recycling water, which improves our energy efficiency, and further promote and encourage a paper-free environment".* The owner further associated the efficiency of the business to reducing costs stating " *We now use lightweight glass, compare to 5 years ago where it was heavier glass, this means we can get more on a pallet, and we now ship more efficiently than we did 5 years ago, efficiency for us means saving money in many ways, an initiative that makes glass lighter actually saves a lot of money".* The business owner fully supports the adoption of green initiatives and finds it to be an advantage for businesses in today's competitive environment.

Company F: Is involved in an organic business and strongly supports the relevance of green initiatives. The main driver is the influence of customer demand for organic produce, the business has a relatively low environmental impact because it is solely organic, and also is actively involved in recycling plastic boards. Waste is kept to a minimal by its re-use as fertilizers on farms, and transportation miles are kept low as a means of reducing the carbon-footprint.

The narrative analysis and construction from interviewees enabled the study identify themes which stand out as motivators for the SMEs to adopting green initiatives presented in figure 1. In enabling and facilitating these green initiatives the most prominent activity seems to be recycling, with the exception of company E which seems to be looking for (green) best practices to add on, the other companies are less active towards the adoption of green initiatives, the study identified some difficulties they encounter towards actively adopting green initiatives.

Inhibitors

An observation from this study indicates that there seems to be more inhibitors to the adoption of green initiatives for businesses in the food and drink SMEs than there are motivators. The factors are summarised as inhibitors in figure 1 and discussed below.

All companies investigated identified with some form of challenge. They acknowledged that to be active in greening their businesses they would need to allocate additional resources to facilitate the

development of such green practices and they were not certain the benefits of such would outweigh the costs associated and the effort required. An example of such a view is seen in company D " *if I focused my energy on none business related activities, nothing will get done to my standard*", on this Company A states " *I know we generate a lot of food waste and I should probably look into food recycling but I just have not been able to do it*", while Company B agrees stating " *it is time consuming for us and it will also cost more*" the companies further stress that they are not getting the right form of support or encouragement from government legislation.

Costs was identified as a major barrier, the cost of going green is associated with costs among the SMEs, the study found that the businesses are happy to adopt green initiatives if it cost nothing, the companies confirmed they encountered costs to recycling and the inconvenience of needing to recycle with different companies for different products such as paper, plastics, wood, and glass was even more frustrating and a big obstacle to their active engagement for example, company B stated " *it would be nice to make sure that we are doing good to the environment as a business and our waste was not going to landfill, but not if that comes at an extra cost*" .

Also, the restriction to recycle yards makes it even more difficult, Company D states, "commercial vehicles are not allowed in the recycling yard, only residents, so even though we pay the business rates, we are not given access and get penalized when we use the yard". Company E, was involved in re-designing their product to be more eco-friendly and confirms that a major challenge they experienced was disruption to their business production as a result they re-design every 10 years in-order to avoid major disruptions.

Five companies out of the six (6) were not active members of trade associations, there was therefore a general sense of lack of knowledge on the subject of green practices and on how their employees get trained to assist in implementing such environmental practices, there was a general trend by the interviewees to indicate one-off trainings or illustrations with workers on how to recycle glass. With the exception of company E who found it immensely useful to be involved with associations and training programmes for its staff as well noting " *we strive to be aware of how things can be improved, and the objective for us it to be efficient*". From this analysis of inhibitors, we can present the following emerging themes illustrated in figure 1.

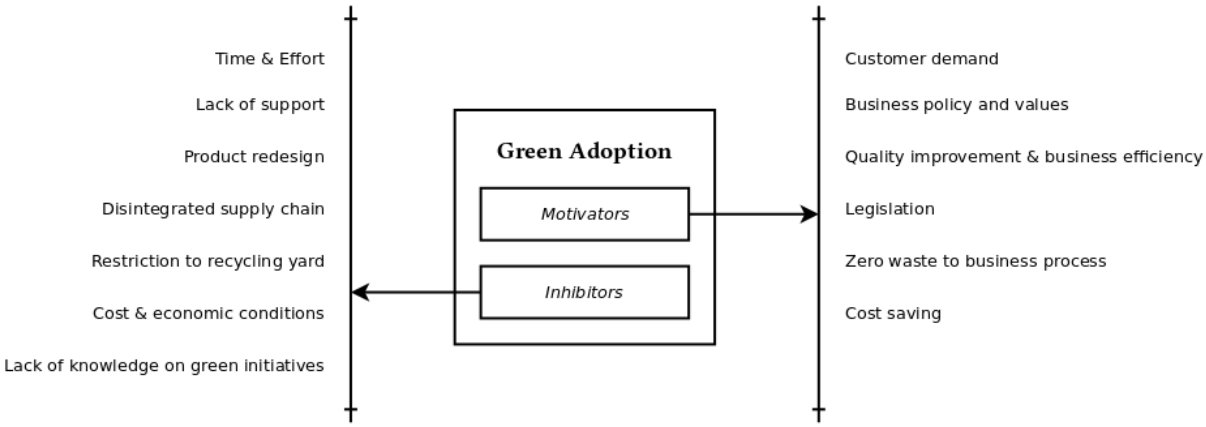

Figure 1: Motivators and Inhibitors to green adoption

The respondents acknowledged awareness of green initiatives but also associated adopting green to high cost that would impact their business profitability and as a result this makes it difficult to adopt. This is not strange as SMEs are noted to face greater obstacles when adopting new innovative initiatives, this is partly associated to the costs of greening, costs associated to training, implementation, environmental regulations, re-design, energy and logistics (Hassini et al. 2012; Revell and Blackburn 2007), they further struggle with issues such as a lack of ample resources, green knowledge and expertise and time constraints (Worthington 2012). SMEs clearly do not have sufficient understanding of how to adopt green initiatives and this poses a huge barrier to sustainability of green practices within the food and drink sector.

Further research

The findings from the pilot have identified areas that will be further investigated in the main data collection of the study, since the pilot was merely used to gauge the receptiveness of respondents within the sector and gain a sense of issues relating to the adoption of green initiatives that might exist in the sector. Previous studies have either examined SMEs from diverse industries (Banomyong and Supatn 2011) or conducted comparative studies between large businesses and SMEs (Islam and Karim 2011) but there is still a limitation of work where green sustainability practices of SMEs and particularly for food and drink (Lee et al. 2012; Bourlakis et al. 2013) and none to the best of our knowledge. This paper sheds some light towards this gap, it has investigated the micro and small firms in the food and drink chain and identified the motivators and inhibitors to the firms adoption of green practices.

The findings reveal a disparity among the firms on the forms of practices they are actively engaged in for instance some patterns have emerged in terms of the on-going practices between these firms, which is highly influenced by some of the inhibitors identified. There is a mixture of both micro and small firms that seem to be more inclined and consistent with on-going green practices mostly influenced by the perception and values of the business owners alongside the need to continuously improve their processes and reduce environmental impact while still maintaining their profitability. The activities of this group goes beyond just recycling and extends into areas of waste minimization, eco supplier selection and reducing Co2 emissions, these are high-level green adopters. Another emerging group is those with very minimal involvement towards green practices, despite their acknowledgment of a generous amount of waste being generated, they are less involved in minimising their impact unless compelled to by legislation, an example of such is one of the companies noted to generate a lot of food waste and despite being aware of food recycling does not implement this as a means to reduce waste. A third group identified is also on the minimal level; they recycle products such as bottles and papers but are not interested in doing more. There are also those with a low awareness level of what green initiatives are and are likely affected by what seems to be a lack of access to information on what they can do within their processes.

Clearly, the data gathered was for exploratory purposes but the findings have led the study to generate a scale, which will explore the level of greenness of these business. The scale could go from low level to high or vice-versa, however the study does not have sufficient data to label what falls in-between the scale as illustrated in the figure 2.

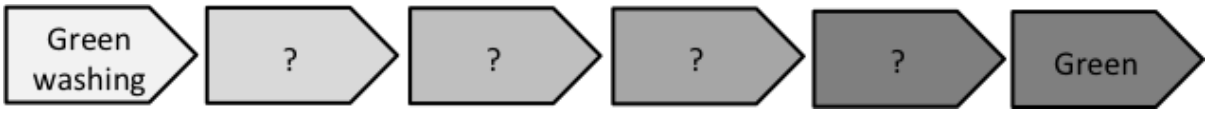

Figure 2: Emerging scale of Greenness among SMEs

Future research will look into expanding this scale and make it more explicit to understand the distinctions between the various participatory levels of adopting green (possible theories to be explored include Rogers “theory of diffusion of innovation”). We also include green washing as a label that might likely be investigated. Green washing as a term emerges from secondary data in literature (Bergenwall et al. 2012; Liu et al. 2012), however this study has not come across any companies from the pilot that fall under this label and simply acknowledges its existence from literature.

Conclusion

The overall objective of this research was to investigate the adoption of green practices in the food and drink SMEs, though the pilot study is presented in this paper, it has been possible to identify

some motivators and inhibitors to adoption. The study involved preliminary data collected from six-micro and small firms. The conclusions drawn from this pilot study are that:

- Food and drink businesses are inclined towards the adoption of green practices as a notion rather than in actual practice.
- Majority of the companies are involved in green practices on a passive activity basis, the most prominent form of practice is recycling which is mostly limited to paper, wood, plastic and bottle recycling and not necessarily to waste generated within the core business activity for example food waste recycling.
- There is clear evidence of both internal barriers such as (lack of knowledge/ access to information, trainings, cost, and time constraints) and external barriers such as (lack of support, resources and cost).
- The findings indicate that awareness on environmental issues has not yet been translated into sustainable green practice adoption.
- A scale of greenness has emerged from the findings, which will explore and expand in future research on activity levels of adoption. Companies will be categorised according to labels of on-going practices.

The limitation of this study is it is only exploratory and was conducted based on very preliminary data, this however serves as a sound basis for expansion into future research as the doctoral study progresses.

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