



Title: Supplier Collaboration for Sustainability: A Study of UK Food Supply Chains

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Supplier Collaboration for Sustainability: A Study of UK Food Supply Chains

Abdul Ali

A thesis submitted to the University of Bedfordshire, in fulfilment of the
requirements for the degree of PhD

December 2018

The Business School

University of Bedfordshire

Supplier Collaboration for Sustainability: A Study of UK Food Supply Chains

Abdul Ali

Abstract

Achieving sustainability in the supply chain is not a choice but an inevitable necessity for the organisation to survive and thrive in the long run. Supplier collaboration to achieve sustainability is widely recognised but poorly studied phenomena. While there is a handful of studies that focused on collaboration for sustainability in food supply chains, only a few considered sustainable (i.e. environmental, cost and social) or Triple Bottom Line (TBL) performance, and in the context of UK food industry, there is hardly any study. Building on previous studies, this thesis addressed these concerns conceptually and empirically by: a) examining supplier collaboration for sustainable performance; b) assessing supplier collaboration for environment friendly and socially responsible practices; c) measuring environment friendly and socially responsible practices for sustainable performance; and d) validating environment friendly and socially responsible practices as the mediators for supplier collaboration and sustainable performance.

To achieve these objectives, first, a structured literature review was performed and identified 61 studies that documented supplier collaboration for sustainability, and a comprehensive review was also conducted to expand the research domain. Second, underpinned by Relational View (RV) theory, a set of 17 testable hypotheses (including sub-hypotheses) were developed, and a survey method was used to collect 203 useable data from UK based food businesses who maintain collaborative relationships with their suppliers. Finally, for data analysis, Partial Least Squared-Structural Equations Modelling (PLS-SEM) technique was used with SmartPLS3 software.

The empirical findings validated that: a) supplier collaboration improves environmental, cost and social performance; b) supplier collaboration contributes to improved environment friendly and socially responsible practices; c) environment friendly practices enhance environmentally, cost and social performance; d) socially responsible practices have an impact on environmental and social performance, however socially responsible practices do not have an impact on cost performance; e) environment friendly and socially responsible practices mediate the relationship between supplier collaboration and sustainable performance. The results suggest that supplier collaboration enhances environment-friendly and socially responsible practices which will lead to enhanced environmental, cost and social performance.

The contributions of this research to supply chain management literature are: a) to achieve sustainable performance in the food supply chain, collaboration with the suppliers is essential; b) collaborating with the suppliers, firms can improve their environment friendly and socially responsible practices; c) socially responsible practices in the supply chain enhance environmental and social performance but do not improve cost performance; c) this study extends the Relational View theory (RV) from the relation-specific assets for sustainable performance to the relation-specific assets for environmentally friendly and socially responsible practices which lead to sustainable performance. This study found that inter-organisational relationship facilitates environment-friendly and socially responsible practices which will lead to improved sustainable performance. For practitioners, this study offers the sustainability framework that suggests for greater collaboration with the suppliers to improve environment-friendly and socially responsible practices which should lead to a sustainable performance in the food industry. For the policymakers, this study offers a unique proposition to encourage a collaborative environment in the supply chain to achieve sustainable performance in the food industry.

Keywords: Food Supply Chain, Supplier collaboration, Sustainability, UK, environmental practices, Social Practices, Relational View.

Author's Declaration

I, Abdul Ali, declare that this thesis and the work presented in it are my own and has been generated by me as the result of my original research. The paper titled as the *Supplier Collaboration for Sustainability: A Study of UK Food Supply Chains* is exclusively my work and effort where except otherwise acknowledged. I would also like to affirm that the contents of this thesis been studied and written as part of My PhD study at the University of Bedfordshire. No materials of this work were submitted in part or full for the award of any other academic qualifications at this or any other institutions. I have acknowledged the major sources, and I have cited wherever I have used previously published materials.

Name of Candidate: **Abdul Ali**

Signature:

Date: 20/12/2018

Dedication

This PhD study is dedicated to **my parents as well as my entire family** whose dream was to see me as a highly educated individual. I would also like to dedicate this study to **my beloved wife Asma Akter Sweety** who inspired me a lot to embark on the Journey of PhD and patiently supported me throughout this challenging journey to see me as a highly educated academics to contribute to the wider society. I love you all. I am grateful to all of you for your patience as the time during this PhD. Your support, encouragement, and prayers are highly appreciated and acknowledged. Without your love, encouragement, prayer and by the grace of almighty, coming this far would not have been possible.

Thank You

Acknowledgement

All praise to the Almighty Allah (The God) for making it possible for me by giving me knowledge, strength, and courage to complete this research study. There are many people who I am grateful to and would like to thank. **Dr Yongmei Bentley**, my Director of Studies and a great mentor, has kept an eagle eye of my work and kept me pushing to move forward. **Dr Guangming Cao** as a great mentor has also supported me very well throughout my PhD Journey. I am grateful to both of you for your continuous support. It would not have been possible to come at this stage without your support. I am grateful to my father and mother who kept me in their prayers and encouraged me continuously: my brothers and the little sister who wanted but have not got them besides me for all these many years during the PhD studies.

I want to thank Prof. Amir M. Nasrullah who encouraged me a lot during my Bachelor and masters to pursue PhD. I am grateful to my PhD colleagues including Ahsraf Mahmud, Manpreet, Sajeel and all PhD colleagues from BMRI room - J111 in the University of Bedfordshire who were a wonderful help in debating research ideas. The RGS team was very supportive. The Director of BMRI Prof Dr Ram Ramanathan was a wonderful support for me. Thanks to my friends especially Milton, Abu Nasar Tuhin, and Mahir Faisal have mentally supported me well. I am also thankful to my nears, dears, and well-wishers who kept me in their prayers and mentally supported me well.

Research Outputs

Journal Paper (Published):

- Ali, A., Bentley, Y., Cao, G. & Habib, F. (2017). Green supply chain management—food for thought? *International Journal of Logistics Research and Applications*, 20, 22-38. Available at <http://www.tandfonline.com/doi/abs/10.1080/13675567.2016.1226788>

Conference Papers:

- Ali, A., Bentley, Y. and Cao, G. (2017), "Environmental practices in UK food supply chains: Role of supplier collaboration", Presented in the POMS 28th Annual Conference in Seattle, the USA, held on May 5th-8th.
- Ali, A and Bentley, Y. (2017), 'Supplier collaboration for sustainable food supply chains in the UK', The 4th EurOMA Sustainable operations and Supply chain management, Politecnico Milano, Milan, Italy, held on February 27th-28th.
- Ali, A., Bentley, Y. and Cao, G. (2016), The influence of supplier collaboration on green supply chain management practices on the performance of UK food supply chain SMEs. Presented at the conference of 21st Logistics Research Network (LRN) Annual Conference, the University of Hull, UK, September 7-9.
- Ali, A., Bentley, Y., Cao, G., and Habib, F. (2015) 'The Impact of Green Supply Chain Management Practices on the Performance of UK food retail SMEs' presented at the 20th Logistics Research Network (LRN) Annual Conference, University of Derby, UK, September 9-11.
- Ali, A. and Bentley, Y. (2015), 'The Impact of Green Supply Chain Management on Performance: a study of Garments Industry in Bangladesh' presented at the International Conference on Sustainable Development (ICSD) 2015, Southern University, Chittagong, Bangladesh, November 21-22.

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List of Abbreviations

- GM- Genetically Modified
- NGOS- Non-Governmental Organisations
- ILO- International Labour Organisation
- EPA-Environmental Protection Agency
- DEFRA- The Department for Environment, Food and Rural Affairs
- SC: Supply Chain
- FSC: Food Supply Chain
- SCM: Supply Chain Management
- GSCM: Green Supply Chain Management
- SSCM: Sustainable Supply Chain Management
- SCOL: Supplier Collaboration
- TBL: Triple Bottom Line
- EP: Environmental performance
- SP: Social performance
- CP: Cost performance
- EFP: Environment-Friendly Practice
- SRP: Socially Responsible Practice
- SME: Small and Medium Size enterprise.
- MNE: Multinational Enterprise
- SPSS: Statistical package for the social sciences
- SEM: Structural Equation Modelling
- PLS- Partial Least Square
- RBV: Resources Based View

- RV: Relational View
- EMS: Environmental Management System
- ISO: International Organisation for Standardization
- SLR: Structured Literature Review
- CSR- Corporate Social Responsibility
- ESI- Earlier Supplier Involvement
- NPD- New Product Development
- EFSCM -Environment-Friendly Supply Chain Management
- GP- Green Purchasing
- SRM- Supplier Relationship Management
- CO₂: Carbon Dioxide
- GHG: Greenhouse Gas
- FDF- Foods and Drinks Federation
- FSB-Federation of Small Businesses
- EU- European Union
- UK- United Kingdom
- GDP: Gross Domestic Product
- TQM: Total Quality Management
- TQEM: Total Quality Environmental Management
- LCA: Life Cycle Assessment

1 Chapter 1: Introduction

1.1 Introduction

The purpose of this study is to investigate the impact of supplier collaboration on sustainable firm performance in the contexts of the food supply chain (FSC) in the UK. This study also looks at whether environment-friendly and socially responsible practices in the supply chain mediate the relationship between supplier collaboration and sustainable performance in the UK food Supply Chains (SCs). Sustainable performance in this study refers to the environmental, cost and social aspects of the UK food SCs. Thus, this study will also look at whether supplier collaboration influences environment-friendly and socially responsible practices in the supply chain (SC) and whether these practices have an impact on sustainable firm performance.

Achieving sustainability in the food supply chain has become a priority for the academics, practitioners and the policymakers at large. Sustainability is referred to as meeting the needs of the present without compromising the needs of future generation to meet their own needs (Brundtland, 1987). Sustainability in the supply chain is the consideration of the environment, society and financial factors in supply chains (Elkington, 1998, Giannakis and Papadopoulos, 2016). This is famously known as triple bottom line(Elkington, 1998) (TBL) approach or the People, planet, and profit (3Ps). For measuring sustainable firm performance, this study considers the triple bottom line (TBL) performance (Environmental, cost and social performance).

Collaboration in the supply chain has become a strategic issue for gaining social, environmental and economic sustainability (Chen *et al.*, 2017). Most academics define collaboration in the supply chain as a partnership process where two or more independent entities in the supply chain work together to plan and implement SC operations to achieve set targets and mutual benefits (Cao and Zhang, 2011, Chen et al., 2017). Collaboration can be with the suppliers, customers or internal departments within the organisation or even it could be with the Universities, research institutes, governments or other stakeholders depending on the objectives of the collaboration. Collaboration with SC

partners should be the key to initiate environment-friendly and socially responsible practices in the supply chain (Chen et al., 2017) which will lead to better firm performance. Collaboration between partners in the SC is the common ways to share information, reduce overall costs and bring efficiency in inventory management and forming strategic alliances to improve sustainable performance (Soylu *et al.*, 2006). The overarching aim of the collaboration in the SC should be to secure a competitive advantage (Soylu et al., 2006, Cao and Zhang, 2010).

The Companies in this dynamic environment need to consider internal and external entities in the SCs to enhance environment-friendly and socially responsible practices which may improve their environmental, cost and social performance or triple bottom line (TBL) performance. Collaboration is a practicable means to balance these priorities (Chen et al., 2017). This study investigates the supplier collaboration for environment-friendly and Socially responsible practices as well as sustainable firm performance in the UK food sector with the focuses on collaboration among upstream supply chain partners (suppliers) and considering TBL performance of the organisations in the supply chain.

Environmental concerns in the corporate arena have been a focused issue for decades (Sarkis, 2012) due to environmental degradation and climate change that threatens human existence and natural inhabitants. Sustainability has become imperative for the organisations to be competitive as much as quality, cost, and flexibility. Competitiveness of an organisation depends to a great extent on its strategic resources (Barney, 1991, Aragon-Correa *et al.*, 2008) and the backward and forward linkages which are the activities of Supply Chain Management (SCM) of that organisation. To practice sustainability in an organisation, selecting and getting the right SC partners is one of the crucial parts. The suppliers are the backbone of a business organisation, so having them included in the business practices will enhance the competitive edge of the organisation and hence improve their performance.

Supply chain management (SCM) is the process to which upstream and downstream linkages of organisations are interconnected for creating value as a form of goods and services for the end consumers (Slack *et al.*, 2010). Environment-friendly or green practices can be defined as the incorporation of eco-friendly practices into supply chains (Sarkis, 2012). So, a firm's environmentally friendly practices aim to reduce the environmental impact of the firm's entire operations including its products, purchasing, manufacturing, packaging, distribution and so on (Pullman *et al.*, 2009). Social practices, on the other hand, are strongly linked to corporate social responsibility (CSR) which comprises actions not required by law, but furthering social goodness, beyond the explicit, transactional interests of a firm (Sarkis *et al.*, 2010, Ashby, 2012). SC collaboration is the joint activities between the partners in the supply chains. It can be referred to as the relationship developed for a long time between supply chain members to lowering cost and risk as well as improving quality and market value (Gunasekaran *et al.*, 2015). This study investigates the impact of upstream supply chain collaboration (supplier) on sustainable performance in the UK FSC.

A Supply chain is a network of activities among two or more firms (Slack *et al.*, 2010) where an individual firm cannot control the whole Supply chain. That is why it is crucial to have a healthy relationship with the key partners in the supply chains (SC). Once there is a strong relationship between the SC partners, then firms can collaborate to secure distinctive relational rents in the market. Moreover, environment-friendly and socially responsible practices in the operations are critical components in the organisations long time survival because of the pressures from various stakeholders (Laosirihongthong *et al.*, 2013, Hoejmose *et al.*, 2014).

The focal company cannot itself alone implement environment-friendly practices in its entire operations. That is one of the reasons why the company needs to form the relationships with various partners in the SCs. The firms collaborate with their suppliers to secure various strengths and overcome weakness, eliminate threats and grab opportunities in the supply chain. Collaboration is formed based on the relationship and its strengths. This collaboration enhances mutual

dependence between the firms and their activities. So, it became easier for both the firms to implement certain practices (e.g. environmental and social practices) they need. Therefore, supplier collaboration influences environment-friendly and socially responsible practices in the SCs.

Environment-friendly practices in the SCs include product-related environmental practices (product stewardship) and process-related environmental practices (process stewardship)(Wong *et al.*, 2012). On the other hand, social practices or socially responsible practices in SCs are the activities that an organisation voluntarily undertakes for the welfare of the employees and communities at large in the society. Socially responsible practices advocate for social and ethical practices in the organisation. So, a socially responsible supply chain requires the entire chains to be ethically bound, morally acceptable and socially responsible. Through supplier collaboration, the focal firms can ensure that across all the tiers (e.g. 1st tier suppliers, 2nd tier- suppliers' supplier and so on) in the upstream supply chain are practising socially responsible activities which help focal firms to practice in their firms and even drive it to the downstream supply chains. This is achievable when there is a better relationship with suppliers. The collaboration between the partners is the strongest form of relationship. Thus, Collaboration with suppliers influences socially responsible practices in the SCs. Some organisation initiated environment-friendly practices, and there are suggestions that firms' performance gets improved regarding efficiency, profitability, environmental performance and improved brand reputation (Bowen *et al.*, 2001, Vachon and Klassen, 2008, Lee *et al.*, 2012).

There are several reasons for this study to focus on the food industry in the UK. Approximately one-third of the total food purchased in the UK is getting wasted ([Beitzen-Heineke et al., 2017](#)). In 2011, food Industry in the UK generated 17.3 million tons of wastes which worth £19.2 billion (WRAP, 2017). This food waste not only contributes to environmental degradation but also contributes to the scarcity of basic social needs (foods) within the UK and by extension to other parts of the world. Also, the UK Government has targeted to green the economy and to reduce CO₂ emission by up to 57% by 2032 (Guardian, 2016). The food SCs in the UK have massive impacts on this. So, this study

looked at how supplier collaboration influences the environment-friendly and socially responsible practices in the SCs that will lead to achieving sustainable performance.

1.2 Research Background and Context

Recently business organisations are moving towards more social and environment-friendly SCM practices which are widely known as sustainable Supply Chain Management (SSCM). Some organisations are proactive in taking actions to green their supply chain and make it environment-friendly and socially responsible as they have available resources, relational opportunities and collaborative capabilities whereas some of them are reactive to external forces. The purpose of this research is to investigate whether supplier collaboration helps improve firms' environmental, cost and social performance in the UK FSC.

So, this research is within the context of supplier collaboration, environment-friendly and socially responsible practices and firms' sustainable performance in the UK FSCs. The food industries in the UK is considered as the study domain for this research. Food SCs in the UK has been selected as the study sample in this research for several reasons. Firstly, as mentioned earlier, the UK is targeting to green the economy. Secondly, the UK is one of the top 15 global CO₂ producers (CIDIAC, 2016). Thirdly, food SCs in the UK produces enormous waste which directly impacts the environment, has social implications and impact on the financial bottom line of the company. Global consumers are much better informed about companies environment-friendly and socially responsible practices in their SCs now than they used to be when they make purchasing decision (Zailani *et al.*, 2012, Zhu and Geng, 2013, Sharma and Jain, 2014) due to digitalising news and media. These stimulate the food businesses to be aware of the importance of social issues and green practices and, to understand their customer needs.

To practice green and to be socially responsible in the operations, the supply chain partners play the key roles. Therefore, this study takes the challenge to investigate whether collaborating with

suppliers can influence firms' environment-friendly and socially responsible practices which may in turn influence achieving environmental, cost and social performance in their organisation.

The food and drink industry in the UK is a valuable industrial field that offers cutting-edge competencies in production, logistics, sales, marketing and innovation which have a gross annual value of £21.8 billion (FDF, 2016). The food business is the largest industrial field in many industrialised and emerging economies in the world (Li *et al.*, 2014, Mattevi and Jones, 2016). This industry is dynamic where customers' demands change continuously. Moreover, processes of the food industry have become heavily dependent on mass production (Beske *et al.*, 2014). In spite of being efficient in many aspects, the food industry still uses a huge amount of natural resources (Li *et al.*, 2014). Sustainability in the food supply chain is becoming a global challenge in the 21st century. Around one-third of the total food produced in the world get wasted or lost (Gustavsson *et al.*, 2011). Li *et al.* (2014), stated that food industry is dealing with problems such as food security, waste management, farming, public health, fair trade, climate change, dependency on oil and localisation. Hence, in the food industry, there is an increasing fear whether environment-friendly and socially responsible practices can be improved in all stages of the SCs and whether sustainable performance in terms in environmental, cost and social performance can be achieved.

According to WRAP (2017), UK food supply chains (FSCs) in 2011 alone has generated 17.3 million tons (mt) of waste (worth £19.2 billion) around 90% of which is from food accounting one-third of all food purchased in the UK (Beitzen-Heineke *et al.*, 2017). Similar trends were noted in the European Union where 88 million tons of food was wasted in 2012 which worth 143 billion Euros (Stenmarck *et al.*, 2016). Also in 2011, around 176 Mt of CO₂ equivalents were emitted from UK FSCs (Beitzen-Heineke *et al.*, 2017). So sustainability in food supply chains, in the UK in particular, is not sustainable.

In future, the food industry faces many challenges: By 2030, global demand for food and energy is expected to increase by 50%, leading to a 40% increase of water use and freight transport

(FoodDrinkEurope, 2012). However, it is a big question whether food production, supply, distribution, and consumption can be done sustainably without compromising cost. To develop food supply chains more sustainable, considering factors such as environmental, scientific, market, technological and socio-economic are essential (Li et al., 2014).

Overcoming these problems can be smoother having a good relationship with key suppliers. For firms to survive, considering sustainability without taking its suppliers and their strategic impacts into account is detrimental (Li et al., 2014). Hence, this study proposes that supplier collaboration influences environment-friendly and socially responsible practices that will lead to improved environmental, cost and social performance for the firm.

1.3 The Rationale of the Research

Concerns regarding matters such as collaboration, sustainability, green or environment friendly practices and socially responsible activities in the SCs are in the peak of popularity in the corporate arena, to the government officials and to the wider stakeholders (Sarkis, 2012, Zhu et al., 2012, Laosirihongthong et al., 2013). In this vibrant and fiercely competitive business environment, unique resources embedded in mutual relationships can bring a competitive edge in business processes.

Supplier collaboration which is built on a strong mutual relationship helps firms achieve relational rents (competitive advantage) through improved environmental, cost and social performance. Environment-friendly and socially responsible practices in businesses processes are innovations and unique which can be strengthened by collaborating with its partners. Collaborating with the partners in a supply chain, the firm can capitalise on the relational strengths to enhance performance. Hence, it is important to understand whether collaboration with the suppliers enhances environment-friendly and socially responsible practices in the SCs. This study shed light on that.

Due to the pressure from different stakeholders such as government and environmental agencies, some rules considering environmental protection, pollution prevention, and climate change are already in place aiming at reducing carbon emissions and improving sustainability. In some cases, if a company does not maintain the environmental standards, they can experience penalties and other regulatory measures. For instance, recent Volkswagen's emission scandal 2015 in the USA which cost around 16.2 billion (\$) as emission bill and Thames water sewage flowed 2014 in the UK costs more than 250 thousand (£) as a penalty. To avoid issues like these, the companies can adopt environment-friendly practices which will in turn work in their favour as a good marketing tool. For managers, it is indispensable to understand the needs for collaboration for environment -friendly and socially responsible practices and firms' performance in the UK FSCs. Hence, this study is important.

Food waste and food loss in the supply chain starting from harvesting or extracting raw materials till final consumptions are huge. So, collaborating with suppliers will enhance mutual activities including information sharing, mutual learning and so on which will help reduce food waste and food loss. The outcome of this study should help managers understand the necessity to collaborate with their suppliers for enhancing their social and environmental practices. It should also help the firm reduce the organisation's cost by reducing recycling cost, saving products, proper maintenance and so on. UK Government has set a target to green the economy and to achieve zero waste economy. Food wastes in the UK are massive, by collaborating with the suppliers, this waste can be minimised which could help reduce Co₂ emissions. To achieve sustainability, this study should encourage the food businesses in the UK to enhance their environmentally friendly and socially responsible practices by collaborating with the suppliers. Hence, this study is needed.

1.4 Research Aim and Objectives

This study aims to assess the impact of supplier collaboration on environmentally friendly and socially responsible practices and sustainable performance (Environmental, Cost, and Social) in UK food SCs.

The research has thus the following objectives:

1. To determine the relationship between supplier collaboration and sustainable performance.
2. To assess the relationship between supplier collaboration and environment-friendly as well as socially responsible practices.
3. To measure the relationship between environmentally friendly and socially responsible practices on sustainable performance (environmental, cost and social).
4. To measure the mediating effect of environment-friendly and socially responsible practices between the relationship of supplier collaboration and sustainable performance.

To help solve the practical business problems and to address the knowledge gaps, this research postulates the following research questions.

1.5 Research Questions

RQ1: Does Supplier collaboration have an impact on sustainable performance (environmental, cost and social) in the UK food SCs?

By answering this question, this study aims to empirically examine whether supplier collaboration enhances TBL performance in UK food supply chains.

RQ2: To what extent does supplier collaboration influence environment-friendly and socially responsible practices in UK food SCs?

By answering this question, this study aims to empirically test whether supplier collaboration enhances environment-friendly as well as socially responsible practices in the UK food SCs.

RQ3: Do environment-friendly and socially responsible practices have an impact on sustainable performance (environmental, cost and social) in UK food SCs?

By answering this question, this study aims to empirically check whether environment-friendly and socially responsible practices enhance TBL performance in UK food supply chains.

RQ4: To what extent do environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and sustainable performance (environmental, cost and social) in UK food SCs?

By answering this question, this study aims to empirically examine whether environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and TBL performance in UK food SCs.

1.6 The Phenomenon of Interest and Unit of Analysis

The phenomenon of interest in this research is to achieve sustainability in food SCs by collaborating with suppliers. Suppliers collaboration stimulates environment-friendly and socially responsible practices in the SCs which should facilitate sustainable performance (environmental, cost and social). The unit of analysis of this research is the focal company in the food businesses, and the respondents are the senior executives/managers responsible for operations, purchasing and supply chain related activities. Single but the most informed respondents from every firm are selected to answer the research questions.

The purpose of using an individual focal company in the supply network as a unit of reference is to test the relationships between the supplier collaboration and sustainable performance of the focal company in various level of the supply chain. Whether supplier collaboration influences focal firms to undertake environment-friendly and socially responsible practices in the supply chains were also tested. In so doing, this study attempts to address the gap in the extant literature where supplier

collaboration for environment-friendly and socially responsible practices and sustainable performance is rare.

1.7 Why Supplier Collaboration

There are several reasons for this study to look at only supplier collaboration. Firms' overall performance in environmental, cost and social is greatly influenced by the strategies taken towards the upstream of the SC including purchasing and other services (Luzzini et al., 2015). In other words, the downstream of supply chain is heavily depended on the upstream of supply chain particularly in the food industry. So, an organisation cannot achieve sustainability without collaborating with its suppliers. Also, focal firms are increasingly held responsible for the environmental and social activities of their suppliers. For instance, the Horsemeat scandal in TESCO's upstream supply chain in 2013 significantly affected TESCO's sales, consumers' trust, and corporate reputation.

Similarly, the fire in Bangladeshi Garments factory (Tazrin) that killed more than a thousand people used to produce products for Wall-Mart. Because of this incident, the Wall-Mart faced enormous criticism for their suppliers' socially responsible practices. Similar cases also reported about Apple's supplier, Foxconn in China. These incidents drew significant criticism in the global media and hampered companies' corporate reputation. So, it is evident that activities in the upstream supply chain do have significant influences on focal firms' environment-friendly and socially responsible practices which consequently have an impact on their sustainable performance. Hence, collaborating with the suppliers for environment-friendly and socially responsible practices in the supply network is crucial.

Suppliers are the vendors that supply the raw materials, components and services and a firm cannot produce itself (Kuo et al.2010). Suppliers are regarded as the critical partners in a supply network as the environmental and social initiatives, and overall organisational performance are significantly depended on the suppliers' activities (Bowen et al. 2001, Seuring and Muller 2008, Lee et al. 2015, Luo et al. 2014, Yu et al. 2017). To implement eco-friendly practices in the supply chain, the firms

should collaborate with their suppliers (Rao and Halt, 2005). Suppliers collaboration and their continuous support are crucial to environmentally friendly practices such as waste reduction, eco-friendly sourcing, fewer uses of hazardous materials and so on (Vachon and Klassen et al. 2008, Zailani et al. 2012, Yu et al. 2017). Also, Vachon and Klassen (2008) noted that collaborating with the supplier with environmental issues improve manufacturing performance, and simultaneously Yang et al. (2010) noted that collaboration with the supplier for environmental management programme improves manufacturing competencies including cost and delivery performance.

The suppliers are also the significant source of ground-breaking concepts (Kähkönen et al. 2017) . Hence, collaborating with the suppliers for innovative practices is essential. Achieving sustainability requires firms to act collaboratively where the upstream SC partners are crucial, in the food supply chain in particular. Supplier collaboration facilitates inter-firm learning. In supply management, upstream supplier management is regarded as a strategic matter because of its implication on firms' existence and performance. Supplier collaboration helps improve information sharing and knowledge acquisition between customers and their suppliers through benefiting from mutual competencies and resources (Patrucco *et al.* 2017).

Supplier collaboration could be regarded as the activities of mutual planning, information sharing and mutual problem solving between the focal firm and the supplier. Collaboration with the suppliers requires seamless information sharing between the partners. Mutual information sharing between the partners on products and production processes facilitate the buying firm to optimise products, inventory and distribution planning (Flynn et al. 2010). These reciprocated activities enhance trust in the long run and facilitate leveraging mutual skills, know-how and resources. Through improved communication and joined activities, firms can have a better understanding of each other's strengths, weaknesses and mutually figure out improvement options to achieve sustained competitive advantage. By improving mutual understanding between the buyers and the suppliers, the supplier firms can expand their supply services and can gain invaluable insights from

the downstream customers in the chain (Cao and Zhang, 2011). The focal firms can also improve their innovative practices and be efficient in responding customers' need (Cao and Zhang, 2011).

By focusing on supplier collaboration, this study intends to emphasise that collaborating with the partners in the upstream could influence a firm's aptitude to create superior value for the customers in the downstream. Chang (2017) noted that manufacturing firms could minimise costs, enhance quality and improve cycle times by maintaining a strong close relationship with the suppliers. Suppliers should be regarded as the key partners to improve innovative practices in the supply chain. It is noted that competitive advantage can be secured through leveraging mutual resources, skills, competencies and experiences.

1.8 Theoretical Underpinning- Relational View

Relational View (RV) theory (Dyer and Singh, 1998), which is an extension of Resource-Based View (RBV) (Wernerfelt, 1984, Barney, 1991), was used as guiding theory for this study. The RV is frequently known as capability development process (Dyer and Singh, 1998) which supports the view that capabilities of a firm can be developed through combining or bundling its resources from various parts of the supply chains through inter-firm integration or strategic partnership (Leuschner *et al.*, 2013). Hence, forming an exchange relationship through organisational capabilities or resources become easier among various parts of the supply chain. This perception can be extended from a single firm to multiple firms who are on the same network and bundle their resources together. The RV postulates that competitive advantage comes from inter-organisational resources which cannot be achieved or possessed by an individual firm alone (Lavie, 2006, Leuschner *et al.*, 2013).

According to Dyer and Singh (1998), RV generates profits from relation-specific assets, inter-firm knowledge sharing activities, mutual availability of resources and efficient control. RV shifts focus from individual firm to an inter-firm relationship or network relationship which suggest that firms share their resources and capabilities with other partners in the supply chain in order achieve

competitive advantage. It helps to enhance mutual relations between and among firms through mutual trust, communication exchanges, and knowledge sharing. Rivals find it hard to copy joint actions because of its collaborative nature with the firms and their partners through relation specific-investment, knowledge sharing, accumulating resources or capabilities and reducing transaction costs (Mesquita *et al.*, 2008). These are possible because of effective maintenance of mutual relationship (Leuschner *et al.*, 2013).

RV is essential for this study because knowledge acquisition, supplier collaboration in partnership specific assets and capabilities, and buyer-supplier relationship for mutual activities can be better elucidated deploying relational view theory. RV helps in justifying the decisions to collaborate with suppliers or partners. The RV is gaining popularities in collaboration paradigm of operations and supply chain management however it mostly has been used in conjunction with other theories (e.g. RBV). The RV is appropriate for this study because the reviewed literature has shown that to portray a complete picture of supplier collaboration performance, RV which advocates for inter-firm collaboration and collaborative relationship for competitive advantage is the right choice. Practices in the supply network through RV's lens is a unique contribution to this study.

1.9 Research Methodology and Research Design

This is explanatory research aiming to explain the relationships among the study variables drawn from the literature proposed as hypotheses. The nature of this research dictates that the positivism viewpoint as the ontology of this study. Positivism viewpoint and deductive approach guided this study. Positivism viewpoint supports the quantitative data analysis technique to prove the relationship between the variables. That is supported by the deductive approach, as the main purpose of this study is to develop an existing theory not to create a new one. The Survey technique was used to collect data. Before the data collection, a pilot study was conducted to test the study instruments. Data were collected from the operations, purchasing, supply chain directors/managers or senior executives responsible for purchasing or supply chains in the UK food industry using a

survey questionnaire. Collected data were organised and screened with SPSS and analysed using PLS-SEM (SmartPLS3).

1.10 Summary of Potential Contributions

This research contributes to the existing literature on supplier collaboration, social practices, environmental practices and firms' sustainability performance by providing conceptually developed, evidence-based research. This study draws supplier collaboration from supply chain collaboration and enriching the extant literature on supply chain collaboration too. Environmental practices were looked at product and process stewardship related environmental practices. Simultaneously, social practices in the supply chain were drawn from Corporate Social Responsibility (CSR) and social sustainability literature which were mostly focused on employee, community and wider stakeholders related to social practices. Finally, this research tested whether supplier collaboration has an impact on sustainability performance and whether environment-friendly and socially responsible practices can mediate the relationships.

This study makes several unique contributions as follows_

1. It is confirmed from this research that to achieve sustainable (i.e. environmental, cost and social) performance, collaboration with the suppliers is important.
2. Through the strong relationships and collaboration, the firms can exert pressures and influence their partners for certain practices including environmentally friendly and socially responsible practices in the SCs.
3. This study has combined all three aspects of sustainable performance and carried an empirical validation of the extant literature which makes a unique contribution to the study of sustainability in food supply chains.
4. This study extended the Relational View (RV) theory from the inter-firm relationship for competitive advantage to inter-firm relationship for environmentally friendly and socially

responsible practices which will lead to TBL performance. In short, this study suggested mediating constructs in the RV theory.

5. For the academics, this study should pave the way for future research in the area of food sustainability through collaborating with the suppliers. This study should also help explore future avenues for researching in achieving circular food system through collaboration. This study also offered a unique contribution in extending the Relational View (RV) theory.
6. For the wider practitioners, sustainability framework developed in this study is another important contribution of this study as it indicates that collaboration with the supplier's influences environment-friendly and socially responsible practices in food SCs which will lead to improving TBL performance.
7. For the managers, this study should guide them to form a better collaboration with their suppliers for environmentally friendly and socially responsible practices to achieve sustainable performance in their supply chains.
8. For policymakers, this study can offer a unique proposition to encourage firms to collaborate with their suppliers. They can also create and encourage other for creating a collaborative business environment. Achieving sustainability in the food industry is not the concern of the businesses only but also the concerns for the policymakers. For the UK, it is even crucial as the anticipated looming effect of BREXIT already being felt in the food sector. Secondly, the UK government is targeting to have a zero- waste circular economy. So, the food industry has a lot to contribute in this regard. Hence, the collaboration with the suppliers is crucial.

Above all, this research is unique in a sense that it looks at how collaboration with the suppliers enhances environmental and social practices in their operations which will help improve environmental performance, save costs and enhance social performance. Thus, contribute to achieving sustainability in the food SCs.

1.11 Structure of the Thesis

Chapter 1 of this thesis presents the introduction, background, and rationale of the study along with research questions, aims, and objectives, and highlights the potential contributions of the research. Relevant academic themes, earlier studies and critical analysis of the literature are presented in Chapter 2, theoretical underpinning and the process of hypotheses development are discussed in Chapter 3 followed by the Research methodology in Chapter 4. Chapter 5 is dedicated to the analysis of the empirical findings. Chapter 6 focuses on discussions of the research findings through revisiting the research questions. Chapter 7 provides the conclusion of the thesis along with the research contributions, limitations and the opportunities for further research. The diagrammatic structure of the thesis is presented in Figure 1:1.

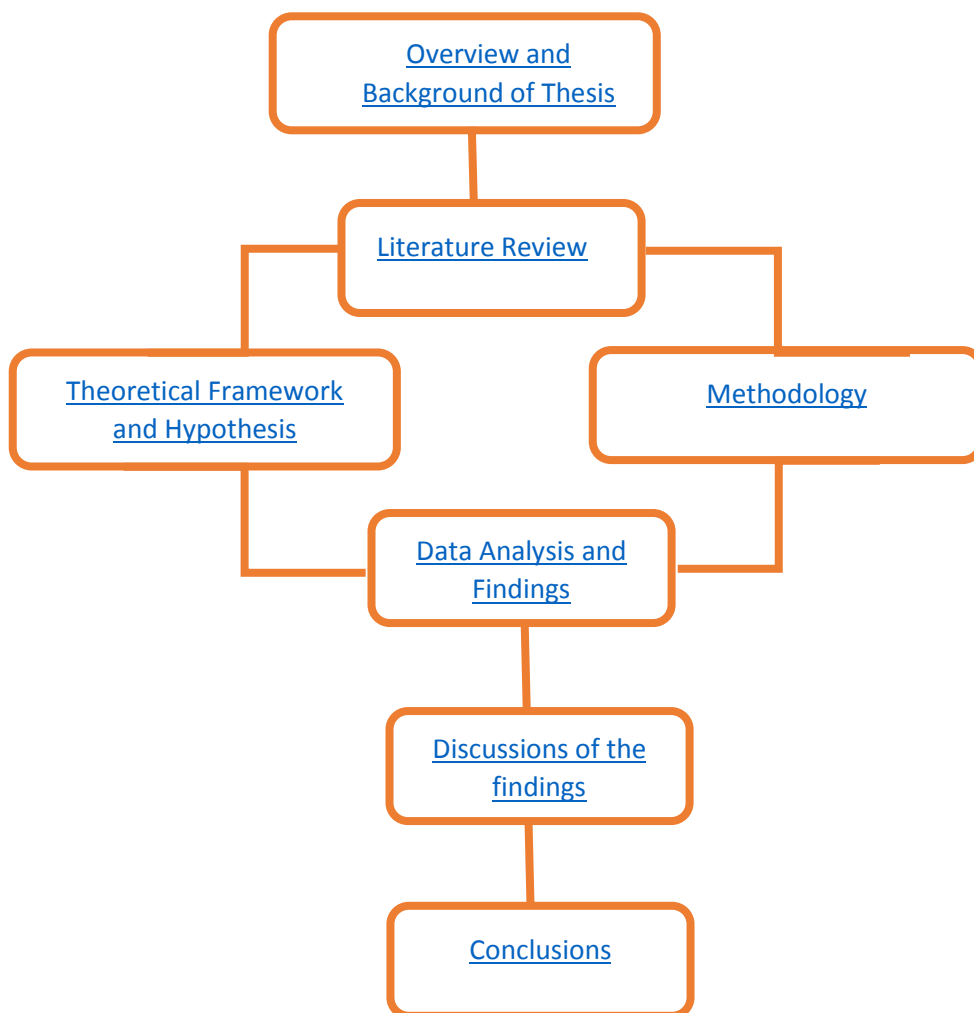


Figure 1:1 The structure of the Thesis

2 Chapter 2: Literature Review

2.1 Introduction

The first chapter of this thesis has presented the background of the study, research aim and objectives, research questions, research gaps and potential contributions of this research. This chapter highlights the process of literature review, the review of the extant literature, theoretical underpinning (RV theory), research gaps, hypotheses development and the theoretical framework. Literature review for this study has been conducted in two phases. The First phase was a structured literature review (SLR) to map the specific literature and to find out and confirm the research gaps. In the second phase, a narrative approach has been taken to include relevant studies on supply chains collaboration in food and other industries for sustainability. Also, the comprehensive review has also covered literature on supplier collaboration, environment-friendly and socially responsible practices, sustainable performance considering social, environmental and cost aspects that focus specifically on the food industry. RV theory has been used as a guided theoretical lens to conduct this study. Based on the comprehensive literature review guided by the RV theory this study has developed several hypotheses and derived a theoretical framework before concluding the chapter. These hypotheses were empirically tested based on the collected data from the survey.

2.2 Literature Review Process

This study is of significance to managers because it is to address a field problem, i.e. sustainability in food supply chains (Denyer *et al.*, 2008). The literature review in this study is conducted in 2 stages. The first stage is using Systematic Literature Review (SLR) methods to map the literature and find out the research gaps. The second stage is comprehensive narrative review to expand the research domain to include available relevant quality articles and studies across the globe in the field of Supply chain, supplier collaboration, environment friendly and socially responsible practices and sustainable performance and food supply chain considering the UK as a study domain. The SLR methods are briefly outlined below.

2.2.1 Structured Literature Review (SLR)

This study adopted SLR methodology to conduct a systematic search for the extant literature that is pertinent to the phenomenon of interest (Tranfield *et al.*, 2003), i.e. supplier collaboration, social and environmental practices. This research implemented five broad stage (plan, search, extract, synthesise and report) to ensure comprehensiveness and repeatability of search. To find suitable and relevant articles, this part of the study focused on the following review questions-

1. Do supplier collaboration influence sustainability?

This question was considered to guide the SLR search process (Tranfield *et al.*, 2003). Literature search results highlighted that articles found are from multiple disciplines including operations, marketing, supply chain, strategy, sustainability and organisational behaviour. These were identified by:

- 1) A systematic review approach was undertaken.
- 2) Search strings (based on keywords identified from different streams of literature) were applied to two bibliographic databases (Scopus and Web of Knowledge) and various content databases including EBSCO, ProQuest, Science Direct, Wiley–Blackwell and so on. Key Themes and associated keywords are highlighted in Table 2.1.

Table 2:1 Key Theme and Associated Keywords for SLR

| Key themes | Examples of Associate Keywords |
|--------------------------------------------------------------------------|------------------------------------------------------------------|
| Environmental sustainability/ Environmental practices/green practices | "environmental practices" AND supply AND chain AND collaboration |
| | "green practices" AND supply AND chain AND collaboration |
| | "green practices" AND supply AND chain |
| | "environmental practice" AND supply AND chain |
| | "Green supply chain." |
| | "close loop supply chain." "Sustainable supply chain." |
| Social sustainability/ Social practices/CSR | "social practices" AND supply AND chain |
| | "CSR" AND food supply chain |
| | "social sustainability" AND food |
| | "social practices" AND "food |

| | |
|----------------------------------------|-------------------------------------------|
| | "CSR" AND food |
| Supply chain collaboration in food SCs | "Supply chain collaboration" AND food |
| | "Supplier collaboration" AND food |
| | "supply chain collaboration." |
| | "supply chain environmental collaboration |
| | "supply chain integration." |
| Food Supply Chains | "Green supply chain" AND food |
| | "Environmental practices" AND food |
| | "Green practices" AND food |
| | "Environmental strategy" AND food |
| | "green strategy" AND food |
| | "food supply chain." |
| | "food supply chain" AND waste |

Using selected keywords in the databases, 2212 abstracts have been generated using keywords, abstracts, and Titles published between 1987 and May 2017. After removing the Duplicates, 1337 abstracts have been read based on pre-determined inclusion and exclusion criteria (see Table 2:2). Through this process, 105 articles were selected for full-text screening, and from there 44 articles have been excluded firstly because those were not either considering supplier collaboration or were only focusing on only one area of (e.g. economic) sustainable performance. Finally, 61 articles were selected for the review.

Table 2:2 Inclusion and Exclusion Criteria for SLR

| Criteria (Inclusion/exclusion) | Rationale |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <u><i>Inclusion Criteria:</i></u> | |
| Sustainability (social, environmental, economic) and SC Collaboration | Main areas for literature |
| The publication selected from Peer-reviewed journals | Quality of peer-reviewed journal articles is deemed to be better than that of other conference papers. |
| Publications since 1987 | The term sustainability become popular after the 1987 Brundtland report |
| <u><i>Exclusion criteria</i></u> | |
| Non-English Language journals | Researcher's language limitation. |

| | |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Articles considered the only one dimension of performance (i.e. economic) performance was excluded | To have at least two dimensions social or environmental along with the economic aspect. |
| Articles that considered other collaborations except supplier collaboration were excluded. | Research is focused on supplier collaboration. Any other collaboration where supplier collaboration is not present is not deemed appropriate for this study. |

The article selection process is highlighted in Figure 2:1.

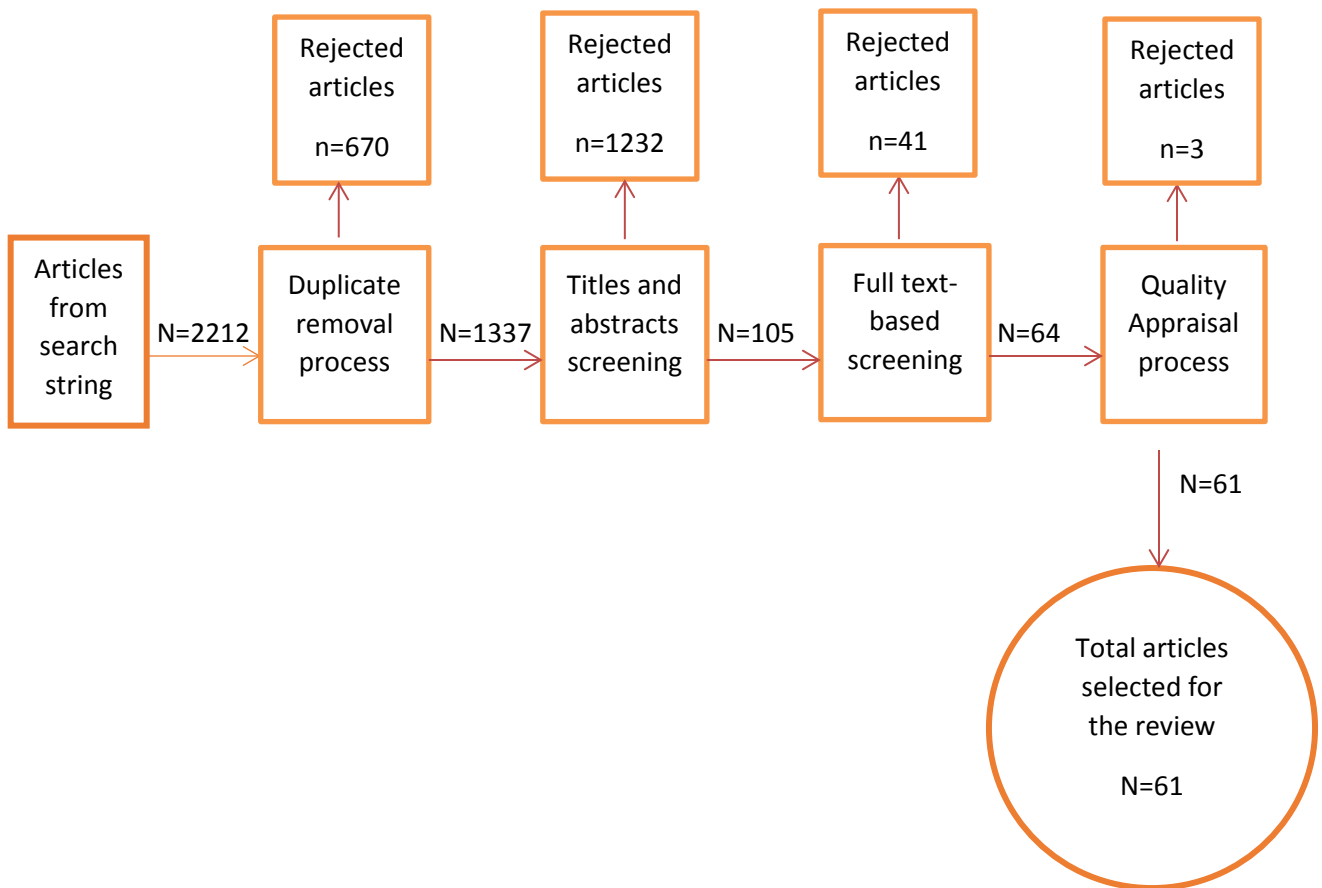


Figure 2:1 Summary Diagram for the Article Selection Process

2.2.2 Summary Results of SLR

This part of the literature review section is dedicated to highlighting the map of the extant literature on supplier collaboration, environment-friendly as well as socially responsible practices and sustainable performance. Based on the findings of the systematic literature review, there have been

some studies on collaboration and supplier collaboration in particular, and there was a tendency in literature to focus on sustainability. However, supplier collaboration for sustainable performance in the UK food supply chain has not received much attention. Hence, this research is essential. To have a quick look at the summary of the research available in the extant literature that focused on collaboration for sustainable performance is highlighted in the below Table 2:3.

Table 2:3 Summary of Literature on Collaboration and Sustainable Performance Using SLR

| Authors | Contexts/ Industry | Country | Collaboration | | | | Reasons for collaboration | Sustainable Performance variables | | |
|----------------------------|----------------------------------------------|----------------------------|---------------|----------|----------|-------|---------------------------|-----------------------------------|---------------|--------|
| | | | Internal | Supplier | Customer | Other | | Economic | Environmental | Social |
| Carter and Carter (1998) | Consumer products industries | USA | Y | Y | | | Environmental | | | |
| Corbett and Cutler (2000) | Plastic Industry | New Zeland | Y | Y | Y | | Environmental | | | |
| Carter and Jennings (2002) | Consumer products manufacturing industries | USA | Y | Y | | | Environmental and social | Y | | |
| Klassen and Vachon (2003) | Manufacturing Plants | Canada | | Y | | | Environmental | | | |
| Zhu and Sarkis (2004) | Manufacturing enterprises | China | Y | Y | Y | | Environmental | Y | Y | |
| Zutshi and Sohal (2004) | Manufacturing and Non-Manufacturing Industry | Australia and New Zealand. | Y | Y | | | Environmental | | | |
| Pujari (2006) | Eco-innovation in Environmental NPD Projects | North America | Y | Y | | | Economic | Y | Y | |
| Field and Sroufe (2007) | corrugated cardboard industry, Manufacturing | USA | | Y | | | Economic, Environmental | Y | | |
| Vachon (2007) | Package printing industry | USA & Canada | | Y | Y | | Economic, Environmental | | | |
| Vachon and Klassen (2007) | Manufacturing plants | Canada | | Y | Y | | Environmental | | | |
| Vergheese and Lewis (2007) | Industrial Packaging | Australia | | Y | Y | | Environmental | | | |
| Vachon and Klassen (2008) | Manufacturing firms | North America | | Y | Y | | Economic, Environmental | Y | Y | |

| | | | | | | | | | | |
|---------------------------------------|-------------------------------------------------------------------|-------------|---|---|---|--|---------------------------------|---|---|---|
| Ciliberti <i>et al.</i> (2008) | Social Accountability Certified (SAC) companies | Italy | | Y | | | Economic, Environmental | | | |
| Lee and Klassen (2008) | Automobile Industry | South Korea | | Y | | | Environmental | | | |
| Zhu <i>et al.</i> (2008a) | Manufacturing firms | China | Y | Y | Y | | Economic, environmental | Y | Y | |
| Lee and Kim (2009) | Electronic Industry | Korea | | Y | | | Social | | | |
| Andersen and Skjoett-Larsen (2009) | CSR Practices in IKEA | Denmark | Y | Y | | | Environmental | | | |
| Yang <i>et al.</i> (2010) | Manufacturing plants from the Electronic and electric industries | China | | Y | | | Economic, environmental | Y | | |
| Büyüközkan and Berkol (2011) | Energy Sector | Turkey | | Y | | | Economic, environmental, social | Y | Y | Y |
| Gavrinski <i>et al.</i> (2011) | Manufacturing plants | Canada | Y | Y | | | Environmental | | | |
| Lee and Kim (2011) | Semiconductor Industry | Korea | | Y | | | Environmental, economic | Y | Y | |
| Ateş <i>et al.</i> (2012) | Turkish Manufacturing firms | Turkey | Y | Y | | | Environmental | | Y | |
| Caniato <i>et al.</i> (2012) | Fashion supply chain | Italy | | Y | | | Environmental | | Y | |
| De Giovanni and Esposito Vinzi (2012) | Various industries | Italy | | Y | | | Environmental | Y | Y | |
| Fu <i>et al.</i> (2012) | Using Grey based DEMATEL methodology in Telecommunication systems | China | | Y | | | Environmental | | | |
| Gallear <i>et al.</i> (2012) | Various industries | UK | | Y | | | Social | Y | | |

| | | | | | | | | | | |
|-------------------------------------|--------------------------------------------------------------------------------------|--------------------|---|---|---|--|---------------------------------|---|---|---|
| Gimenez and Tachizawa (2012) | Systematic literature review | Spain | | Y | | | Economic, environmental, social | Y | Y | Y |
| Gimenez <i>et al.</i> (2012) | Manufacturing assembly industries | 19 Countries | | Y | Y | | Economic, environmental, social | Y | Y | Y |
| Gopalakrishnan <i>et al.</i> (2012) | British Aerospace (BAe) Systems | UK | | Y | | | Economic, environmental, social | | | |
| Jacobs and Subramanian (2012) | Product recovery in SCs through numerical examples | USA | | Y | | | Environmental | | Y | |
| Kim and Rhee (2012) | GSCM businesses in Korea | Korea | | Y | Y | | Economic, environmental | Y | Y | |
| Klassen and Vereecke (2012) | 5 Multinational firms in Europe having operations in Europe, Asia, and North America | Europe | | Y | Y | | Social | | | Y |
| Kumar <i>et al.</i> (2012) | Coca cola and Apple | USA | | Y | | | Environmental | | Y | |
| Lu <i>et al.</i> (2012) | Chinese manufacturing firm | China | | Y | | | Economic, environmental, social | Y | | |
| Narasimhan and Schoenherr (2012) | Manufacturing Industries in Several countries | Multiple Countries | | Y | | | Environmental | | Y | |
| Walker and Brammer (2012) | Sustainable procurement and e-procurement in the public sector | 20 countries | | Y | | | Environmental, social | | | |
| Wong <i>et al.</i> (2012) | Electronic Manufacturers | Taiwan (China) | | Y | | | Environmental | Y | Y | |
| Zhu <i>et al.</i> (2012) | Manufacturing enterprises | China | Y | Y | Y | | Environmental | Y | Y | |

| | | | | | | | | | | |
|---------------------------------|------------------------------------------------------------|-------------------|---|---|---|---|------------------------------------|---|---|---|
| Chan <i>et al.</i> (2013) | Grocery supplier | China | | Y | | | Economic, environmental | Y | Y | |
| Gimenez and Sierra (2013) | Purchasing managers in Both countries | Spain and Germany | | Y | | | Environmental | | Y | |
| Morali and Searcy (2013) | Content analysis and interview with Sustainable SC experts | Canada | | Y | Y | | Economic, environmental and social | | | |
| Yang <i>et al.</i> (2013) | Container Shipping | Taiwan (China) | | y | y | Y | Environmental | Y | Y | |
| W. Clark <i>et al.</i> (2014) | manufacturing plants | USA | | Y | | | Environmental | Y | | |
| Dou <i>et al.</i> (2014) | Grey analytical Network processed based methodology | China | | Y | | | Environmental | | | |
| Grekova <i>et al.</i> (2014) | Food and Beverage firms | The Netherlands | | Y | Y | | Environmental | | | |
| Grimm <i>et al.</i> (2014) | Food supply chain | Switzerland | | Y | | | Environmental | | | |
| Anisul Huq <i>et al.</i> (2014) | Readymade Garments Industry | Bangladesh | | Y | | | Social | | | |
| Mitra and Datta (2014) | Manufacturing firms | India | | y | | | Environmental | Y | | |
| Pan <i>et al.</i> (2014) | Food Industry | France | | Y | | | Economic, environmental | Y | Y | |
| Paulraj <i>et al.</i> (2014) | Various industries | USA | | Y | | | Environmental | | Y | Y |
| Prajogo <i>et al.</i> (2014) | ISO 14001 Companies | Australia | Y | Y | Y | | Environmental | | | |
| Schoenherr <i>et al.</i> (2014) | Manufacturing industry | USA | | Y | | | Environmental | | | |
| Treitl <i>et al.</i> (2014) | Petrochemical Industry | Austria | | Y | | | Environmental | Y | Y | |
| Dai <i>et al.</i> (2014) | Various industries | USA | | Y | | | Environmental | | | |

| | | | | | | | | | | |
|---------------------------------------|----------------------------------------------|--------------------------|---|---|---|--|---------------------------------|---|---|---|
| Ji <i>et al.</i> (2015) | Evolutionary Game Theory Perspective | China | | Y | | | Environmental | | | |
| Luo <i>et al.</i> (2015) | Chinese manufacturing firm | China | | Y | | | Environmental | | | |
| Luzzini <i>et al.</i> (2015) | Procurement executives in various industries | Europe and North America | Y | Y | | | Economic, environmental, social | Y | Y | Y |
| de Sousa Jabbour <i>et al.</i> (2015) | ISO 14001 Companies | Brazil | | Y | Y | | Environmental | Y | | |
| Porteous <i>et al.</i> (2015) | 17 different Industries | USA | | Y | | | Environmental, social | Y | Y | Y |
| Marshall <i>et al.</i> (2015) | 10 Different Industries | Ireland | | Y | | | Environmental, social | | | |
| Graham and Potter (2015) | Food Industry | UK | | Y | Y | | Environmental | Y | Y | |
| Chen <i>et al.</i> (2017) | Literature review based | China | Y | Y | Y | | Environmental, social, economic | Y | Y | Y |

It is evident from the above Table 2:3 that there has been an increasing number of studies conducted on collaboration and mostly on SC collaboration for sustainability.

However, most of them looked at the environmental and economic performance aspects of the collaboration separately. Only around 6 articles (Büyüközkan and Berkol (2011), Gimenez et al. (2012), Gimenez and Tachizawa (2012), Luzzini et al. (2015), Porteous et al. (2015), Chen et al. (2017)) looked at collaboration that considered all three aspects of sustainable performance – environmental, economic or cost and social.

However, among these Gimenez and Tachizawa (2012) and Chen et al. (2017) were based on a systematic literature review. Luzzini et al. (2015), looked at sustainable performance aspects in various industries in multiple countries in Europe. Instead of SC collaboration, Luzzini et al. (2015) considered collaborative capabilities and commitment to sustainability on environmental and social and cost performance and measured social and environmental performance as combined one variable. That might not give the same outcome if social and environmental performance were measured separately. Similarly, Porteous et al. (2015) also considered TBL aspects in their paper for 17 different industries in the USA. However, they mostly focused on incentivising and penalising suppliers for social and environmental compliance.

On the other hand, Gimenez et al. (2012) considered sustainable operations for TBL performance within the assembly industries in 19 countries. They have found a positive association between internal environmental practices in all three dimensions on TBL. However, internal social initiatives did not show a positive association with financial aspects. However, it was found that SC collaboration improves TBL performance. Their findings were based on collected data in plants level instead of total business or supply chain level. Another aspect is that they carried out a direct effect of SC collaboration on TBL performance and did not consider any mediating variables (or did not check for any indirect effects) such as environmentally friendly and socially responsible practices. So, all these above suggest solid literature gaps be fulfilled. Hence, this study endeavours to fulfil

these research gaps (details of The gaps in the literature can be seen at section 2.12) by looking at supplier collaboration as an antecedent for environmentally friendly and socially responsible practices that will lead to the sustainable performance in food SC UK contexts.

To achieve sustainability in an organisation, practising green supply chain is crucial. Performance of an organisation indicates the achievement of the organisation in different dimensions. A great number of previous literature measured organisational performance only from the financial point of view. However, there is a realisation that financial performance on its own does not reflect true features of an organisation's performance because the organisation is a social entity and its activities affect and are affected by the environment. Hence, the inclusion of social and environmental performance along with economic performance (i.e. cost) reflects the sustainability performance of an organisation. The inclusion of economic, social and environmental performance is famously known as the triple bottom line (TBL) approach.

Moreover, the supply chain is a network of activities among many firms where an individual firm has to collaborate or get support from other firms one way or another. Every organisation needs suppliers, so collaborating with suppliers to achieve competitiveness is an unavoidable reality though the degree of collaboration may be dependent upon the business settings (e.g. industry, size, location, business nature/strategies and so on) and requirements. They are mutually dependent on each other's resources, and that is why the relationship between the partners in the supply chain is critical because this is the basis for long-term collaboration. So, developing and maintaining inter-organisation relation-specific assets, firms need to build and enhance relational strength with the supply chain partners in the networks to achieve sustainable performance. Hence, the relational view theory suggested by Dyer and Singh (1998) become a relevant theory to underpins this study.

2.3 Theoretical Underpinning

In the academia, a number of theories have received attention in perceiving and researching collaboration (Vachon and Klassen, 2006, Zacharia *et al.*, 2011), green or sustainable SCM (Carter and Rogers, 2008, Gold *et al.*, 2010) and sustainable firm performance considering financial, economic and social aspects. Carter and Rogers (2008) deployed several theories including Resource Dependence Theory, Resource-Based View (RBV), Population Ecology and Transaction Cost Economics to develop the SSCM framework whereas Gold *et al.* (2010) considered Relational View (RV) and RBV to develop SSCM concepts to explore the collaboration of environmental and social dimensions to construct inter-firm resources resulting in long-term inter-organisational competitive advantages. In collaborative paradigm, some studies have been carried out to understand collaboration (Cao and Zhang, 2011, Zacharia *et al.*, 2011) and collaboration for green or sustainability (Vachon and Klassen, 2006, Sancha *et al.*, 2015).

Hence there are a lot of theories in the supply chain and sustainability literature that can elucidate sustainability, supply chain, and supplier collaboration concepts. This study is anchored within Relational View (RV) (Dyer and Singh, 1998) theory an extension of Resource-Based view (RBV) (Wernerfelt, 1984, Barney, 1991). That is because the reviewed literature has shown that to portray a complete picture of supplier collaboration and the impact of supplier collaboration on environment-friendly as well as socially responsible practices in the supply network for sustainable Performance, RV which advocates for inter-firm collaboration and collaborative relationship for competitive advantage is the right choice.

2.3.1 The Rationale for Selecting RV

Relational View (RV) which is the extension of RBV (Leuschner *et al.*, 2013) is frequently known as capability development process (Dyer and Singh, 1998). RV supports the view that capabilities of a firm can be developed through combining or bundling its resources from various parts of the supply chains through inter-firm integration or strategic partnership (Leuschner *et al.*, 2013). Hence,

forming an exchange relationship through organisational capabilities or resources become easier among various parts of the supply chain. This perception can be extended from a single firm to multiple firms who are on the same network and bundle them together. Dyer and Singh (1998) Consider this as network relationship or inter-organisational relationship. Whereas RBV considers internal strategic resources, the RV postulates that competitive advantage also comes from inter-organisational resources which cannot be achieved or possessed by an individual firm alone (Lavie, 2006, Leuschner et al., 2013). The RBV consider single firm whereas RV takes inter-organisational collaboration aspects into account. This study considers the collaboration with the suppliers for implementing environmentally friendly and socially responsible practices in the supply chains where more than one firm are involved. So, RV as a guiding theoretical lens suit the needs for investigating the phenomenon of this study.

According to Dyer and Singh (1998), RV generates profits from relation-specific assets, inter-firm knowledge sharing activities, mutual availability of resources and efficient control. RV shifts focus from individual firm to an inter-firm relationship or network relationship which suggest that firms share their resources and capabilities with other partners in the supply chain. RV can enhance mutual relations between and among firms through mutual trust, communication exchanges, and knowledge sharing. Rivals find it hard to copy joint actions because of its collaborative nature with the firms and their partners through relation specific-investment, knowledge sharing, accumulating resources or capabilities and reducing transaction costs (Mesquita et al., 2008). These are possible because of effective maintenance of mutual relationship (Leuschner et al., 2013).

However, RV has some drawbacks relating to inter-firm resource sharing, scarcity of right allies and indivisibility of resources to develop relational rents. Inter-firm resource sharing and collaborating may create repetitive expectation because of previous relationship-specific activities between the partners. Also, selecting right partners is an additional restraint to improve relational rent. Relational rent is created through collaboration with other partners having complementary strategic

resources and relational capabilities to achieve desired objectives, but in many occasions, it is difficult to happen because the target partner may already have joint activities with other firms. Besides, Dyer and Singh (1998) mentioned that targeted partners might not be capable of harnessing sufficient relational skills including knowledge sharing or investing in relation-specific assets. Moreover, firm resources have specific features of distinctiveness in indivisibility which hinders them in developing resources or capabilities.

However, these weaknesses can be minimised through an effective selection of the SC partners and develop them over time. Through mutual partnerships and collaboration, a firm can create unique resources which will bring differentiation in products or services (Mesquita et al., 2008). So, firms can develop relational rents successfully when they have collaborative relations and trusts with the partners. RV can be used to understand inter-organisational relationships in supply chains (Dyer and Singh, 1998). Inter-organisational collaboration creates win-win situations for the participating firms enhancing supply chain benefits by using difficult to copy specific resources, skills, and information (Leuschner et al., 2013). RV is essential for this study because knowledge acquisition, supplier collaboration in partnership specific assets and capabilities, and buyer-supplier relationship for mutual activities can be better elucidated deploying relational view theory. RV helps in justifying the decisions to collaborate with suppliers or partners.

Though RBV is widely used in various SC related research RV is gaining popularities in collaboration paradigm of operations and supply chain management however it mostly has been used in conjunction with other theories (e.g. RBV). So, it has been used as a supporting theoretical lens in the previous literature.

Based on a comprehensive literature search for this thesis only a couple of articles (Omar *et al.*, 2012, Sancha et al., 2015) considered RV as a single guiding theory to understand collaboration in the supply chain. The former research looked at relationship orientation, supplier relationship and firm performance whereas the later looked at supplier development practice considering social

performance in Spanish manufacturing firms. Though RV is getting popular in collaborative supply chain domain, Chen et al. (2017) based on their recent comprehensive systematic literature review on collaboration for sustainability, found only one article deployed RV theory to comprehend collaboration for sustainability. Previous studies have not used this theory to understand supplier collaboration for environmentally friendly and socially responsible practices and sustainable performance in the UK food supply chain context.

RV postulates that collaboration within the supply Chain enhances competitive advantage by extension sustainable performance. With this view in mind, this study proposes that collaboration with the suppliers enhances sustainable performance through environment-friendly and socially responsible practices in the supply chains. In other words, this study not only proposes that supplier collaboration enhances sustainable (environment, cost and social) performance but also examined whether environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and sustainable performance. Hence, adding supplier collaboration for environment-friendly as well as socially responsible practices in the supply Chain through RV's lens to achieve sustainability performance is a unique theoretical contribution to this study.

2.4 Food Supply Chain

Food industries are moving more towards an interrelated system linking various supply chain actors with diverse relationships. Food SCs integrates all the organisations that are responsible for the production, processing, distribution and the disposal of food and food-based products (Van Der Vorst *et al.*, 2000, Ahumada and Villalobos, 2009, Van Der Vorst *et al.*, 2009). Van Der Vorst *et al.* (2009), distinguished food SCs as fresh firm products SCs where growers, breeders, auctioneers, wholesalers, importers, exporters, retailers and other logistics service providers are the potential actors; and Process food products SCs in which focal firm uses the inputs from the growers to produce consumer products adding higher value. Usually, Consumer products are comparatively less perishable than fresh firm products because of conservation and conditioning processes. The

food SC is distinguished from other supply chains because of some of its features as food quality, food safety, weather-related variability and perishability (short-shelf life) (Van Der Vorst, 2006). That is why food supply is more multifaceted and tougher to handle than the others.

The food supply chain is one of the biggest road freight user handling approximately 80% of goods moved in the UK. This massive amount usually transported with large goods vehicles, which are responsible for 25% CO₂ emissions in Europe's road transport, affects congestion, safety, and pollution. Food industry consumes and pollutes around 70% of global freshwater which intensifies worldwide drinkable water shortage (Allaoui et al., 2018). Hence achieving sustainability in the food supply chain is crucial. It is predicted that global food demand is going to increase by 50% by 2030. To meet the demand, the production of foods to be increased putting enormous pressure on already scarce resources such as land, energy, and water. That will lead to increased transportation and CO₂ emissions having a huge impact on climate change.

Food SCs are different than other product SCs because of quality issues (e.g. perishability) which change reasonably quickly while processing through the SCs (Ahumada and Villalobos, 2009). The degree and speed of quality deterioration are determined by specific environmental conditions which may be influenced by the packaging types and quality, transportation modes, storing facilities, the distance of travel, vehicles, and warehouses (Manzini and Accorsi, 2013). These all require firms to plan properly and act collaboratively with the partners. Van Der Vorst and Beulens (2002); Bourlakis and Weightman (2004) have discussed the characteristics for food SCs that influences supply chain planning processes such as the Perishability of products, Seasonality in production, Appropriate storage and transportation facilities, Weather and other biological hazards (e.g. pests), Necessity for tractability for quality and environmental requirements.

Along with these, food waste in the food SCs is also widely recognised for its environmental impact. Food waste in one part of the world, hunger and deaths are also reported in some other parts of the world because of a shortage of food. Hence, it is crucial to have the security for foods, a basic

human need, which can be achieved through collaboration with the supply chain partners in the food industry. In food SCs, production, distribution and consumption activities impact the environment and the society in many different ways, such as the emissions of greenhouse gases and pollution, the use of natural resources and the creation of waste (Mena et al., 2011). Moreover, many people across the globe are dying not having enough food to eat for survival whereas one-third of global food production is getting wasted. Therefore, industries should take social and environmental practices into account and combine this consideration with their SC partners to reduce environmental impact, enhance social benefits and increase economic profits for the firms. Previous studies such as Sellitto et al. (2018) looked at critical success factors in short food supply chains considering two Italian and two Brazilian milk and dairy producers. Cultural difficulties in the short food supply chain across the globe is a critical factor. They suggested that shorter distances in FSC help improve economic benefits as well as social and cultural gains including eco-friendly practices and strengthening cultural bonds. They argued that supply chain research mostly concerned about risk management and economic sustainability, but food supply chains consider social and cultural issues too.

Sellitto et al. (2018) noted that in the UK, local FSC has on average 48 KM radius between production and final consumption. They found critical success factors as ethical concerns and adopting sustainability dimensions as ecological, social, and economic aspects. Specific foods production and consumptions are considered heritage and tradition for that particular region or country. Sustainable food production creates a positive moral attitude and persuades ethical distinctiveness between the manufacturers and the consumers.

Jacob-John (2018) investigated the organic dry food supply chains in India considering sustainability and responsibility centric values. He claimed that responsibility centric values influence actors in the supply chains to behave responsibly in their supply chain and the operations overall.

Enjolras and Aubert (2018) considered a short food supply chain and their impact on the pillars of suitability (Economic, social and environmental) considering French fruits supply chain as a study domain. They found that short food supply chain does interact with economic sustainability however social and environmental sustainability appeared to be independent. That means that social and environmental sustainability does not interact with each other in their research. They found a short food supply chain enhances social sustainability however it did not support environmental sustainability.

Gharehgozli et al. (2018) identified the key Characteristics of food supply Chains and trends that will determine the future of food transport along with the challenging areas for researchers to investigate. They highlighted that FSC is influenced by socioeconomic trends, digitalisation as well as innovation and trans-boundary challenges such as pests and diseases. These will have a huge impact on food transportation and their digitalisation.

FSC is becoming E-FSC through effective implementation of information and communication technologies and e-business solutions that will facilitate goods, services, and information to be delivered from farm to fork and vice versa. To facilitate the integrated e-FSCs, it is crucial to have collaboration with the partners in the upstream supply chain as it requires seamless information sharing and numerous mutual activities. These challenges can be significantly minimised by collaborating with the upstream partners in the supply chains.

2.4.1 Food Supply Chains in the UK

Achieving sustainability where Food waste and loss is a great challenge for the organisations, academics, policymakers and the wider stakeholders. It is a sad reality that even though the world is producing enough food to feed the entire population on earth but due to food waste and loss, lack of proper distribution and responsible consumption over 10% people across the globe chronically starving (FAO, 2017), while one third of global food produced get wasted in the food supply chain (Gustavsson et al. (2011)). That means, the global food production, distribution and consumptions

are not done sustainably. Also, Porter *et al.* (2018) noted that food production in the world is responsible for around 10-12% of greenhouse gas (GHG) emissions and wasting food alone is responsible for around 16% of environmental impact caused by agri-food supply chain (Scherhauser *et al.*, 2018).

The food supply chain in the UK and Europe is oligopolistic (Porter *et al.*, 2018). That means only a handful number of supermarket chains control a large market share. Around 90% of the food sales in the UK, due to consolidation and emergence of multiple retailers throughout the last five decades, are dealt with by the major supermarkets and retailers including Tesco, Asda, Sainsbury's, Morrison's, the Co-operative and Waitrose (Oglethorpe and Heron, 2013). Tesco stated that 85% of their products' carbon footprint takes place in the supply chain and Asda described 90% of their products environmental impacts take place in the Supply Chain (Tidy *et al.* 2016). These food retailers have customer facing outlets and online ordering facilities where customers directly fulfil their needs. So, most of the activities in the UK food supply chains are taking place in the upstream part of the supply chain. To achieve sustainability in the UK food supply chain, integrating upstream part of the supply chain is crucial. Tidy *et al.* (2016) noted that around 75%-90% carbon footprint in food supply chains takes place in the upstream part of the supply chain and they suggested that to achieve sustainability it is indispensable to influence supplier behaviour for environment-friendly and socially responsible activities. To influence supplier's behaviour and their practices, a strong form of supplier relationship (i.e. supplier collaboration) is fundamental.

In the food supply chain, the farmers or the suppliers need to maintain certain standards and contractual obligations (e.g. cosmetic requirements) to deliver the specific products and services (Halloran *et al.*, 2014). To maintain these requirements, a huge amount of foods is not easily getting sold and perhaps wasted or lost in the supply chain. It is worth mentioning that the cosmetic requirements are a crucial quality element to evaluate the standard of the fresh fruits and vegetables (Porter *et al.*, 2018) along with the food safety features and nutritional facts. A recent

study revealed that In Germany and the Netherlands around 20% of the produced foods gets wasted due to cosmetics requirements at the upstream supply chain (de Hooge *et al.*, 2018). The foods that are considered low quality or are not fulfilling the required standards (i.e. cosmetics) are ending up going to non-food supply chain routes (i.e. animal feeds, landfills and so on). Porter et al. (2018) noted that around 40% of harvested fresh foods and vegetables are getting wasted or lost in the upstream supply chain. This waste and non-value-added activities can be minimised through collaborating with the suppliers through reconfiguring new ways of utilising those foods with low quality and bring that back in the food value chain. Oglethorpe and Heron (2013) considered observable operational and supply chain related barriers in UK local food supply chains. They noted the supply chain relationships is crucial to achieving sustainable local food supply chains.

Studying UK food supply chain and its sustainability is very crucial. GOFs (2011) stated that food supply chain contributes to 33% of total greenhouse gas emissions in the EU and it is around 40% in the UK including wider food catering and processing services. So, collaboration with the suppliers is a significant tool to achieve environmental practices in the supply chain as most of the CO₂ emissions takes place in the upstream supply chain.

In addition, several incidents (i.e. Food hygiene scares in 1998 where salmonella was found in eggs, Mad cow disease in 2001 and recently horsemeat scandal in 2013) in the UK food supply chain have shaken consumers trust and their confidence (Oglethorpe and Heron, 2013, Wilson *et al.*, 2017) which is another important reason why the UK food supply chain is highly topical for research. The recent Horsemeat scandal has shaken the entire food supply chain significantly. Wilson et al. (2017) noted that these incidents let customers feel that the food system has betrayed them. The business organisations, policymakers and academics are exploring the ways how the food supply chain can be more transparent, reliable and sustainable.

Also, BREXIT (UK's planned exit from the European Union) will have a tremendous impact on UK food supply chain which has already started to face several challenges including cost, availability

and scarcity of migrant workers in the food supply chain(Hendry *et al.*, 2018). Local food supply chain through collaborating with the local farmers and suppliers may reduce global food security issues by improving traceability, reducing food poverty and improved sustainability through reducing food miles and creating employment for the local community (Oglethorpe and Heron (2013), Hendry *et al.* 2018). Fearne *et al.* (2006) found that through collaborating with the suppliers and leveraging on their mutual resources, Sainsbury's a major UK supermarket retailer has significantly improved their shelf availability and reduces waste of strawberries in their supply chain. So, it is crucial for the businesses in the supply chain to have a better collaboration with their suppliers to improve environment-friendly and socially responsible practices which will lead to achieving sustainable performance.

2.4.2 Supplier Relationship Management in Food Supply Chains

Supplier relationship management in the literature is referred to as the incorporation of the management of the relationship between the supply chain partners (Choi and Wu, 2009, Lambert and Schwieterman, 2012). Sanders (2012) described it as the coordination, collaboration and information sharing between the partners in the supply chains. These activities help firms in joint planning and executions to achieve sustainability objectives (Ashby *et al.*, 2012, Seuring and Gold, 2013, Gualandris *et al.*, 2014). A successful SRM requires trust and open communication, but mistrust, less communication or hiding information may lead to the transactional approach to a relationship or complete avoidance rather than collaboration approach. Tidy *et al.* (2016) suggested having better supplier relationship management (SRM) to reduce Green House Gas (GHG) emissions.

2.4.3 Supplier Collaboration in Food Supply Chains

It is imperative for greening upstream supply chains to enhance environment-friendly practice in the organisation and its supply chains. That's why collaboration with suppliers is critical especially in the food supply chain because of its limited shelf life, perishability, easily damageable and food

mileages (Lockström *et al.*, 2010). There is a need for researching on coordination and integration of food supply chain (Hobbs and Young, 2000, Ahumada and Villalobos, 2009). Uncertainty in the food supply chain is critical. Forecasting errors which affect firms significantly are the well-known source of uncertainty that brings risk in food SCs. Risk can affect the performance of the food supply chain and strategic decision.

Consequently, managing risk is a concerning issue. The considered issues are common in the food supply chain which largely focuses on financial performance. There are different kinds of performance measures at various levels in the organisation. Integration with suppliers is beneficial for supply chain relationships.

Collaboration in the food supply chain is gaining attention in the academia as well as in the industry. Fearne *et al.* (2006) studied a collaborative approach between the buyers and the suppliers to manage demand which will lead to better customer service for the suppliers as well the supermarkets. The study focused on the supply disruption and heavy wastes of strawberries in a UK supermarket- the Sainsburys and suggested that these problems have been mitigated through collaborating with the suppliers.

Forecasting sales for food products especially during sudden changes in the environmental factors, for instance, the weather, is a daunting task. That makes it difficult to forecast the demand and order what might be required. The purchasing department needs to balance between ensuring the right quantity for shelf availability and having too much stock on hand which may potentially become waste. As the demand is uncertain, so they may tend to order over or under of what is required. This has adverse effects in both the circumstances either of running out of stocks and disappoint the customers or having too much waste putting pressure on the bottom line which neither the focal firm nor the suppliers want. So, it is a complex task to understand the trade-off between forecast, orders, availability, and wastage. It becomes even more complicated when the buying firms (the retailer) do the demand forecasting in-house. However, collaborating with the

suppliers particularly with the professional expert firms can give an advantage in forecasting the sales and getting the right supplies (Fearne et al., 2006).

Fearne et al. (2006) suggested that collaborative planning and forecasting between the suppliers and the retailers of branded groceries have become a common practice to reap the benefits from lowering the inventory level, enhancing processing capacity and maximising the resource utilisation. Fearne et al. (2006) found that Sainsbury's (a Supermarket in the UK) is one of a handful number of retailers to extend the support to their suppliers and integrated them in sales forecasting activities and getting the supplies based on that forecast. The study revealed that both the supplier and the retailer derived benefit from the collaboration regarding reducing wastage, increased sales, enhanced customer services, and improved bottom line. These also strengthen the mutual relationships between the firms.

A summary of studies that focused on collaboration in food SCs is presented in table 2.5.

Table 2:4 Summary of Previous Studies Focusing on SC Collaboration in food SCs

| <u>Source/s</u> | <u>Aims, Issues, and sectors</u> | <u>Key findings</u> |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Derqui <i>et al.</i> (2016) | Sustainability in the food supply chain, invisible waste in food service in Spanish food services company | Causes and ways of minimising food waste. Most businesses mainly consider economic criteria instead of social, ethical and environmental factors to minimise food waste. So, only visible food waste is minimized, but the invisible one is not. So, they urge for multi-stakeholder collaboration. |
| Aggarwal and Srivastava (2016) | The role of SC collaboration focusing on agri-food industry in India for waste reduction and understanding the buyers and suppliers' insights. | The paper attempted to examine whether collaboration leads to waste reduction and improve efficiency in the Indian agri-food SCs. The authors also noted buyer-supplier perceptions on collaborative practices. They, not information sharing, mutual planning, and supplier selections are the antecedents of collaboration that helps improve profitability, reduce waste and improve SC efficiency. They also noted the trust issues between the partners and emphasised the need for a better relationship between the partners to improve the performance. |
| Kirezieva <i>et al.</i> (2016) | Cooperatives for food quality and safety management in the fresh produce chain (strawberry) in The Netherlands and Belgium. | Cooperatives play a double role in dealing quality and safety in the FSCs. They take tactical decisions about the coordination of quality and safety requirements between customers, cooperative firms, and their farmers. At the same time, they are selling the products of their members and make strategic decisions about the governance of transactions in the supply chain, which ultimately may have an impact on the SCM and the food safety management on the farms |
| (Aschemann-Witzel <i>et al.</i> , 2016) | Characteristics, success factors and food waste reduction at the consumer level | Consumer-related food waste is a complex issue that needs collaboration between various supply chain actors and sector stakeholders. They found that collaboration between stakeholders, timing, and sequence of initiatives, competencies that the initiative is built on, and a large scale of operations are key success factors for food waste reduction. |
| (Danloup <i>et al.</i> , 2015) Danloup <i>et al.</i> , (2015), | Collaborative transportation practices in food SCs to reduce Co2 emissions. | The collaboration could be in the form of sharing trucks by retailers, to increase the fill rate of the vehicles and to reduce their empty running. The total CO2 emissions are claimed to be reduced by at least 26 per cent. |
| Halloran <i>et al.</i> (2014) | Causes and food waste reduction in Denmark | The majority of food waste is still incinerated with energy recovery. Improved communication, more efficient food packaging and multi-stakeholder collaboration may solve the problems. |
| Manzouri <i>et al.</i> (2014) | Waste elimination through lean practices in Halal food SC in Malaysia | They investigated the lean concept and tested whether several lean tools can eliminate waste and reduce cost considering Hala food SCs in Malaysia. They considered demand collaboration, continuously improve and inventory management is the crucial tools to |

| | | |
|--------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | implement lean SCs. They also noted only a handful number of companies in the food industry in Malaysia implement lean tools |
| (Leat and Revoredo-Giha, 2013) | Key risks and challenges involved in agri-food SCs. | SC vulnerability can be reduced through horizontal collaboration between producers and vertical for processors and retailers. |
| Fischer (2013) | Trust and communication in a buyer-supplier relationship in European agri-food SCs. | Trust in supply chain partners can be significantly improved by effective communication and by positive past collaboration. |
| Nicolaas Bezuidenhout <i>et al.</i> (2012) | SC collaboration in sugarcane production and processing | They found the lack of collaboration between the partners in the SCs as a problem considering sugarcane milling in South Africa. They highlighted the stability, reliability, trust, personal relations, and communication as a major factor to be considered in collaboration. Because without these attributes, fragmentation, opportunistic behaviour and over controlling tendency grows between the partners. Mutual dependence and mutual communication are important in collaboration. |
| Sharma and Patil (2011) | Collaboration, traceability and vertical integration in Indian agri-food SCs. | Based on the literature review they proposed a framework of supply-demand synchronisation, traceability, vertical integration. The authors noted that through collaboration waste could be minimised, and productivity can be improved in the Indian Agri-food SCs. They also noted the important role of IT collaboration. |
| Fischer <i>et al.</i> (2009) | Influencing factors in Inter-firm relationships in pig, beef, and cereals SCs. | Market, industry and enterprise-specific characteristics are found to influence contract type choice while dyadic, firm-level factors appear to affect relationship sustainability. |
| Bechini <i>et al.</i> (2008) | Patterns and technologies for traceability in SCs | Industrial traceability system should guarantee context independence, scalability, and interoperability. They demonstrated a practical implementation of a traceability system through a real-world experience |
| Taylor and Fearne (2006) | Demand management in retail food SCs | Drawing from a multiple case study from the UK food SCs, they found that there are issues in misalignment between supply and demand including demand augmentation, unsuitable manufacturing policies and irregularities in IT systems and data handling procedures. However, their findings were not empirically validated. |
| Koops <i>et al.</i> (2002) | Efficiency and responsiveness in food SCs | Considering food SCs in New Zealand, they found that food business is coping with the changing consumer demands and the pressure from the market that helps them being flexible in their products and processes. They emphasised internal and SC relationships to bring strategic change. They found that the recourses impact on product and process change. However, they did not find the collaboration with the suppliers and with the customers have any moderating effect. |
| Grekova <i>et al.</i> (2015) | Customers' and suppliers' environmental collaboration in Dutch food and beverage firms | They looked at suppliers and customer's environmental collaboration for cost savings and market gains. |

Supplier management is found by Seuring and Müller (2008) in their Delphi study as one of the four issues in sustainable SCM. This study highlighted the importance of supplier management in the supply chain. Supplier relationship helps in supplier development which leads to improved performance. Through collaboration, partners can set benchmarking and share best practices in the industry and exchange expertise (Vachon and Klassen, 2006, Sarkis *et al.*, 2011). Sanders (2012) highlighted 3 R's for the competitive supply chain as responsiveness, reliability and relationship management. The relationship management focuses on long-term relationships and collaboration aspects. Initially, Supply chain management was referred to the synonymous with the purchasing functions of the firm, but this notion started changing in the 1980s (Kraljic, 1983). SCM is a central strategic management task in which managing suppliers is crucial. Forming a partnership is a strategic decision and partnership is to be established only when the long-time strategic objective is pursued by the focal company. A buyer-supplier relationship should be based on mutual trust, commitment, fairness and for mutual benefit (Cox, 2004).

SRM is a mechanism that can help achieve sustainability objective especially when it requires other partners in the supply chain to act accordingly (Ashby *et al.*, 2012, Seuring and Gold, 2013). Tesco stated that 85% of their products' carbon footprint takes place in the supply chain and Asda described 90% of their products environmental impacts take place in the Supply Chain (Tidy *et al.* 2016).

Collaborative activities with the suppliers are increasing in the supply chains. Because of the collaboration with the suppliers both the Asda and its suppliers gained financial benefits, reduced emissions and enhanced their environmentally friendly practices (Tidy *et al.*, 2016). Though the Tesco did not claim the same, they mentioned that they aim to establish a strong long-term relationship with the suppliers as they value the relationship aspects of succeeding. One of the key performance indicators that Tesco consider is the satisfaction of their suppliers which is collected through an annual survey.

Sustainability in the food supply chain can be best described from the perspective of corporate social responsibility (Li et al., 2014). Maloni and Brown (2006) outlined several dimensions of CSR in the food supply chains. Procurement is one of them which are highly related to supplier relationship and the collaboration. Without having a strong supplier relationship, it is difficult to implement social and environmental practices in the SCs (Chiou *et al.*, 2011). Strong supplier relationship or mutual collaboration is a key way to influence socially responsible and environment-friendly practices in business operations including products and services (Simpson and Power, 2005, Li et al., 2014). Gold et al. (2010) suggested that robust supply relationships can improve social and environmental practices in SCs.

GOFS (2011) stated that food supply chain contributes to 33% of total greenhouse gas emissions in the EU and it is around 40% in the UK including wider food catering and processing services. So, collaboration with the suppliers is a significant tool to achieve environmental practices in the supply chain as most of the CO₂ emissions takes place in the upstream supply chain.

The short-term relationship in the food supply chain is not conducive to achieve competitive advantage and sustainability. If the long-term relationship with the suppliers is established through collaboration, then the desired outcome of environmental and social practices can be enhanced leading to increased sustainable performance. Relationships in the context of the sustainable food supply chain are too wide, the research under this cluster is not very well-structured (Vasileiou and Morris, 2006). Hence, this study will try to contribute to supplier collaboration for environment-friendly and socially responsible practices which may lead to firms' sustainable performance.

2.4.4 Environment-Friendly Practices in Food SCs

Environmental practices and green considerations in supply chains, the food industry, in particular, gaining attention from the scholars and business practitioners (Luthra *et al.*, 2015). Companies have pressures from various stakeholders to reduce the environmental impact of their products and operations. Environment-friendly practices can be referred as organisations environmental

practices to reduce the impact of the firm's entire operations including its products, purchasing, manufacturing, packaging, distribution and so on to the environment (Pullman et al., 2009). Zhu *et al.* (2011) considered environmental practices as the incorporation of environmental concerns into inter-organisational practices.

In essence, environmental practices in this study are looking at environmental or green practices in the UK food SCs. Green or environmental practices in the supply chain have received tremendous popularity in the supply chain area. It is also widely recognised in food supply chains to reduce the carbon footprint of foods and food-related products. Also, the food industry is facing huge problems with food waste which damage the environment also make the food SC unsustainable. If an organisation is caring to the environment, they proactively communicate and establish a relationship with their upstream partners in the supply chain (the suppliers) in various aspects including information sharing, mutual planning, forecasting to reduce the environmental impact of their mutual operations and so on. That's how environment-friendly practices enhance supplier environmental collaboration.

Food system(manufacturing, logistics and retailing) has a significant contribution to the Green House Gas (GHG) emissions amounting around 15-28% total GHG emissions in developed countries and is rapidly increasing in developing countries(Li et al., 2014). Moreover, climate change and rapid population growth are putting pressures on the food system (Bloemhof *et al.*, 2015). That's why governments and policymakers are in search of dealing with challenges of food sustainability. Hence, it is critical for stakeholders to develop sustainable food supply chains. To mitigate risk and to enhance efficiency in meeting customer demands, achieving sustainability of production and process is essential which can be achieved through collaboration with suppliers (Chiou et al., 2011). The motive behind improving a firm's social and environmental practices is to capitalise more business gains than those of their competitors (Zhu and Sarkis, 2004, Rao and Holt, 2005, Azevedo *et al.*, 2011, Li et al., 2014).

Achieving sustainability in the food supply chain is the matter of considering economic, social and environmental performance (Beske et al., 2014, Bloemhof et al., 2015). Beske et al. (2014) studied sustainable supply chain management and dynamic capabilities in the food supply chain where they mentioned sustainability practices enhance traceability which fulfils customer demands.

Organisations take famous sustainable performance or triple-bottom-line as an economic, social and environmental approach for sustainable performance measurement because it is still immature in the literature(Hobbs and Young, 2000, Ahumada and Villalobos, 2009). A summary of articles considered environment-friendly practices focusing on waste reductions in food SCs is presented in the below Table 2:6.

Table 2:5 Environment-Friendly Practices in Food SCs

| <u>Source/s</u> | <u>Aims, Issues, and sectors</u> | <u>Key findings</u> |
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| Alexander and Smaje (2008) | Surplus retail food distribution (logistical arrangement) through a fair share for minimising food waste | They investigated the food donation by large food retailers to FareShare, a British Charity, and its franchises for redistribution to reducing food waste and alleviate food poverty. FareShare uses a Tripartite model where it works as a broker between food retailers and charities. The study highlighted frictions within the distribution model. However, they found that effectiveness and the efficiency depending on the relational aspects among the entities (franchise partners, store managers, redistribution agencies and so on) involved in collecting and distributing the food flows. They noted that the surplus food should be donated early in the supply chain to maximise the recipients. |
| Stanger <i>et al.</i> (2012) | Drivers of good management of perishables within the supply chain using the example of blood inventory management in UK hospitals | Six recommendations (1, ensure using experienced staff and train them; 2 understand target stock levels and order patterns; 3 create and maintain transparency of inventories; 4 keep inventory procedures simple; 5 keep stock fresh and monitor remaining shelf life, and 6 collaborations across the business is critical to success) are developed for how managers can improve perishable inventory performance. These are based on simple management procedures implemented by experienced staff. The case studies develop three propositions that recommend how inventory theory should be embedded in practice. |
| Simpson (2012) | Waste reduction through investment in resources | The relationship between institutional pressures, waste reduction resources and performance were assessed for a sample of U.S. manufacturers. Findings indicated that firms' investments in waste reduction resources help them reduce pollution and cost. Waste reduction resources better position firms to predict and effectively respond to institutional pressures. |
| Kaipia <i>et al.</i> (2013) | Information sharing in perishable food SCs to reduce waste and facilitate sustainable performance | They found that the performance of the fresh food SCs can be enhanced by more efficient information sharing. The purpose and the process of data uses are the determinants for improved operation. To speed up the deliveries and the self-availability, SC structure needs to be changed. The improved performance was obtained with parallel changes in information sharing and usage and material flow. |

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| Wiengarten <i>et al.</i> (2013) | Effect of investment environmental practices and lean. | They empirically investigated the synergistic impact of investment on environmental, quality and lean practices in SCs base on a cross-country survey data from Europe. They found the synergistic impact of these practices on SC operational performance is possible. They also validated that the impact of lean and quality practices on operational performance can be improved through environment-friendly practices in the food SCs drawing form RBV perspective. |
| Shukla and Jharkharia (2013) | A systematic literature review of the last 20 years in the field of Agri-fresh produces SCs. | Based on the comprehensive review of fresh produce SCs they noted that though there is an increasing tendency of studies in fresh food SCs the prime attention towards it is still in its infancy. They found that main interest in the fresh produce SCs is to achieve customer satisfaction, improved profitability and waste reduction. They noted several challenges in fresh produce SCs including inefficient demand planning, lack of communication and absence of integrated approaches to confront those challenges. |
| Rijkema <i>et al.</i> (2014) | Effective sourcing strategies for food quality and waste | They investigated whether sourcing strategies in internal fresh product SCs maintain quality, reduce waste and reducing costs considering a prototype of international strawberry SCs. They found poor product quality and high product wastes with standard cost parameters. They found sourcing strategies are attributed to improved product quality and reduced food waste, but they noted that the transportation costs increase to maintain these. They noted sourcing strategies are crucial and a balance to be maintained between the product quality, reduced wastes transportations and other associated costs to optimise SC business gains. |
| Garrone <i>et al.</i> (2014) | Surplus food generation, management and waste reduction for sustainability | They investigated deploying several case studies whether managing surplus foods can reduce waste. They developed a model for food SC sustainability which includes integrated food SCs with businesses, societies and other environmental partners noting that the surplus food generation and management can improve waste reduction. They highlighted waste reduction strategies through the model in different SCs stages to reduce waste and achieve sustainability. |
| Li <i>et al.</i> (2014) | Increasing Green SCs practices through reusing empty containers | They investigated whether reusing empty container in the maritime industry can improve green SCM practices and complement business value. They found that this practice does not only increase business value but also reduce costs in the SCs. They deployed profit-driven objective functions and emphasised a collaborative approach for container repositioning and reusing. They suggested that collaboration with the partners in the SCs is essential to improve these green initiatives. |

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| Vlachos (2015) | Adopting and implementing the lean concept in food SCs | They developed a new lean action plan for SMEs; they claimed based on the action research that food waste can substantially be reduced through lean implementation, |
| Piercy and Rich (2015) | Lean operations for sustainability benefits | Lean operations meet a wide range of sustainability outcomes beyond environmental benefits (including supply monitoring, transparency, workforce treatment, and community engagement). They mentioned internal and external policies, procedures, tools, and strategies for implementation of lean and sustainable operations management (OM). It is proposed that lean implementation and sustainability performance are interlinked. |
| Scholz <i>et al.</i> (2015) | Reducing Greenhouse gas emissions through waste minimising in the Swedish supermarket's food SCs. | They investigated whether carbon footprint can be mitigated through reducing food waste in the food SCs considering Swedish supermarket as the study domain. They considered that food waste is responsible for various environmental, economic and social costs. They noted inconsistencies between the waste amount and wastage carbon footprint profiles of wasted foods in the supermarkets. They also deployed life cycle assessment method (LCA) and noted that through reducing food waste in the supermarkets, the Carbon footprint could be minimised which will also contribute to bringing sustainability in the food SCs. |
| Fercoq <i>et al.</i> (2016) | This paper offers a quantitative study of Lean/Green integration focused on waste reduction techniques in manufacturing processes | A hierarchy of progress factors for waste minimisation program in manufacturing is developed. |
| Gadde and Amani (2016) | "network" framing of food supply arrangements to reduce waste | They frame two approaches to reduce food waste as an extension of shelf-life and enhancing responsiveness in the supply arrangement. The framework was then used for suggesting managerial actions to reduce food waste through increasing activity coordination, resource combining, and actor interaction with consideration of the potential consequences of such actions. |
| Canali <i>et al.</i> (2017) | Food waste drivers in Europe | They investigated the drivers of food waste reduction with the help of several European institutions engaged in research and activities in reducing waste in food SCs. They considered three contexts for examining food waste sources including technological, institutional and social. They noted multidimensional challenges in all stages of supply chains. |

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| Eriksson <i>et al.</i> (2017a) | Take-back agreement (TBA) in the retailer-supplier interface | A full TBA is in operation for bread. The bread had the highest waste and the most extensive take-back policy. Fresh fruit and vegetables had medium levels of waste, partly because of unverified rejections, while milk had a very low level of waste combined with an even lower level of rejections. They concluded saying FSC system where the direct costs of waste management or incentives for waste reduction are separated from the company responsible for generating the waste poses a substantial risk factor in food waste creation and is, hence, a potential hotspot for waste-reducing measures. |
| Eriksson <i>et al.</i> (2017b) | Quantifying food waste in the Swedish public sector | It is noted in this study that to have a sustainable food supply chain, preventive measures at the end of the value chain, where the consumptions take place, is crucial. The study considered the public catering sector in Sweden for and quantified food waste in schools, pre-schools and elderly care homes. It is found that around 23% of the food served getting wasted. The authors, however, noted that there is a variation of waste level between kitchens in different organisations. They also found that the schools had a higher food waste level than the pre-schools. It is found that the Kitchen that produced food themselves had 42% lower waste than the kitchens that received food from another satellite kitchen. Their findings suggest that there are various reasons for food waste in different organisations and thus provides various opportunities to minimise them that includes quantifying waste at the kitchen level. |
| Campoy-Muñoz <i>et al.</i> (2017) | Assessing the effects of food waste reduction on national economies regarding total output, Gross Domestic Product (GDP) and employment | The results show that the most significant impacts are due to a reduction in the avoidable portion of the wasted food by the households across the countries. However, the size of these impacts depends on the economic structure of the country in which reduction could be implemented, highlighting the need to tailor measures intended to reduce food waste |

This study also focuses on examining the impact of supplier collaboration on sustainable performance considering the triple bottom line (TBL) approach in the UK food supply chains. Yakovleva (2007) conducted one of the few studies that have taken the initiative to propose performance indicators, from these triple bottom line aspects for the UK food supply chain is drawn. However, they acknowledged that data for the environmental and social issues are scarce which perhaps is the reason to be under-studied.

In the food industry, customer's expectation for food safety and the demand for sustainably produced foods are increasing. Companies are fulfilling these demands for customers by considering all three dimensions of sustainability, i.e., the economic, ecological, and social, circumstances in which food is produced and offered. Social and environmental practices in the supply chain are used among others to enhance traceability and tracking to fulfil customer demands (Beske et al., 2014, Mattevi and Jones, 2016).

Many studies investigated environmental practices in the SCs from various angles for example- Wong et al. (2012) divided green practices as product stewardship and process stewardship to investigate firms' performance. Graham and Potter (2015), in a recent study, has extended these practices in UK food supply chain context and they considered energy reduction, waste reduction as pollution prevention practices and process stewardship practices through collaboration with suppliers and customers.

Product stewardship is product oriented environmental practices that aim to reduce the environmental impact of the products in the supply chains. It is related with minimising the environmental impact of the products in every stage of product development including product design, packaging, and materials used through using renewable materials and avoiding hazardous substances (Wong et al., 2012). Process stewardship, in contrast, is a process-oriented environmental practice that aims to reduce negative environmental impact in all stage of the SC processes ranging from production, distribution, and end of life product management (Wong et al.,

2012, Graham and Potter, 2015). Considering the environmental impact of the production process in the supply chain is the key focus of this study. Moreover, this study looks at supplier collaboration for environmentally friendly practices in the supply chain processes. This study operationalises environmental practices as product and process stewardship as suggested by Wong et al. (2012). A brief discussion of Product and process stewardship is presented below.

2.4.4.1 Product Stewardship Related Environment-Friendly Practices

Product stewardship can be seen as the environment-friendly practices to products, their packaging design, and development (Wong et al., 2012). It helps to minimise the negative environmental effect of products in the SCs from materials and components sourcing, production, distribution to disposal (Wong et al., 2012). With an emphasis of waste reduction and resource savings product stewardship in food supply chains involves the environment-friendly design of packaging, protective packaging for transportation, developing products that use less energy, fewer materials with extended product life and recyclable and reusable.

Resource constraints are driving us to think about sustainability. Business organisations, NGOs, other individuals, and organisations are keen about sustainability because the way resources are used or consumed is not sustainable meaning that it cannot be continued at the same rate forever because the resources are finite. This is particularly crucial for the food industry where the accessibility of energy and water resources for production is a challenge to SCM.

The United Nations Environmental Programme (UNEP) pointed out that one-third of the global population has already exceeded consumption of 10% of their water supply and the list is increasing on other food-related items. So, SC managers should ponder resource limitations when they make a business decision for their operations as water shortages or energy may intensely affect businesses in the foreseeable future. For example, both Pepsi and Coca-Cola lost their license to use local groundwater at bottling plants in Kerala, India, following a local drought(Beamon, 1999).

The way resources are used in producing, supplying, manufacturing and distributing foods, and food-related products are huge, and it significantly impacts the environment. Beamon (1999), suggested that there must be a reduction of resource usages and reduction of waste generation to achieve sustainability. Resources are extracted or sourced to grow or process foods and food-related products in every single stage of the supply chain. The forms of resources mostly used in the SCs are energy and other materials (e.g. water, raw materials for process foods and so on). Saving resources or reducing the usages of resources (e.g. energy) in the operations is important. Recycling practices help substantial resource savings (UNEP, 2011). A firm can save its resources by using less energy in the supply chain and using fewer materials to enhance productivity.

Environmental, technological innovation also helps the firm enhance productivity utilising limited resources. Firms can reduce energy usages in many ways including using renewable energies to produce products, using electric vehicles to deliver products and using the energies only when necessary. Firms can also save resources by implementing product recovery, remanufacturing, reusing and recycling practices in the SCs. A firm can track and improve the resource usages in the supply chain and can save resources by collaborating with their suppliers.

Product stewardship also includes selecting and evaluating alternative materials and components in product and packaging development including the usages of renewable, recyclable and non-hazardous materials. Product stewardship also advocates for the reduction of pollution through reducing food waste and their disposals.

Waste reduction related environmental practices focused on eliminating waste in every stage of the SCs. Food waste and food losses are the major concerns for achieving sustainability in the food SCs. Waste on one side create environmental damage and, on another side, destroy valuable resources deployed to make that food or food-related products.

Collaborating with the upstream partners, firms can enhance their practices for waste reduction. Through information sharing with the partners, the firms can improve their demand forecasting which may reduce waste by reducing unnecessary stocks, enhancing Just in time (JIT) or Lean practices. So, food waste can be minimised.

Supplier collaboration also helps the firm with practices Total Quality Environmental Management (TQEM) practices that will eliminate waste at the production stages. Through collaboration, firms can also exchange information in using the mode of transport and which way to send particular products to avoid unnecessary damages. Firms can develop packaging for the products and their transportations to avoid damages. Collaboration also facilitates supply chain partners in implementing effective date checking policy because most of the fresh foods are getting wasted because of short shelf life. If the date is not checked properly, then waste will go up. However, through effective collaboration that enhances greater information sharing and communication with suppliers, this problem can be mitigated.

The environment-friendly design considers eco-friendly techniques that save energy and other resources in production and products — product stewardship advocates for environmental management of the entire product life cycle in the supply chain(Graham and Potter, 2015). So, this requires inter-firms' mutual activities which can be facilitated through collaboration with suppliers.

Product stewardship is an externally oriented environmental strategy that requires the development of environmental practices outside the firms' internal boundaries (Graham and McAdam, 2016). Hence, buyer firms can achieve relational rents by collaborating with the suppliers. Product stewardship can be implemented by using environmentally friendly materials for producing foods and for their packaging, designing the packaging and products to be reusable and recyclable, packaging is designed to protect the foods and minimize the foods waste during handling and transportations, and designing the products to use less energy and materials (Wong et al., 2012).

2.4.4.2 Process Stewardship Related Environment-Friendly Practices

Process stewardship is the process-oriented environmental practices (Wong et al., 2012). Process stewardship aims for reducing carbon emission, enhancing recycling practices and it also advocates for a waste reduction in the supply chain. However, it mostly advocates for practices that help enhance environment-friendly activities in upstream and downstream supply chains. Firms adopting stewardship approach have long-term commitment to pursue environment-friendly activities in the supply chains. Process stewardship is the process-oriented environmental practices that aim to reduce negative environmental impacts across all stages of SCs. It emphasises that all actors in the SC process be involved in enhancing environment-friendly practices(Graham and Potter, 2015).

Process stewardship can be executed through monitoring suppliers and customers activities, setting up or maintaining certain standard practices in the supply chain or practising any other standard set by other certification Bodies such as ISO14001. So, process stewardship is the monitoring and executing environmental practices with the suppliers and with the customers. Collaborating with upstream SC partners firms can enhance their product and process stewardship. Collaboration with the supplier can facilitate the process stewardship practices in the supply chain which may lead to sustainable performance. Process stewardship can be implemented through deploying environment-friendly technologies to save the environmental impact on organisational operations, designing the production process to reduce resource consumptions, using environment-friendly transportations, designing the production and delivery process to reduce carbon dioxide emissions(Wong et al., 2012).

2.4.5 Socially Responsible Practices in the Food Supply Chain

Social practices in the supply chain can be defined as the management practices that affect the way a firm contributes to developing human potentials or protects them from harm(Shokri *et al.*, 2014). The complexity of social practices in the supply chain occurs because the visibility of the focal

company is most of the time limited to the supplier and few firms may have some visibility to 2nd tier suppliers as well.

So, the more complex the supply chain is, the less visible it becomes making socially responsible practices implementation across the supply chain a daunting task. However, collaboration with the suppliers may enhance this visibility because when collaboration becomes part of the business culture then focal firms collaborate with their suppliers and the supplier will collaborate with their suppliers and it moves on this way which creates a collaborative culture in the chain. This may also create a collaborative cycle in the supply chain which will contribute to enhancing visibility in the SCs. Shokri et al. (2014) considered Socially responsible practices in the food supply chain as consumer health, transparency, food safety, and quality, animal welfare, labour, and ethics. Socially responsible practices in the supply chain mostly involved with the employees, the supply chain partners, the customer and the wider community.

Employee-related social practices in the supply chain refer to providing employees with not only their contractual rights and payments but also some voluntary treatments to improve their wellbeing. These treatments can be in the form of good working conditions, working hours, better treatment, training and development opportunities, work-life balance, equal treatments, adequate health and safety practices, human rights, child and forced labours.

Reducing unemployment, caring employees' health and safety, averting social segregation and safeguarding equal treatment are social practices in the supply chain(Ashby et al., 2012). Environment-friendly practices focus on management of natural resources whereas social practices are concerned with the management of social resources including employee's skills, expertise, institutions, relationships and social values(Sarkis et al., 2010).

Transparency in the food supply chain is crucial, and it is a combination of traceability, labelling, and product specification. Transparency in product levelling, product specification helps enhance

traceability. Traceability helps the effective flow of product and information, quality assurance, food safety as well as security and consumer health (Maloni and Brown, 2006, Shokri et al., 2014). Information such as the origin of foods, fair trade, nutritional values, and ingredients are essential food-related social issues.

Van Der Vorst (2006) highlighted that product information and levelling are important social issues because it provides evidence for the consumer about their possible dietary or health needs, for example, some people may be allergic to nuts or some people are vegetarian, or some people look for the Halal products. So, these social issues that affect the consumers, communities or the society at large can be practised through enhancing transparency in the SCs. The collaboration with the suppliers can facilitate overcoming these challenges. Some of the previous studies on Socially responsible practices in the food supply chains are presented in Table 2:7 below.

Table 2:6 Socially Responsible Practices in Food SCs

| Source/s | Aims, Issues, and Sectors | Key findings |
|---------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Piacentini <i>et al.</i> (2000) | CSR practices in food retailing and the motivation behind their practices | The main motivation was found as the space maximisation, profitability, and customer pressure while some company recognises the importance of being a socially responsible company but none of the company practices CSR primarily for philanthropic purposes. |
| Jones <i>et al.</i> (2005) | CSR Practices in the UK leading food retailers | They investigated CSR practices in the key UK food retailers through case study analysis. They have drawn their findings from the empirical evidence from the corporate CSR reports and information available in the public domain such as financial reports, websites and so on of those selected ten food retailers. Their findings suggest that every company has their method towards CSR practices however there are variations in the way they are implemented and reported. They also noted some common practices including issues such as eco-friendly, sourcing, personnel, customers and the wider community-related. The core message of their findings is that every company under investigation has their CSR practices in place. |
| Shreck <i>et al.</i> (2006) | Organic agriculture and social sustainability in the USA. | They attempted to incorporate social sustainability in organic agriculture. The authors noted that the focuses of organic agriculture are now on to provide benefits to the consumers and farmers or businesses. They tried to understand whether there is an association between social sustainability and organic agriculture. Drawing from a survey conducted on organic farmers in California in the USA, they suggested that social certification supports organic agriculture. They noted that organic agricultural fosters social as well as economic sustainability. They also reported based on the in-depth interview that some farmers have unusual practices and in some circumstances, their production can be social, economically and environmentally sustainable. |
| Maloni and Brown (2006) | CSR practices in food SCs | They provided a comprehensive understanding of the CSR practices drawing from the existing literature and emerging trends in the food industry from which they also developed a CSR framework for the industry. The framework provided guidelines for CSR implementation in the food SCs that includes health and safety practices, human rights, fair trends, environmental issues and so on. They also noted souring and community-related issues in the food SCs. |
| Kong (2012) | Investors' concerns about CSR activities in the Chinese food industry. | This study investigated whether CSR issues are important in the Chinese food industry. Drawing from a recent incident, they highlighted that investors, as well as consumers, have increased their attention to CSR practices in the Chinese food industry. So, they noted that CSR practices |

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| | | in the food industry could be meaningfully amplified when growing consideration is provided to the CSR related programmes. |
| Forsman-Hugg <i>et al.</i> (2013) | To identify and define key CSR dimensions in the food SCs | They attempted to identify and define CSR for the food SCs in Finland. Drawing from the previous studies and a qualitative approach, this study found various dimensions of CSR in food supply chains including ecological issues, nutritional facts, food safety, employee welfare, animal welfare, locality and financial accountability. They suggested that CSR practices in food businesses will contribute to achieving sustainability in the food SCs. |
| Wiese and Toporowski (2013) | CSR failures in food supply chains – why and how to avoid? | Drawing from the agency theory perspective, this study attempted to analyse the CSR failures, their possible reasons, and recommendations to avoid them for future scenarios. They noted that actions by a firm in the SCs might impact the activities in the entire SCs. If a supplier or a supplier’s supplier does malpractices in CSR activities, it will harm the focal company and the entire SCs. They found that failure of CSR practices does have reputational and financial consequences. They suggested that implementing and monitoring CSR practices in the SCs should be the primary activities of the focal firm. They also noted that through improved communication and the better relationship these challenges could be minimised. |
| Reilly and Hynan (2014) | CSR, corporate communication, and social media. | This study is about using a social media platform to communicate sustainability. Drawing from sixteen international companies from four different sectors including retail, technology, food and consumer goods, this study attempted to explore the way companies are communicating their CSR practices for sustainability. They found atypical communication approaches regarding sustainability initiatives across various industries. This could be attributed to the size of the firms, the metrics employed, and the communication platforms used (e.g. social media). Besides, they also noted that the environment-friendly companies are more active in CSR practices for sustainability than non-environment friendly ones. |
| Wilhelm <i>et al.</i> (2016) | Strategies and contingencies for applying sustainability in multi-tier SCs. | Drawing from earlier studies on multi-tier SCs and collecting data from second-tier suppliers and beyond from four different industry settings they classified four dissimilar features of multi-tier SCs as open, closed, third party and don’t bother. They found three key aspects that will determine when to encompass their sustainability strategies to the sub-suppliers such as SC complexity, sustainability management competences of the first-tier suppliers and the type of sustainability considered (e.g. eco-friendly and social sustainability). They noted that challenges regarding sustainability mostly happens in the upstream SCs at the sub-supplier level. |

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| Shnayder <i>et al.</i> (2016) | The motivation for CSR in the packaged food industry | Based on the literature, it is unlikely that CSR is intrinsically motivated by the values of firms. This paper looked at self-reported motivations for different dimensions of CSR. Motivations that are framed as intrinsic or values-based can be explained by external pressures. In addition to legislation and normative obligations, social pressure is an effective driver for CSR. Overall, this paper shows that different types of institutions and stakeholders motivate different types of CSR and that these motivators can be used to drive policy |
| Pino <i>et al.</i> (2016) | Influences of CSR on consumer attitudes, buying behaviour in Genetically modified food in Italy | perceptions about producers' philanthropic and legal responsibilities favourably impact Italian consumers' attitudes toward genetically modified foods and their intentions to buy such products, respectively |
| Souza-Monteiro and Hooker (2017) | CSR strategies in UK food retailers-comparison | Health and safety and the environment are the leading themes in both data sets. Animal welfare, community and biotechnology and novel foods take the middle ground with differing use across reports and products. Fairtrade, labour and human resources and procurement and purchasing are the least commonly described themes in reports and on products. Retailers focus on different CSR themes in reports and new products, which may be evidence of competitive rather than pre-competitive strategies. |
| Vu <i>et al.</i> (2017b) | develop an approach to measure business sustainability in food service operations (fast food retailer chain) | This study proposed a sustainability framework (social, environmental and economic) based on the review of 6 well know sustainability framework. They are- The United Nation Commission for Sustainable Development (CSD) theme indicator framework; Wuppertal sustainable development indicator framework: sector and interlinkage indicators-1998; Sustainable metric of the Institution of Chemical Engineers IChemE-2002; Krajnc organizational chart of indicators of sustainable production Krajnc; Hierarchical structure of the global reporting initiative (GRI) framework; Labuschagne with four levels of operational framework. They also applied this to a food industry context and highlighted that sustainability measurement considering all three aspects are compatible with the food industry. |
| Zuo <i>et al.</i> (2017) | Institutional pressures on CSR behaviour considering the food industry in China. | They analysed three forces that potentially affect the behaviour of Chinese firms: (a) coercive isomorphism, (b) mimetic processes, and (c) normative pressures. Based on a questionnaire survey of 164 Chinese managers and employees, the CSR behaviour of firms operating in the Chinese food industry is found only to be significantly affected by the institutional factor of normative pressures |

Food safety for health and safety challenges is another social responsibility that food business in the UK and the other parts of the world to be considered. There is also confusion among consumers about genetically modified (GM) and organic foods and whether they are sustainable (Maloni and Brown, 2006). There are regulations and standards for that. However, Shokri et al. (2014) mentioned that GM and organic food might be sustainable as they use fewer chemicals and pesticides but they are costly.

The food industry is relatively labour intensive and maintaining labour standard is another important social sustainability aspect. Ethics in using and treating employees is also an important area of social practices in the food SCs. Fairtrade is regarded as a familiar social practice in the SCs that advocates for a better and fair-minded relationship with suppliers. In the global trades, it provides a new model that is based on fair trading terms and prices. It also advocates for creating awareness among the consumers about the detrimental impact of conventional trades (Ashby et al., 2012). Fairtrade advocates for equitable treatment in SCs and a standard set of practices are used by NGOs on this. Some organisation uses certification of different social bodies or follows the International Labour Organisation (ILO)'s guidelines. Pagell and Gobeli (2009) highlighted unsafe working condition, and child labour is explicit social issues. Socially responsible purchasing (SRP) is also a social practice that helps the businesses and the community at large. SRP is also related to green purchasing. However, SRP is considered social aspects of the purchase and their suppliers' social practices.

2.5 Supply Chain Collaboration

Collaboration is the joint activities between the partners in the supply chains. Gunasekaran et al. (2015) referred to Supply chain collaboration as the relationship developed for a long time between supply chain members to lowering cost and risk as well as improving quality and market value. Collaboration in the literature mostly focused on collaboration with the supplier, collaboration with customers, internal collaboration and some studies also looked at collaboration with other

stakeholders including Universities, communities and local governments(Melander, 2018). The main stimulus for collaboration comes from the thrust of achieving competitive advantage.

Firms in collaboration can do better than being in isolation because of the synergistic benefits. Once the firms are in collaboration they have access to each other resource, they share information, exchange knowledge, share reward and risk. However, a high degree of trust is crucial in a collaborative relationship. Also, how much information to share with the partners in the SCs is another concern. Nonetheless, collaboration helps the firm secure and maximise relational rents (improved performance) in supply chains has been previously researched, and it is prevalent in industrial practices as well.

Collaboration for sustainability is gaining popularity in the academic community and the industrial settings. To achieve sustainability, in the SCs, is critical for organisational success in this present dynamic environment. However, to achieve that in the SCs, requires partners in the chain to act collaboratively. This study argues that collaborative practices can help firms achieve sustainability in their operations. This study also suggests that collaboration with the supplier will enhance mutual relationships and improve trust between the partners. In the long run, collaborating with suppliers, firms can improve their environmentally friendly and socially responsible practices which will lead to achieving sustainable performance.

In the literature, supply chain collaboration and Supply Chain Integration (SCI) are being used interchangeably though they are not the same as the SCI concentrates on integrating certain parts of the organisational activities or processes with other departments in the same organisation or with other organisations. While both involve sharing information, however, collaboration requires much more than just information sharing with the partners. Integration is possible without the collaboration however for collaboration, integration is essential. To achieve or secure collaboration with the partners, it takes time. Some of the previous studies also looked at SCI for competitive

advantage and better performance in the supply chains. Thus, this study also reviewed articles that considered SCI that focused on suppliers' integration or collaboration specifically.

Supply chain integration is defined as the degree to which a business strategically collaborate with its SC partners and collaboratively accomplishes intra and inter-firm processes, with a view to achieving effective and efficient flows of goods and services, information, finances, and decisions to deliver the supreme value to the customers(Flynn *et al.*, 2010).

In a basic supply chain, upstream partners of a focal company are suppliers, and downstream partners are customers, and for internal operations there are employees. Collaborating with upstream partners in the supply chain facilitates firms in environmentally friendly practices and socially responsible activities in their supply chains, focal firm's operations and the upstream parts in particular, which may lead to sustainable performance. Previous studies outlined below also highlighted the claims.

Ueki (2016) investigated the relationship between customer-supplier collaboration and supplier's quality control performance, considering supplier's attitude toward improving quality and production management deploying a survey to the focal firms, their buyers, and suppliers considering Indonesia, the Philippines, and Thailand as the study domain. They found an improved mutual relationship between the buying firms and their suppliers and improved process control because of the ISO requirement to their suppliers.

de Vargas Mores *et al.* (2018) studied sustainability and innovation in the context of green plastic supply chain in Brazil. They found that collaboration between the focal firms and other supply chain partners is necessary for product development.

Chen *et al.* (2017) Based on a comprehensive, structured literature review and bibliometric analysis, noted that studies for sustainability and SC collaboration in the field of business are growing. Even though the economic and environmental aspects are still dominating the research filed but a

minimum consideration is provided for social aspects including working conditions and child labour. Besides, studies in SC collaboration are mostly limited with buyers, suppliers, and internal aspects, but competitors and studies in horizontal collaboration and collaboration with upstream partners (i.e. suppliers) have received little attention. Though many actors are working in the supply chain, this research focused on the important part, the upstream supply chain partners (supplier collaboration), to perceive their impact on environmentally friendly and socially responsible practices that may lead sustainable performance.

2.6 Supplier Collaboration

Supplier collaboration is the activities of a collaborative relationship between the focal firm and its suppliers to maximise SC related performance. Buyers to a great extent depend on its suppliers' resources including advanced know-how, manufacturing competence, engineering expertise and financial backing (Yan and Dooley, 2014). Simultaneously, suppliers also depend on buyer firms for product knowledge, market needs, customer expectation and so on. So, it becomes critical for firms to collaborate to obtain access and exploit mutual resources to initiate certain practices.

Previous studies also support these above notions. Such as, Chang (2017) focused on supplier's task involvement and joint planning for product innovation. They also looked at knowledge accusation through these collaborative activities with the suppliers that will lead to product innovation. It is found that the firms can achieve competitive advantage by establishing close relationships with their network partners. Partners in the supply chain can minimise costs, improve product quality and lessen product cycle times by collaborating with the suppliers.

Zhang *et al.* (2017) investigated which of the supplier collaboration practices are linked with the speed-to-market (STM) of new products across different firm size. They confirmed the positive and direct relationship between information sharing and STM. It is found that information sharing as a partial mediator between the relationship of strategic purchasing and STM and a full mediator

between the relationship of supplier involvement and STM. They also found that firm size significantly influences the relationships in buyer-supplier collaboration.

Ambrose *et al.* (2010) looked at buyers-suppliers perceived mechanism to understand their relationships. The study suggested that buyer-supplier perceptions about their relationships vary significantly. They found transaction cost theory and social exchange theory are a useful set of theories to explain the success in buyer-supplier relationships. They suggested that previous researchers advocated that Communication between the partners enhances trust and commitment. Improved trust and commitment lead to increased satisfaction and help form successful relationships. Although much of the previous studies did not consider having dyadic data from both the suppliers and the customers their contributions were insightful.

Narayanan *et al.* (2015) found that increased communication leads to increased performance and satisfaction. Collaboration enhances resource sharing and dependency which influences commitment, trust, and satisfaction. Previous studies highlighted that in relationships, the buyers have higher expectations and less commitment than those of their suppliers. Supplier collaboration requires some forms of firm-specific investments of money and time; these require commitment and mutual satisfaction. Collaboration with the suppliers helps achieve certainty of the supplies these will have a direct impact on performance.

Hoegl and Wagner (2005) investigated buyer-supplier collaboration for new product development. They found that supplier collaboration helps the firms to achieve required product quality, cost performance and product development projects and schedules. They also suggested that frequency and the intensity of communication has a positive relationship with project development and the costs target. Patrucco *et al.* (2017) investigated whether innovation can be achieved through supplier collaboration. They highlighted that it is difficult for the firm to innovate alone in the supply chains, it is rather achieved in networks. Collaboration helps firms' innovative practices (e.g. Social as well as eco-friendly practices) as they have greater access to wider resources.

Corsten and Felde (2005) investigated the conditions that facilitate the benefits of collaboration between a firm and its suppliers. In other words, they examined the conditions under which the collaboration with important suppliers is advantageous for the buyers. They found that collaboration with suppliers positively influence innovative capability and economic performance. They also found the trust and dependency has a crucial role in supplier relationships.

Sáenz *et al.* (2017) found that buyer-supplier collaboration enables inter-organisational learning which leads to manufacturing flexibility and customer satisfaction. Buyer-supplier collaboration enhances knowledge sharing processes (Dyer and Singh, 1998). The deeper the buyer-supplier collaboration is, the better the inter-organisational learning will be (Yan and Dooley, 2014). Sáenz *et al.* (2017) focused on inter-organisation learning as it facilitates gaining new knowledge which helps adapt to increasingly changing market needs. Inter-organisational learning assists in forming combined capabilities that help harness market opportunities (Blome *et al.*, 2014). Sáenz *et al.* (2017) claimed that buyer-supplier collaboration directly linked with capability development. Collaboration enhances the firms' ability to compete and react to environmental changes. Through collaboration, firms can harness relational capabilities and can understand each other well to provide better services to the customers. However, the Buyer-supplier collaboration is not a straightforward path to enhanced performance or a guaranteed way to succeed. Buyer-supplier collaboration facilitates mutual environment-friendly and socially responsible practices which will lead to achieving sustainability in the supply chains (Sáenz *et al.*, 2017).

2.6.1 Benefits and Drawbacks of Supplier Collaboration

Yan and Dooley (2014), claimed that collaboration facilitates knowledge creation through internalising partner's knowledge. To enhance environment-friendly practices, the partner firms influence each other's resources and activities to exploit learning and knowledge sharing opportunities (Grekova *et al.*, 2015). The firm can capitalise on the strength of the partners and can enjoy benefits through it. Gunasekaran *et al.* (2015), mentioned that collaboration relies on mutual

benefit. Supplier collaboration, however, is not always effective for improved performance (Kopfer *et al.*, 2005, Yan and Dooley, 2014) due to lack of communication, mutually non-supportive environment and lack of coordination in mutual decision making.

In the academia, it is demonstrated that the most vital source of novel ideas and information are the relationships. Collaborative relationship helps firm share their tacit and explicit knowledge and enhance knowledge creation and innovation with the suppliers (Kopfer *et al.*, 2005, Yan and Dooley, 2014, Grekova *et al.*, 2015).

Collaboration can reduce buying cost by minimising contracting cost, instant communication, enhanced coordination and mutual operational problem-solving approach. Key suppliers can have a significant impact on the overall wellbeing of the focal firm (Kopfer *et al.*, 2005). As knowledge sharing become more frequent and inevitable in supplier collaboration; so, trust, openness, and transparency become fundamental. Supplier opportunistic behaviour is minimised when mutual trust exists and thus reduce purchasing cost through enhanced coordination, information sharing, and process dependency. In Collaboration, the dependence between the firms is inevitable.

However, over-dependence may weaken the focal firm's innovative capability (Kopfer *et al.*, 2005). Theoretical arguments in the previous research and empirical findings do not portray a transparent picture whether supplier collaboration influences a firm's activities and under what conditions their performances get improved. Collaboration with suppliers may not always expose the improved performance. However, collaboration with the supplier for specific innovative practices (e.g. environment-friendly and socially responsible) may lead to improved environmental, cost and social, performance.

Dissimilar results lead focal firms in a dilemma whether to collaborate or not. McIvor *et al.* (2006), investigated the degree of early supplier involvement (ESI) between the multinational electronics

company and its key suppliers. They identified three key strategic dimensions as supplier involvement, buyer-supplier relationships, and information exchange.

Wagner and Hoegl (2006), investigated supplier's involvement in New Product Development (NPD) and suggested that involving suppliers in new product development is important and inevitable. However, they suggested that not all efforts are successful arguing that attention should be given in organisational contingency factors and effectively manage the suppliers' involvement in project level. Suppliers are expected to take responsibility for developing, designing, integrating, manufacturing, delivery, quality of the provided products. Why collaboration with suppliers is essential and what can facilitate supplier collaboration to achieve sustainability? This research tried to shed some light on this complex relationship.

2.6.2 Types of Supplier Collaboration

In the previous literature, supplier collaboration has not been idiosyncratically featured as various individual types. However, based on their collaborative natures and contextual factors, previous literature recognised supplier environmental collaboration (Vachon and Klassen, 2008, Wassmer *et al.*, 2014, Chin *et al.*, 2015, Grekova *et al.*, 2015), collaboration with suppliers for daily operational activities (i.e. information sharing) and Collaborating with supplier for long time strategic activities (i.e. product development).

Supplier environmental collaboration is to reduce the environmental impact of both suppliers and customer's products and processes in their operations. The focal firm may collaborate with their suppliers to reduce the environmental impact of firm's products and processes, to reduce waste, to anticipate and solve environmental problems, to minimise logistics related environmental impacts and to achieve environmental goals collaboratively.

Focal firms have to maintain a mutual relationship with their suppliers for daily operations. Activities such as order management, inventory management, demand management, information sharing for

customer's requirements, risk minimisation and education and training with their suppliers are tactical.

Some activities suppliers and focal firms are engaged with are strategic. For example, the long-term collaborative relationship itself is strategic. Strategic collaboration can be referred to as activities those take a long time to build and maintain. Strategic collaboration is something valuable and hardly imitable for a long time. Chiou et al. (2011) claimed that longtime strategic benefits could be secured by collaborating with suppliers.

2.6.3 Enabling and Preventing Factors of Supplier Collaboration

There are various enabling and preventing factors, that may affect supplier collaboration, have been identified in prior studies. For instance, Lockström et al. (2010) identified enabling and preventing factors for supplier integration in the Chinese automotive industry perspective. They found buyer-side leadership as an imperative antecedent to build motivation, trust, and commitment among suppliers and to shape their mindsets. This will help build suppliers collaborative capability which is the prerequisite for supplier integration. They also mentioned firm size which may affect supplier collaboration.

Supplier integration takes place in multi-layered including production planning, product development, information sharing, strategic planning and inter-organisational agreements and policies (organisational integration). Suppliers' collaborative capability is the key driver to form Supplier collaboration. Supplier's capabilities are process management, performance management, communication, autonomous problem solving, organisational learning, planning as well as engineering and innovating capabilities (Lockström et al., 2010). The readiness for collaborative relationship considering such factors as quality mind-sets, customer focus, top management support, strategic alignment, trust, long-term orientation, willingness to learn and improve is crucial.

McIvor et al. (2006), highlighted that there are factors which can contribute to implementing supplier integration including technology uncertainty, levels of trust between the buyer and supplier, coordinating communication mechanisms. It is therefore important to identify the potential strengths and impediments that can arise and their causes for supplier collaboration.

For successful supplier's involvement, Wagner and Hoegl (2006) hinted the criticality of two domains: (1) contingency factors on the organisational level and (2) the management of supplier involvement on the project level. At the organisational level, partnering between buyer and supplier firms are critical. They argued that the partnership between buyer firm and supplier firm do not merely exist or emerge rather buying firm has to establish a cooperative norm, high level of trust and commitment. Open exchange information between the firms is crucial. Supplier selection criteria need to be considered to implement certain practices(Wagner and Hoegl, 2006) such as environmentally friendly and socially responsible practices in the upstream SCs.

Yang and Zhang (2017) studied performance impact sustainable supplier management (SSM) practices. They considered selecting, monitoring, developing and collaborating with the suppliers as the SSM practices. They considered performance aspect as supplier performance, buyer-supplier relationship and competitive advantage. The positive effect of supplier development and supplier collaboration for supplier performance is found, but supplier selection, monitoring, and collaboration respectively have a positive effect on the buyer-supplier relationship and competitive advantage.

Zacharia et al. (2011), Investigated two capabilities that enable successful episodic collaboration as absorptive capacity and collaborative process competences. Absorptive capacity is an organisational capability to identify the value of fresh external knowledge, integrate it, and utilise it to commercial ends. This is the organisational mechanisms that recognise, communicate and integrate relevant external and internal knowledge. Similarly, process competence focuses on managing the collaboration process from partner selection to facilitate knowledge exchange and synthesise, to

monitoring and adjusting the process for timely and successful completion. For innovation, problem-solving, and improving the supply chain performance, the businesses are highly dependent on external knowledge and expertise. Zacharia et al. (2011), found that both the capabilities have a positive impact on successful collaboration claiming that collaborative process competence as a mediator between the relationships of absorptive capacity and collaborative engagement and positive impact on both relational and operational outcomes. Capabilities are a vital source of a firm's operational strength and competitive performance. Competencies are created through mutual relationships which will lead to relation specific firm performance (e.g. TBL).

2.7 Environment-Friendly Supply Chain Management

2.7.1 Definition

Environment-friendly Supply Chain Management (EFSCM) considers green issues, and this is the extension of typical SCM. It is also generally referred to as Green supply chain Management (GSCM). Slack et al. (2009) referred to SCs as the connected operations to source and deliver products and services to final consumers. EFSCM follows similar activities but in a way that is more innovative, profitable, widely acceptable, socially responsible and environmentally friendly (Sarkis et al., 2011, Zhu et al., 2012). So, EFSCM is the integration of environmentally-friendly practices in the SC processes starting from extracting raw materials till final consumption to minimise the environmental impact of the operations.

The reviewed literature indicates that scholars have used slightly different terminologies to comprehend EFSCM over the period of time, for instance, Green SCM (Lee, 2008), cleaner SCM (Subramanian and Gunasekaran, 2015), Sustainable Supply Chain Management (SSCM) (Linton *et al.*, 2007, Seuring and Müller, 2008, Gold et al., 2010, Ahi and Searcy, 2013, Beske et al., 2014, Touboulic and Walker, 2015), environmental SC (Jabbour *et al.*, 2015), green practices of SC (Azevedo et al., 2011), and socially responsible SC (Hoejmose *et al.*, 2013).

There are some subtle and few obvious differences among the terminologies used to denote EFSCM, GSCM or SSCM including the definitions, scopes, and characteristics of the practices. Ahi and Searcy (2013), have attempted to distinguish the definitions between GSCM and SSCM. They claimed that SSCM is the extension of GSCM and they found there is considerable overlap between the definitions. However, they could not identify any complete definition for either GSCM or SSCM, but the debate is still inconclusive. This study used Environment-friendly supply chain management to denote green or environmental supply chain management. The following section discussed the environment-friendly practices in the SCs.

2.7.2 Environment-Friendly Practices in SCs

Green or environment-friendly practices in the SCs are referred as being considerate to the surrounding environment, society and the entire globe to making the world as a better place to live for the present generation and the generations to come. As mentioned earlier, the EFPs and GSCM practices are interchangeably used in the literature. In this study, however, environment-friendly practices will be used throughout to avoid confusion. Many scholars have tried to define environment-friendly SCM practices from various perspectives. For example, from three different strategic perspectives, Testa and Iraldo (2010) illustrate green SCM as reputation related, efficiency related and innovation-related. They claimed that reputation-led green practices in the SC improve corporate image; efficiency-led practices are cost saving activities, and innovation-led green practices facilitate in becoming an industry leader through product and process innovation. While Srivastava (2007) proposed proactive, reactive and Value Seeking practices, Laosirihongthong et al. (2013) recommended only Pro-active and reactive practices.

Pro-active practices are green purchasing practices, eco-design practices, reverse logistics, and on the other hand, reactive practices are due to legislation and regulations. Zhu and Sarkis (2004), have highlighted some of the popular green practices in the SCs as Green purchasing, Cooperation with Customers, Investment Recovery, Eco-Design and internal Environmental management. Based on

these, Lee et al. (2012) advocated for Internal Environmental Management (IEM), Green Purchasing (GP), Cooperation with Customers (CC) and Eco-Design (ECO).

Adoption and management of environment-friendly practices in internal organisational operations (Zhu *et al.*, 2008b) can be referred to as greening the internal management. Greening internal management is the proactive environmental strategy by the organisation (Zailani *et al.*, 2012a). To green the internal operations, the top management should have a strong commitment to implement GSCM practices. Firms may have environmental auditing system or can obtain environmental certification (i.e. ISO14001). Employees in the organisation are aware of the environmental impact of their activities in the organisation. There will have internal training, coaching or communication between new and senior colleagues for environmental practices. The firm will proactively engage in recycling, reusing, minimising hazardous materials in operations process and dispose of non-recyclable items. Many scholars including Bowen et al. 2001, Lee et al.2012; Tseng *et al.* 2014 noted that to achieve corporate environmental purposes, commitment, encouragement, and support from the senior management is essential.

In the upstream supply chain, an organisation primarily depends on purchasing from its suppliers. Green purchasing (GP) has received increased consideration to the scholars and business practitioners recently. To be environmentally friendly, sourcing products from the eco-friendly suppliers or green purchasing and selecting eco-friendly suppliers are crucial to reducing the environmental impact of the operations (Tseng and Chiu, 2013). Tseng et al. (2014) further noted that strategic green purchasing facilitates environment-friendly practices in the upstream SCs.

Banaeian *et al.* (2015) in a recent investigation outlined a unified framework for selecting green suppliers in FSCs. For instance, ISO14001 certification, which supports Environmental Management systems (EMS), could be a supplier selection criterion for food businesses that consider being environment-friendly.

Green practices with the suppliers and supplier's supplier (2nd Tier) can be considered as greening the upstream supply chain. Considering 2nd or more tiers suppliers in the upstream supply chain for environmental practices considers this. Supplier selection criteria, standard environmental requirements or certification from suppliers and auditing 2nd tier supplier's environmental activities helps green upstream supply chain.

Downstream supply chain involves with customers and customers related and focused activities in the supply chain. Tseng et al. (2015) claimed that businesses might not do well if EFPs are implemented in segregation. To alleviate the mounting environmental challenges in the SCs, businesses should concentrate on building a better relationship with external partners along with its internal operations (Laari *et al.*, 2016).

Azevedo et al. (2011) recommended EFSCM practices as greening the supply process through selecting right suppliers, product based practices through integrating environmental concerns, greening delivery process and green practices through cooperating with suppliers and customers while Rao and Holt (2005) highlighted EFSCM initiatives of firms as Inbound logistics, production or internal supply chain, outbound logistics and reversed logistics. Though their views are not identical, their notions are similar. Evaluation of environmental SCM is historical. Its dimensions, definitions, and level of acceptance have changed significantly since it first emerged in the practical and academic domain.

From the above discussions, it can be deduced that EFSCM is being practised within the organisational processes, with upstream supply chains (i.e. suppliers) and with downstream supply chains (i.e. customers). As a popular research area, scholars distinguished EFSCM practices from their understanding (Huang *et al.*, 2012). Though EFSCM practices have been explained in several ways by different scholars, there is a dearth of a common framework for environment-friendly or green SCM practices (Murphy and Poist, 2003). Srivastava (2007) suggested that the investment for

greening the supply chain should focus on resource savings, waste elimination, and productivity improvement.

In this study EFSCM practices have been considered as product related and process related environmental practices in other words product stewardship and process stewardship (Wong et al., 2012) taking UK food SCs into consideration.

2.7.3 Drivers and Pressures for Environment-Friendly Practices

Organisations practice EFSCM proactively or reactively (Laosirihongthong et al., 2013). Whatever the way they practice, there are some driving forces behind them. Those driving forces can be from within the organisation (internal) or from outside the organisation (external). Many researchers (Testa and Iraldo, 2010, Zailani et al., 2012, Lee *et al.*, 2013) maintain the view that internal drivers and external pressures induce organisations to practice ESCM. However, Laosirihongthong *et al.* (2013) mentioned reactive pressures and proactive drivers instead of internal drivers and external pressures that drive firms practising ESCM.

Some of the organisational theories such as resources based view, relational view, resource dependence theory, and institutional theory have been used to understand how firms succeed in implementing certain operations strategies (Sarkis et al., 2011, Lee et al., 2012, Laosirihongthong et al., 2013, Lee et al., 2013).

Diverse entities in the EFSCM act to fulfil business needs, customer expectations and legitimate requirements. Businesses receive pressures from regulatory bodies and increased influence from customers for a cleaner, transparent, socially and environmentally responsible supply chain (Zailani et al., 2012). Due to these pressures from outside and driving forces from within the organisation such as organisational values, corporate commitment, and long-term vision, companies are institutionalising environmental practices in their operations.

Based on institutional theory (DiMaggio and Powell, 1983), Sarkis et al. (2011) highlighted three isomorphic drivers of EFSCM namely *Coercive pressures* – governments, environmental interest groups, and industrial associations; *Normative pressures* - social pressures, consumer expectation, communities and wider stakeholders (Seuring and Müller, 2008); and *Mimetic* - coping the activities of a successful organisation i.e. competitive benchmarking. The higher the coercive pressure is, the higher the tendency of the firm to take environment-friendly practices in the SCs (Zhu and Sarkis, 2007, Testa and Iraldo, 2010). For instance, to avoid legislative hassles and to comply with current rules and regulations, firms accept a certain level of green practices in their operations including reduced CO₂ emission, design eco-friendly products, and try to avoid environmentally hazardous substances during their procurement and production process.

Nonetheless, Testa and Iraldo (2010) argued that pressures could be from inside the organisation for instance strategic motivation (Laosirihongthong et al., 2013). In contrast, normative drivers are the social reaction towards EFSCM whereas the companies who follow market leaders to survive in the market face mimetic pressures. In contrast, internal drivers are company's commitment from the top executives (Zhu and Sarkis, 2004, Laosirihongthong et al., 2013) in line with organisational values (Testa and Iraldo, 2010), support from mid-level managers as well as senior employees (Zhu and Sarkis, 2007) and long-term vision for expected business gains.

Moreover, the organisational aspiration to achieve cost leadership (cost minimisation) and differentiation (innovation) strategy as well as to secure confidence, trust, and respect from stakeholders can all contribute to shaping SCM strategies. Summaries of environmental drivers and pressures outlined in the previous studies are summarised in Table 2.4.

Table 2:7 Summary of Key Drivers and Pressures for GSCM Practices from the Literature

| Author/s | Source of Drivers/Pressures | Key Issues/Sectors |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zhu <i>et al.</i> (2007a) | Regulative, Market forces, Suppliers and Internal | Exploring the GSCM pressures/drivers (motivators), initiatives and performance of the automotive SC using an empirical analysis of 89 automotive enterprises within China |
| Walker <i>et al.</i> (2008) | Organisation's internal factors, Legislative and regulatory, Customer's expectation, Market forces, Societal factors, Suppliers | Exploring the factors that drive or hinder organisations to implement GSCM initiatives in the public and private sectors |
| Holt and Ghobadian (2009) | Regulations, Societal drivers, customer pressures, Internal drivers | Examining environmental sustainability through the management of SCs, focusing on a sample of UK manufacturers |
| Chen and Lee (2010) | Firm's Commitment and managerial role, Experiences and organisational cultures, External Pressures | Exploring the driving forces behind SMEs', green investment in SC and to provide an integrated model of adopting green SC practices. |
| Diabat and Govindan (2011) | Regulations, Customer Requirements, Expected Business Gains | Identifying the drivers in implementing GSCM practices through Interpretive Structural Modelling (ISM) approach. |
| Lee <i>et al.</i> (2012) | Regulations, Corporate goal and product positioning, Company image | Exploring GSCM practices and relationship with the organisational performance of SMEs that serve as suppliers to large customer firms in the electronics industry in Korea. |
| Green Jr <i>et al.</i> (2012b) | Customer's requirements, Regulations, Internal Practices | Impact of GSCM practices and its performances |
| | Internal Drivers, External Pressures | Identifying the pressures that effect GSCM performance in South Korean Manufacturing Firms |
| Laosirihongthong <i>et al.</i> (2013) | Pro-active practice – green purchasing practices, eco-design practices, reverse logistics practices; Re-active practice – legislation and regulation | Examining the deployment of pro-active and re-active practices in the implementation of GSCM and analyse the impact on environmental, economic, and intangible performance by considering business strategy as an organisational focus |
| Tachizawa <i>et al.</i> (2015) | Coercive, Non-Coercive | To analyse interrelationships among environmental drivers, GSCM practices, and performance |
| Kuei <i>et al.</i> (2015) | Technological, Internal Organisational External Environmental | Identifying the critical factors that influence GSCM adoption and the associated performances. |

2.7.4 Supplier Collaboration for Environmentally Friendly Practices

There have been a plethora of studies on green or environment-friendly SCM practices on collaboration and performance in the literature. However, whether supplier collaboration helps improve environment-friendly practices is inconclusive in the literature. Suppliers are the crucial entity to green an organisation's Supply chains. To initiate environment-friendly practices in operations, it becomes essential to collaborate with suppliers as they have greater control over the upstream supply chains. Chiou et al. (2011), claimed that long-term strategic benefits could be secured by collaborating with suppliers. Kopfer et al. (2005), found that supplier collaboration has a positive effect on firm performance regarding innovative capability and financial results considering relational constructs trust and dependence as the key elements for supplier relationships. Chiou et al. (2011) highlighted that firm supplier's integration in the product innovation can enhance firm performance.

However, establishing a relationship requires time, resources, information and knowledge sharing ability from both parties (Melander, 2018). Lockström et al. (2010) suggested both anecdotal and empirical evidence indicate that firms are experiencing difficulties in undertaking green practices in their operations. This is because of lack of resources/capabilities or lack of strong mutual relationships for collaboration with the partners. Through collaboration, firms can have access to the resources and capabilities of their partners, and they smartly can turn their weaknesses into relational strengths. Collaborating with suppliers certainly has advantages in overcoming shortcomings and gain knowledge with their suppliers which will help them implement green practices in the organisation.

As the SC is a network of activities which have upstream (suppliers) and downstream (customers) partners, so, implementing certain practices in the organisation is heavily depended on their influences. The customers depend on the focal firm to have their desired products or services while focal firms depend on their suppliers. If the supplier part is unwilling to support or have a bad

relationship with focal firms, then the customer gets affected or change their preferences and purchase from the competitors. Simultaneously, when an organisation takes initiatives for environment-friendly practices, it must have good relations with its suppliers to implement. Starting from product designing, product manufacturing, product handling and shipping to the final customers, suppliers play key roles. Regarding information sharing, knowledge sharing, visibility, and traceability enhancement firm significantly depend on their suppliers. The existing studies also support the arguments.

Kumar and Rahman (2016) seek to identify the factors affecting sustainability adoption in the Indian automobile supply chain and the inter-relationships exist between the buyers and the suppliers. They suggested that external influence and expected sustainability benefits positively affect top management's commitment towards the adoption of environmentally friendly practices. Further, it was found that a better buyer-supplier relationship positively impacted the triple bottom line of sustainability which comprises environmental, cost and social performance measures. The buyer-supplier relationship was assessed after breaking it down into three constructs - supplier selection, supplier development and supplier performance review.

Melander (2018) considers the firm's capabilities for collaboration to achieve green product innovation. They noted the importance of finding the right partners which are difficult as they require having eco-friendly knowhows and can offer some new knowledge to the partner. To bring the innovation, the firms need to cartel relational competencies (e.g. trust) with predetermined contracts. The study also highlighted the necessity of managing knowledge and the talents of the firms. So, collaboration does not function in segregation rather in a network setting.

Dai et al. (2017) looked at proactive environmental strategies for operational performance. They developed a model to show that green collaboration with suppliers empowers companies to function more competitively. To promote environmental management practices, many companies are collaborating with their supply networks. They argued that the collaboration with the supplier

firms helps improve green process innovation which also works an instrument for firms' operational performance. Achieving environmental performance depends to a great extent on the firm's inter-organisational practices through collaboration (Cantor et al., 2013, Wong et al., 2015). The logic is that the firms with greater collaboration can closely integrate suppliers into the supply chain process which leads to environmentally friendly practices.

Collaboration in the supply network is the key to achieve environment-friendly practices in the supply chain (Vachon and Klassen, 2006). Collaboration for environmental practices needs specific resources, expertise and investments from the buying firms to tackle green issues. The firms can accumulate knowledge through mutual interactions and relationships with the supply networks. The suppliers in the network sometimes are the powerhouse of information and knowledge with different knowhows and supply chain processes.

The supplier collaboration does not only simplify the means of resource sharing but also facilitate utilising knowledge spill-overs. Supplier collaboration for environment-friendly activities assists companies to locate and eradicate technical problems in the early stage, for example, impractical design or inconsistent specifications. Combined efforts and communication between the buyer and the supplier help strengthen mutual understanding of strategies and expectations which decrease interfirm conflicts. Also, a trusting and supportive environment is created through open and honest communication between the partners which enables incremental as well as fundamental modernisation.

2.8 Socially Responsible Practices in Supply Chain

Socially responsible practices are strongly linked to corporate social responsibility (CSR) practices which comprise actions not required by law, but furthering social good, beyond the explicit, transactional interests of a firm (Sarkis et al., 2010, Ashby, 2012). According to social sustainability principles, the organisation should provide equitable opportunities, encourage diversity, promote

connectedness within and outside the community, ensure the quality of life and provide democratic processes along with open and accountable governance structures (Elkington, 1994, Pullman, 2009).

A large number of previous studies highlighted environmental practices as this is widely practised in most of the large global companies. Also, environmental and economic aspects received more attention in the research than that of social aspects of sustainability (Dillard et al., 2008). According to Vu et al. (2017b), Socially responsible practices as a dimension has not received much attention in the business level by previous researchers.

Socially responsible practices are concerned with companies' practices that impact social systems. A firm can enhance their socially responsible practices to influence their firm performance in food industry Maloni and Brown (2006). Social practices in SC advocates for providing equitable opportunities, encouraging diversity, promoting connectedness within and outside the community, ensuring the quality of life (Elkington 1994). Vu et al. (2017b) highlighted that socially responsible practices should include Providing stable employment for employees, Practicing employment that considers human rights and other national and international legislation. They consider health and safety of the workforce, Career development opportunities for employees through training, career guidance and higher education facilities, Developing products and improve quality through research for the customers, Practicing products responsibility to protect customer's health and safety and maintain nutrition values, Contributing to the local communities.

So, a firm that considers socially responsible practices in its operations does so in various ways. Including recruiting local employees, purchasing from local suppliers, supporting the local communities and events, the company does business keeping ethical and moral values, companies do not get involved in any activities that harm the society, treat employees well, support suppliers in their activities and provide services to the customers. Through social practices, a firm recognises its suppliers, involve in fair trade, support them in various practices and understand each other that enhance the socially responsible practices.

Treating employees well, providing them with the opportunities they need, caring them the way they deserve, taking their health and safety practices into consideration, supporting their work life balance and providing them other intrinsic motivations, the company earning the most precious gift from that employee, their commitment. They feel the company is caring for them and they become more aligned to achieve the company's goal. So, these caring-sharing practices may enhance employee bonding with the company which becomes feasible to integrate and collaborates with employees in environmentally friendly practices.

In sustainability practices, the organisations recognise, value and promote the competences of its employees with proper HR policies and practices to foster equity, development, and well-being (Daily and Huang, 2001). Rothenberg et al. (2001) found that employee participation and training positively influence environmental improvement.

Once a company is good to its employees, its society and its customers and the customers become loyal to the organisation as the emotional attachment works. The business entity becomes the fabric to the society. It enhances the relationship between the companies and the customers. If the company committed to improving their social and environmentally friendly practices, they are in a situation to collaborate with the customers. So, it facilitates customer satisfaction that enhances firms' social performance. Pullman et al. (2009) found social and environmental practices have a positive indirect effect on firm performance suggesting the essentiality of including social practices in sustainability dimension.

2.8.1 Supplier Collaboration for Socially Responsible Practices

Though there have been a significant number of studies on collaboration and collaboration for environmental practices in the supply chain. In the literature, there are limited studies focused on collaboration for performance including social dimension. Studies on collaboration for social practices are scarce in the literature. In a collaborative relationship, firms can exert influences on their suppliers in practising socially responsible activities in their operations including health and

safety practices, community engagement, enhancing corporate ethics, provide training for employee development, serving the community for good causes and so on.

2.9 Sustainable Performance

Sustainability and sustainable development are used interchangeably in the literature. In this part, sustainability and sustainable performance from the previous literature along with sustainability in supply chain management are highlighted.

2.9.1 Sustainability

Sustainability and sustainable development have been defined from various perspectives in many disciplines in previous literature including in operations management, supply chain management and in management science. The term sustainability has been popular after the publication of Brundt report in 1987 'Our Common Future' produced by the World Commission on Environment and Development in 1987 (Brundtland, 1987). Sustainability in that report is defined as "the development that meets the needs of the present without compromising the ability of future generation to meet their own needs". Though this definition has been widely used in the sustainability literature, it is hard to understand the definition fully because of the ambiguity in the conceptual terms has been used in the definition.

The Environmental Protection Agency (EPA) (2011) later, however, defines sustainability as the fulfilment of basic financial, societal and environmental safety needs at present and in the future without depleting lives depending on finite natural resources and ecological quality. In business point of view, the purpose of sustainability is to enhance shareholders and social value in the long term while decreasing materials usages in the industry and diminishing environmental impacts (Environmental Protection Agency, 2011).

In the literature, this definition has been extended and established to three key performance indicators as environmental, social and economic (Carter and Rogers, 2008, De Brito *et al.*, 2008, Seuring and Müller, 2008) and all these factors have an impact on the lives of human beings. There

are many definitions for sustainability in operations management and supply chain discipline, but most of them focus on the natural environmental point of view (Zhu and Sarkis, 2004, Zhu et al., 2005, Holt and Ghobadian, 2009). In operations management, scholars put more emphasis on economic and ecological dimension overlooking social aspects in understanding sustainability (Sarkis, 2006). In prior studies of supply chain discipline, many scholars considered social, financial and ecological aspects without combining all three dimensions in one study. Most of the research in the supply chain discipline were mainly focusing on the natural environment, and financial aspects are ignoring social issues and responsibility of the firm (Carter and Jennings, 2002). Some of the previous studies investigated only financial issues, some were concentrating on only environmental aspects, and few were concentrating only on social matters, i.e., (Carter and Jennings, 2002, Murphy and Poist, 2003). Hence, this study is taking the endeavours to combine all three areas with a view to depicting the full pictures of the understanding of sustainable performance (environmental, cost and social) food supply chain.

In recent times, organisations are adopting sustainability practices and report them annually in their Corporate Social Responsibility (CSR) report or annual sustainability report separately (Carter and Rogers, 2008). Drawing from previously established definitions, it is evident that most of the definitions divided sustainability into environmental, societal and economic (cost) related which is related to the notion of sustainable performance or the triple bottom line (TBL) approach developed by Elkington (1998). This concept helps managers consider their firms' sustainability from all these aspects which demonstrates their sustainable development and enhance Sustainable competitive advantage.

Sustainability in the food supply chains has drawn substantial attention recently from consumers, companies, governmental officials and among the academics due to the continued deterioration of the environment and the contributing factors of foods and food-related products in the environment including food production, packaging, and distribution. Achieving sustainability means having a balance between social development, environmental preservations, and economic growth.

It takes place when organisational innovation and policies in supply chains are considered from the perspective of sustainable development.

Collaboration with the suppliers for sustainability in food supply chain literature is relatively scarce, not because of the insignificance of the issue but because of the complexities involved in the SSCM in food sectors. Consumers are becoming more inquisitive about food quality, integrity, safety, diversity and sustainability (Allaoui et al., 2018). To address these issues, the firms are enhancing their environmentally friendly and socially responsible practices in the supply chains (Gunasekaran et al., 2015) through collaborating with their upstream partners who will lead to achieving sustainable (environmental, cost and social) performance.

2.9.2 Sustainability in the Supply Chain

Sustainable supply chain management has been defined by Carter and Rogers (2008) by a triple bottom line approach as the strategic and transparent integration. They emphasised that the achievement of organisational goals from social, environmental and economic perspective through systematically coordinating important inter-organisational business processes to enhancing long-term financial outcomes within the company and its supply chains.

In the framework, they also included strategy, organisational cultural, transparency and risk management as the sub-dimensions linked to sustainability in the framework (Hart, 1995, Elkington, 1998). All these interrelated facts are highlighted in the following diagram-

Strategy

Organisational Culture

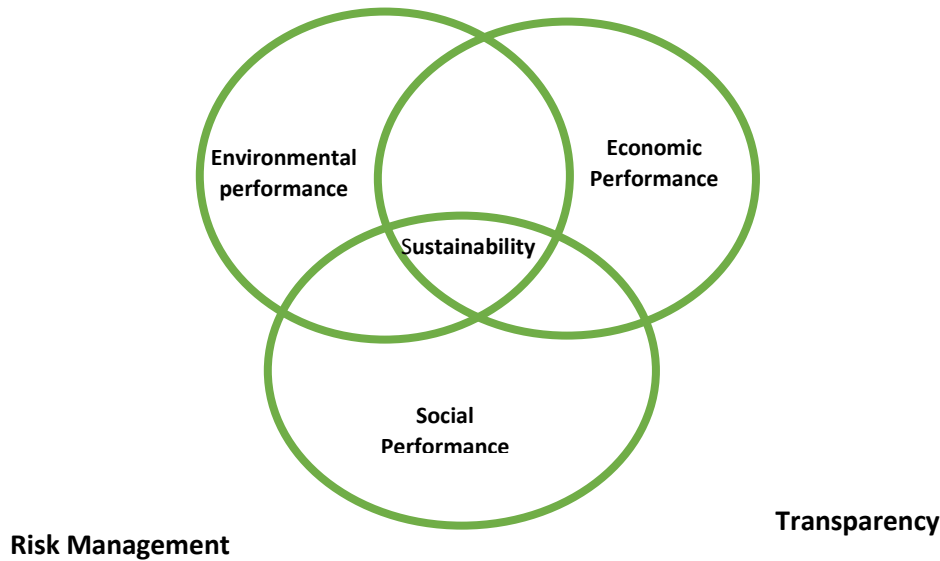


Figure 2:2 Triple Bottom Line

Source: Based on (Elkington (1998), Carter and Rogers (2008))

According to Carter and Rogers (2008), supply chain risk management is the capability of the organisation in understanding and managing its ecological, social and financial risk. Adopting contingency planning in upstream and downstream supply chains, this can be accomplished. Transparency can be realised with the help of rapid technological advancement in communication including internet and satellite television — engaging stakeholders and communicating with them by reporting the updates and collecting their feedback to enhance processes in the supply chain operations. Sustainable supply chain strategy should be in line with the business strategy (Shrivastava, 1995). Carter and Rogers (2008) noted that many organisations including Nike and IBM took sustainability initiatives and unified them in their business strategies.

So, Sustainability in the SC means when the firm has sufficient income to meet its basic obligations such as government tax, fair compensations to the employees, fair price for the goods and services received from the suppliers, proportionate returns on shareholders' investment and doing good to the community and the society at large without harming the environment. In other words, Sustainability in the supply chain can be referred as the network of value-added activities through

which the companies in the chain do good to the community and the society without harming the environment and having sufficient income to meet their basic obligations such as government tax, fair compensations to the employees, fair price for the goods and services received from the suppliers and proportionate returns on shareholders' investment.

2.9.3 Sustainable Performance

The relationship between environment-friendly practices and organisational performance is a controversial issue. Some scholars, e.g. (Bowen et al., 2001, Zhu et al., 2005, Eltayeb *et al.*, 2011, Green Jr et al., 2012b, Zailani et al., 2012) found that environmentally friendly practices improve environmental, operational, economic and overall organisational performance. However, Lee et al. (2013) could not find any statistical significance of it but claimed that there is an indirect relationship. So, it is evident from the literature that there is a lack of uniformity among the findings which may pose a significant barrier for businesses to adopt environment-friendly practices (Eltayeb et al., 2011, Zhu et al., 2011).

There is a perception that environmentally friendly and socially responsible practices enhances efficiency and brings synergy among strategic business units which minimise waste, save costs and improves environmental efficiency (Rao and Holt, 2005). Organisational performance has been measured by different academics using dissimilar components, for instance, (Zhu et al. (2005), Green Jr et al. (2012b)) used environmental, operational and economic performance. Wittstruck and Teuteberg (2012) found three dimensions of performance as environmental, economic and social. Testa and Iraldo (2010) added one more dimension on performance as a brand image which was also used by Eltayeb et al. (2011) as intangible outcomes. Zailani et al. (2012) measured the social performance of an organisation as a product image, company image, and stakeholder's perceptions.

Environment-friendly and socially responsible practices influence efficiency in the working process, lead time and service quality of the organisation. Environment-friendly practices send positive

messages to the stakeholders about the company and its activities. This helps the firm in attracting consumers and media's attention which in turn change consumer perception and buying behaviour. Some scholars (e.g. Slack et al., 2010; Zhu and Sarkis, 2004) argued that practising environment-friendly procedures does positively impact on brand image. However, Zailani et al. (2012) revealed that it might not be the case for a small organisation.

Concurrently, large businesses find environmental practices profitable because reducing waste including reduction of buffer stocks, illuminating obsolescence cost, warehousing costs, energy reduction and minimising defects, directly impact profitability. Simultaneously, Following the 5 R's (recycling, reusing, redesigning, refurbishing and reverse logistics) indirectly influences profitability by reducing production costs. Besides, practising green in the operations improve corporate image which brings positive consumer behaviour about the corporations resulting added turnover and economic performance (Lee et al., 2012, Zhu et al., 2007).

Organisations are dependent on their suppliers for various reasons including resources and hence building a long-term relationship with them is crucial to the organisational performance. This dependency, which requires better mutual relationships, and the long-term strong mutual relationship is the bases for collaboration. Through collaborative activities with the suppliers and the relationship-specific assets, the firms can capitalise on and enjoy improved performance. That's why the relational view (RV) theory is also appropriate to understand the collaborative relationship and performance impact through environment-friendly and socially responsible practices in the supply chain.

As the supply chain became global, the challenge increases for the organisations to maintain manufacturing and distributing units, distance and cultural diversity which increase risks such as inventory control, product quality, lead time and mutual trust. For these reasons, many organisations are solving this SCM related strategic problems through inter-firm relationships. That's why RV is a related theory to explain supplier collaboration for sustainable performance

which may be facilitated through environment-friendly and socially responsible practices in the SCs because it can describe surroundings of an organisation, its partners and its domain implying that individual firms can barely achieve sustainable growth.

Therefore, organisations rely on a mutual relationship among the partners throughout the supply chains. Yu et al. (2017) looked at Green supply management as green supplier selection and green purchasing personnel for Green supplier collaboration which leads to operational and environmental performance deploying resource-based view perspective. Sarkis et al. (2011) highlighted that Success of Implementing environment-friendly practices rely on the mutual relationship of partners in the supply chain as well as the collaborative approach and its quality. The same applies to social practices as well. RV supports firms who do not have the necessary resources can build up a relationship with others to obtain them through collaboration. This also minimises the risks in the business environment as there are a strong buyer and supplier relationship (Carter and Rogers, 2008, Cao and Zhang, 2010).

Supply management focuses on building a long-term relationship through collaboration with the suppliers because they are critical to organisational success. They are the important sources of the companies' environmental impacts in the supply network. Paulraj (2011) stated that to achieve sustainability objectives, the manufacturers should concentrate on their upstream supply chain partners.

Though there has been an increasing number of studies on sustainability in the supply chains, however upstream supply chain, supplier collaboration, in particular, is still in its infancy (Paulraj, 2011, Yu et al., 2017) and requires some closer investigations for food supply chain perspectives. Sustainability in upstream supply network performs a strange phenomenon in the supply chain. Strategic purchasing activities help firms achieve sustainable development objectives. (Zhu et al. (2008b), Yu et al. (2017)) Stated that Providing training to the purchasing department may enhance green supply. Environmental training for the purchasing team and some better remuneration

facilities may enhance environmental practices in the supply chain. Considering the environmental aspects of suppliers helps achieve sustainability (Gavronski et al., 2011, Paulraj, 2011, Yu et al., 2017).

Suppliers are the vendors that supply raw materials, other components or services to the local companies that the focal firms are better for sourcing from the trusted outsiders rather than producing by themselves. They are considered the critical allies in the supply networks because of their positioning in the companies' activities. They can help focal firms to enhance their environmental initiatives in the upstream supply chains (Bowen et al., 2001, Seuring and Müller, 2008, Luo et al., 2015, Yu et al., 2017). To implement eco-friendly practices in the supply chain, the companies should integrate their suppliers into their purchasing processes (Rao and Holt, 2005). Collaboration helps firm overcome resource constraints by gaining access to partners resources (Yu et al., 2017).

Carter and Rogers (2008) described sustainable supply chain management as the systematic coordination of strategies, transparency, and success within the firm as well as entire supply chain processes concentrating on social, environmental and financial performance in the long run. Sustainability notion has later been expanded to Six -P-elements namely perceptions, potentials, practice, planet, people, and profit. Former three elements are to achieve short-term objectives including enhanced output, reduced inventories and lead time while later three items are to increase long-term customer satisfaction, market growth and financial gains in the entire supply chains (Tan *et al.*, 1998) eventually achieving sustainability performance. To achieve sustainability, a firm has to integrate three dimensions as planet or environment, People or social dimensions and economic gains or cost reductions. This research will look at sustainability performance from TBL perspective considering environmental, cost and social performance.

2.9.3.1 Environmental Performance

Natural Environment has become a crucial part of the organisational decision-making process. Environmental concerns are everywhere starting from sipping coffee in the coffee shops to in the corporate boardroom. This is an inescapable reality for today's business world. Business is challenged with numerous environmental issues including toxic substances, pollution (land, water, air), global warming, nuclear waste and depleting ozone layers(Liu, 2010). These challenges made the lives very difficult for all living creatures on the earth including human beings. Environmental degradation is increasing day by day with very little sign of improvement.

These are driving businesses, individuals, governments, and policymakers to consider environmental issues. This is evident in their policies to recover and sustain their natural resource for the present and for the generations to come. Business organisations are after improving their environment-friendly activities and greening their operations to achieve environmental objectives. This can, in turn, enhance the business image and corporate environmental performance.

Environmental performance has been defined in various ways in the literature. Environmental performance is the outcome of organisational activities in environmental issues. Measuring environmental performance is still in the growing stage but may not be sufficient in measuring environmental practices (Hervani et al., 2005).

Some of the widely used tools in environmental practices are balanced scorecard, life cycle analysis activities-based costing and analytical hierarchy process. However, some of them still need further extensions. To understand environmental practices, measuring environmental performance is important (Hervani et al., 2005). Environmental performance measures for UK businesses, The Department for Environment, Food and Rural Affairs (DEFRA) has recognised 22 items in four different aspects as air, water, and land pollutions and resource utilisation. Some organisations take environmental activities and seek environmental performance proactively some may be reactive to fulfil the obligations imposed by the rules and regulations.

Moreover, The International Organisation for Standardization (ISO) has initiated ISO 14001 certification and also provided guidelines for environmental performances irrespective of size, geographical locations, and business types. They mentioned three performance indicators as managerial efforts for environmental costs and budgets; operational environmental performance for raw materials and fuel usages; environmental conditions in regional, local and national for the environmental impact of the organisation.

Zhu and Sarkis (2004) considered reducing air emission, reducing wastewater, reducing solid waste, reducing consumption of hazardous/harmful/toxic materials, reducing environmental accidents and improving the firm's environmental situations. Henri and Journeault (2010) divided environmental performance from four perspectives as environmental effect and company image, relationship with stakeholders, economic effects, and improving product and processes. So, to achieve environmental performance, all four elements are to be considered. Environmental impact on business reputation indicates the relationship between environmental standards or practices and performance. Environmental performance in the food supply chain is measured considering the last two years the environmental impact of the organisation. That includes creation and reduction of food wastes, level of recycling practices of waste materials, reduction of raw materials usage including energy and water for per unit of production, reduction of carbon dioxide emissions per unit of product and the reduction of using harmful or hazardous materials for productions and processes. Though there are several concepts in the literature to measure environmental performances, it is hard to consider the best ones explicitly. It is crucial for the firm to consider stakeholder and their expectations when measuring environmental performance (Shaw et al., 2010).

2.9.3.2 Cost Performance

Zhu and Sarkis (2004) claimed that financial performance (i.e. cost reduction) is the critical drivers of most of the businesses. All companies initially strive for survival which is depended on economic gains through cost reductions. Achieving long-term cost-saving performance is challenging in the

business world. This drives the business to devise strategies such as green initiatives for sustainable economic performance. In the literature, some studies were focusing on economic performance (Rao and Holt, 2005) along with marketing performances.

Cost performance sometimes referred to as financial performances however there are some ambiguities in the terms (Jennings, 2004). The financial performance focuses on money-related issues which can be published through financial reporting or annual report before being publicly available whereas cost performance considers economic gains in the operations or cost savings through utilising human and natural resources to achieve human welfare (Jennings, 2004).

So, Cost performance is not a constraint with the activities of a single firm but with its partners and stakeholders. In previous studies, economic performance has been classified from different angles, for example, Rao and Holt (2005) considered market share, sales growth, profitability growth, new market opportunities and increased product price to measure economic performance. The economic performance considers holistic aspects of organisational financial health that includes sales growth, profitability, market share, cost reductions, return on investment and so on whereas cost performance particularly focuses on economic gains through cost savings and the cost saving related performance include cost saving on purchasing, processing, operations, resource utilisations, distributions and so on. This study, however, considered cost related organisational performance to focus on cost savings aspects of socially responsible and environmentally friendly practices through supplier's collaboration in the UK food SCs.

Improved supplier collaboration that leads to enhanced environment-friendly and socially responsible practices in FSC will facilitate efficient resource utilisations across the networks of the individual firms' practices which will lead to cost savings (Holloos *et al.* 2012). This is another important reason for considering cost performance instead of financial. Another important aspect is that the cost savings are typically inward focused where the focal company can initiate internal practices in the supply network that will lead to saving costs while economic performance is mostly outward where the company had to rely on external factors significantly. That means, cost savings

can be an effective tool through improving internal practices in the supply network and while overall economic performance is significantly depended upon the external factors (e.g. market conditions, customers, regulations and so on).

The cost performance in this study is measured considering the cost savings aspects of the last two years in the operations. That includes saving on purchasing costs, energy and water usages costs, recycling and reusing costs, transportation costs, inventory costs, labour costs and product development costs. The items were developed based on the extant literature focusing on food industry including (Pullman *et al.* (2010), Zhu *et al.* (2013), Graham and Potter (2015), Grekova *et al.* (2015)).

2.9.3.3 Social Performance

In previous literature, there is a scarcity of studies on social performance issues. Only a handful number of studies such as (Carter and Jennings, 2002, Carter and Rogers, 2008, Wu and Pagell, 2011, Hollos *et al.*, 2012) considered social dimensions in empirical studies as performance outcome. This could be due to the difficulties of measuring the social dimensions. Social sustainability includes communities within the organisation (i.e., employees) and outside the organisation (external stakeholders).

Pullman *et al.* (2009) stated social practices based on sustainability performance as “According to social sustainability principles, the organisation should provide equitable opportunities, encourage diversity, promote connectedness within and outside the community, ensure the quality of life and provide democratic processes along with open and accountable governance structures”. Hollos *et al.* (2012) described social practices as the efforts from the focal firm to initiate socially responsible practices including good working conditions, proper and fair payment policy, high safety standards and child labour free practices in their operations and their supplier’s operations.

Scholars have deployed dissimilar measurement components to measure the social performance. For example, Hollos *et al.* (2012) measured social performance as working conditions, labour

standards, and safety standards. Gimenez et al. (2012) investigated single item social reputation as social performance. Wittstruck and Teuteberg (2012) highlighted customer retention, customer satisfaction, differentiation and corporate image. Pullman et al. (2009) noted socially responsible practices as lifesaving health programmes and education, using child labour, low pay, harsh-working condition, worker safety, sanitation, housing and training needs. Food safety is also an important social issue to be considered (Maloni and Brown, 2006, Pullman et al., 2009).

Though social performance constructs have not been properly established yet and an empirical investigation was scarce but social issues, and social performances have been widely discussed in the sustainable supply chain literature (Carter and Rogers, 2008, Seuring and Müller, 2008, Gold et al., 2010, Beske et al., 2014). It is evident that elements of social performance are working conditions, avoiding child labour, improved health and safety practices, reduced work-related accidents, fair pay, employee's relationship and their satisfaction level, customer's relationship and their satisfaction, community activities including social awareness, company reputation, reducing discrimination in gender, race and colours.

It is worth distinguishing that while socially responsible practices are the daily operational social practices in the supply chain, the social performance measures the outcome of supplier collaboration, environment-friendly and socially responsible practices on social performance dimension over a certain period (i.e. for the last two years). Social performance in this study is measured considering the social achievement of a company in its supply chain for the last two years. The social performance was measured using scales such as employees job satisfaction, employees' welfare facilities, health and safety facilities and training, working environment, customer satisfaction, community support, relationship with the SC partners and so on. The items were generated and validated from the existing scales using in the previous studies such as (Carter and Jennings (2002), Pullman et al. (2009), Pullman et al. (2010), Gimenez et al. (2012), Paulraj et al. (2014), Sancha et al. (2015)).

2.10 Supplier Collaboration for Sustainable Performance

Performance in the organisational and firm level through supply chain collaboration has been widely researched. Few studies also considered supply chain collaboration for sustainable performance. However, most of the studies considered one or two dimensions of TBL performance. Nonetheless, whether collaboration, supplier collaboration to be precise, enhances performance is inconclusive in the literature.

Previous studies including Kähkönen *et al.* (2017) examined the key practices that firms can use to engage their suppliers in an interaction, which in turn, can be beneficial for focal firm innovation performance due to improved access to ideas, insights, and feedback from the supplier side. They found that green and ethical supply chain and systemic purchasing positively influence innovation performance. However, the early supplier involvement and inter-firm learning did not reveal the same relationships. Mandal (2017) looked at supplier collaboration and performance in hospital SCs. They found a positive relationship between hospital supplier collaboration and supply chain performance. However, the paper suggested investing in dynamic capabilities to cope with changes that will enhance firms' long-term performance.

Gokarn and Kuthambalayan (2017) looked at the challenges that the Indian food supply chains face reducing waste. They claimed that food waste reduction has an impact on TBL (Social, environmental and economic) performance. They identified 33 challenges that can inhibit food waste reduction in Indian food supply chains in three different levels as strategic, tactical and operational. The challenges are mostly on resource constraints, supply chain complexities, information sharing, trust mechanisms, technological integration and utilisation, demand and supply uncertainty and perishability. This study highlighted the necessity of geographical locations and industry-specific research to enhance sustainability practices globally.

The argument in this research is to be to collaborate for avoiding or minimising these challenges faced by food industries. Through collaboration, firms can have access to partners resources,

streamline information sharing, and technological integration can make processes simple, through enhanced communication what is happening in the upstream and the downstream supply chain are widely shared, and hence demand and supply uncertainty is avoided. Through collaboration and enhanced communication with the suppliers, the process gets simpler, and the food sourcing and distribution takes lesser time hence allowing a smaller amount of food to be wasted contributing to reducing environmental impact, reducing cost and improving social good. So, it is evident from the previous literature that the supplier collaboration enhances sustainable performance in the UK food SCs.

2.11 Supplier Collaboration for EFPs, SRPs and Sustainable Performance

To improve supply chain performance, supplier collaboration is an important concept (Lockström et al., 2010). McIvor et al. (2006) found mixed results of perceived performance benefits of early supplier's integration. However, they emphasised effective management of supplier's integration. Wagner and Hoegl (2006) hinted that there is both positive and negative performance outcome of the supplier integration. Flynn et al. (2010) found that internal and customer integration were more strongly related to improving firm performance than supplier integration. Based on previous studies Ho and Lu (2015) claimed that a firm could obtain higher performance through engaging in exploitative and exploratory activities together with their suppliers. They proposed that a firm's collaboration with suppliers will moderate the impact of market exploitation and exploration of firm performance differently. Ho and Lu (2015) investigated supplier collaboration as a moderator in the performance impact of marketing exploitation and exploration. They have found through surveying 220 firms in Singapore that supplier collaboration increases the impact of marketing exploration but weakens the marketing exploitation on market performance.

Previous literature suggests that a strong collaborative partnership enhance competitive advantages by accessing and leveraging partner's resources and knowledge. Suppliers collaboration empower partners to absorb each other's expertise and best practices a collaboration with supply

chain partners facilities ample opportunities including new product development, operational efficiency and knowledge creation (Cao and Zhang, 2011).

In a collaborative environment, the firms are depended on each other for operational practices in day to day activities including environment-friendly as well as socially responsible practices. The extent of information sharing, shared planning, shared problem solving determine the intensity of supplier collaboration. Buyers get benefits including the finest production plans, timely production, reduced inventory and improved delivery performance through receiving information related to products, production, and processes from suppliers and overall the synergistic relational advantage. The supplier can also get feedback on new product development identifying designing and manufacturing faults. Collaborative planning and problem-solving help improve mutual trust through learning from each other experience and expertise. Continuous communication and mutual actions help improve deep understandings of the strengths, weaknesses and unearned opportunities among the partners. Suppliers can provide improved and expanded services to its buyers once they have a good understanding of the buyer's operations. Through this, buyers get operational advantages which result in strong market performance through efficient responses to customer needs and innovative offerings(Cao and Zhang, 2011). Supplier collaboration is a very affluent source of peripheral knowledge that can be leveraged to enhance environmental, cost, social and overall sustainable performances.

Ho and Lu (2015) found that supplier collaboration may negatively moderate performance when the firms overly depend on its suppliers, they lose opportunities to gain valuable skills and expertise because of not nurturing internal learning and competencies within the firm for a long time. Being heavily dependent on suppliers may hinder customer services of buying companies. Thus, through collaboration, firms can gain external knowledge relatively quickly and easily which gradually stimulate them not to cultivate internal learning competencies and capabilities rather focusing on harvesting external knowledge from suppliers. Thus, in long-term, if the relationship goes wrong

with the suppliers, focal firms lose their capability significantly. So, a balance has to be drawn to maintain the collaborative relationship among the firms.

Supplier collaboration enhances the strength of collaborative communication between a firm and its key suppliers. Supplier collaboration in previous studies was assessed using various scales such as joint planning and problem-solving, information-sharing systems, joint decision-making, and sharing of operational and industrial knowledge (Flynn et al., 2010, Zacharia et al., 2011, Ho and Lu, 2015). Through collaboration, which is the strong form of relationship with upstream SC partners, the focal firm can exert certain practices (environment-friendly and socially responsible) in the upstream SCs. This is because of this for the mutual benefits of both the suppliers and the focal firms. This study also assessed whether this environmentally friendly and socially responsible practices could mediate the relationship between supplier collaboration and sustainable performance

Product and process related environment-friendly practices in the organisation such as resource conservations and savings, reusing and recycling practices, environment-friendly technologies and transportation do help firms to save costs, and these also support firms to reduce the impact of their operations to the environment. Reducing CO₂ emissions and reducing the food waste, simultaneously improve the environmental impact through reducing fewer foods to the landfill and social impact through providing available foods for those in need and reducing food waste also contribute to cost savings for the organisation. So, environment-friendly practices do have an impact on sustainable (environment, cost and social) performance. Socially responsible practices in the organisation such as purchasing products from socially responsible suppliers, ensuring work-life balance for the employees, maintaining the nutritional values of the products, providing fair remuneration packages, do have a positive impact on origination performance.

Collaboration with key suppliers has a direct positive impact on market performance (Ho and Lu, 2015). So, supplier collaboration is a valuable platform for firms to access and leverage

complementary resource to enhance performance. Suppliers collaboration helps the firm acquire knowledge which can then be implemented in innovative marketing practices. Through continuous communication and information sharing, buyer firms can achieve knowledge which they can convert into the new organisational process and hence transform them into organisational performance. So, the firm should see a partnership with key selected suppliers as a source of competitive advantage through which they can enhance their internal resource base and strengthen relational capabilities. Though the collaborative relationship with suppliers render opportunities for the firm to gain innovative knowledge, managers ought to remember the necessity of cultivating and integrating internal organisational knowledge to expand existing practices. The supplier collaboration influences the organisation in enhancing their environmentally friendly and socially responsible practices which lead to improved sustainable performance. This means that the higher the collaboration with the suppliers is, the better the social and environmental practices in the SCs which will lead to sustainable Performance.

2.12 Gaps in the Literature

There have been plethora of studies conducted on supply chain collaboration (SCC) (Doukidis *et al.*, 2007, Cao and Zhang, 2010, 2011, Zacharia *et al.*, 2011, Hudnurkar *et al.*, 2014) and sustainability (Vachon and Klassen, 2008, Blome *et al.*, 2014, Ramanathan *et al.*, 2014, Sheu, 2014, Grekova *et al.*, 2015, Gunasekaran *et al.*, 2015, Luo *et al.*, 2015). A handful number of studies have also been found on supplier collaboration and their influences of environmental practices and firm performance e.g. (Kopfer *et al.*, 2005, Fearne *et al.*, 2006, Oh and Rhee, 2008, Ho and Lu, 2015, Zhang *et al.*, 2015). However, limited studies have been found in UK food processing, manufacturing and supplying organisation that focuses on supplier collaboration for social and environmental practices and sustainable performance considering TBL or sustainable performance. Hence, this research is imperative for practitioners, academics and other stakeholders alike.

Environmental or green practices in the supply chains have received great attention from the academics and industry experts, however, research on socially responsible practices and performance in the food supply chain is scarce (Chen et al., 2017). Based on reviewing previous literature this study has identified several research gaps. The key identified research gaps are outlined below.

2.12.1 Supplier Collaboration for Sustainable Performance

Though environmental collaboration with suppliers as an antecedent has been investigated in previous studies, only recently supplier collaboration has been investigated as moderator by Ho and Lu (2015) to understand performance implication of marketing exploitation and marketing exploration. However, only a small number of previous studies addressed supply chain collaboration focusing on green or environment (Vachon and Klassen, 2006, Vachon and Klassen, 2008, Ramanathan et al., 2014, Wassmer et al., 2014, Danloup et al., 2015, Grekova et al., 2015, Irani *et al.*, 2017) or sustainability (Blome et al., 2014, van Hoof and Thiell, 2014, Chin et al., 2015, Kiron *et al.*, 2015, Chen et al., 2017). Among them Vachon and Klassen (2006), Vachon and Klassen (2008) looked at environmental collaboration with buyers and environmental collaboration with suppliers in North American Manufacturing context deploying Natural Resource-Based View (NRBV) and Relational View (RV) for manufacturing performance. However, they did not consider the social dimension in their studies. Wassmer *et al.*, 2014 consolidated and synthesised existing research on environmental collaborations to map antecedents, consequences, and contingencies. While it provided a good synthesised of existing research and highlighted future research priorities, it was only theoretical based.

Ramanathan *et al.*, (2014) looked at green supply chain collaboration with UK retailers, manufacturers and customers and their environmental performances. However, they did not focus on economic and social dimensions. Irani *et al.*, (2017) looked at influential factors that enable green

supply chain collaboration underpinning knowledge management theory however they did not consider whether this collaboration improves sustainable performance.

For sustainability and collaboration, van Hoof and Thiell (2014) looked at collaborative capability for sustainability, by focusing only SMEs in Mexico; Sheu (2014) looked at green SC collaboration in consumer electronic products, but focused on green supply chain performance only ; Blome et al. (2014) looked at SC collaboration for sustainability from suppliers and customers collaboration and performance, and looked at sustainability (environmental), market and product performance, but they did not include a social aspect. So, whether supplier collaboration enhances TBL (i.e. environmental, cost and social) is yet to be established.

2.12.2 Supplier Collaboration for Environmentally Friendly and Socially Responsible Practices

Firstly, Collaboration in supply chains is crucial for environmentally friendly practices and improved performance (Chen et al., 2017). Supplier collaboration has been widely researched on new product development, (e.g. Von Corswant and Tunälv, 2002, Kopfer et al., 2005, Tsai *et al.*, 2012, Yan and Dooley, 2014) and in combination with supply chain collaboration (such as Vachon and Klassen, 2008, Cao and Zhang, 2011, Ramanathan et al., 2014, Gunasekaran et al., 2015). However, supplier collaboration, in spite of getting recognition in environmental SC literature for achieving sustainability in organisations, has not been sufficiently investigated.

Unlike environmental friendly practices, socially responsible practices in SCs have received less attention in previous studies in general (Chen et al., 2017) and food SCs in particular. There are some studies on social practices in the supply chain such as Mani *et al.* (2015) looked at the enablers of social sustainability. However, they did it based on expert opinions, and the results were not statistically validated; Da Giau *et al.* (2016) looked at both social and environmentally friendly practices in the Italian fashion industry and how it can be communicated with the corporate website. So they did not look at the performance; Kaur and Sharma (2016) looked at social

sustainability in Indian manufacturing SCs. However, they did not bring the collaboration aspect and Sustainable performance aspects.

Similarly, studies that considered only socially responsible practices in the food industry are a few. Piacentini et al. (2000) looked at CSR practices and its motivation in food SCs; Jones et al. (2005) looked at CSR practices in UK food retailers. However, they only considered food retailing, and they did not consider the performance and collaboration aspects. Maloni and Brown (2006) looked at the CSR application in food SCs and developed a framework; Shreck et al. (2006) looked at social sustainability for organic agriculture in the USA; Forsman-Hugg et al. (2013) identified CSR dimension in food SCs; Shnayder et al. (2016) looked at motivation of CSR practices in food SCs. However, did not include environmental aspects and the importance of collaboration in CSR practices. looked at a comparison of CSR strategies in UK food retailers however no collaboration aspects and environmental aspects were considered. So, the studies that consider supplier collaboration to improve environment-friendly and socially responsible practices are limited in the literature.

2.12.3 Collaboration in the Food Supply Chain

collaboration in food SCs has also received good attention, studies, e.g. Fearne et al. (2006) looked at buyer-supplier collaboration in soft fruit SCs in the UK retails, and they highlighted the benefits of buyer-supplier collaboration regarding information sharing and effective demand management. However, it was not focused on the sustainability or the TBL performance. Matopoulos *et al.* (2007) developed a conceptual framework of SC collaboration in agro-food SCs. However, this is based on a single case study in Greece and was focused on SMEs only; Sharma and Patil (2011) looked at SC collaboration, synchronisation, and traceability in agri-food SCs in India; Nicolaas Bezuidenhout et al. (2012) looked at collaboration in sugarcane production and processing SC. However, this research is focused on only sugarcane milling in South Africa, and it was not considering sustainability or TBL performance., Ordoñez and Rahe (2013) looked at design and waste management in food SCs

however they focused on waste management only. Eksoz *et al.* (2014) developed a conceptual framework for collaborative forecasting in food SCs, however, their paper is based on literature review, and was not focused on sustainability. Grekova *et al.*, (2015) considered the drivers of supplier and customer collaboration on sustainable process improvement and performance. However, they looked at performance from market gains and cost savings perspectives only.

Similarly, Danloup *et al.*, (2015), based on a case study looked at collaborative distribution to reduce CO₂ emissions in UK food supply chains. They did not consider upstream supply chain partners, and social aspects in collaboration were not duly focused. Zhu *et al.* (2016) looked at supplier collaboration and performance in agri-food SCs. Aggarwal and Srivastava (2016) found that profitability, SC efficiency and waste reduction as the outcome of collaboration in Indian agri-food SCs, however, this is based on qualitative investigation and collaboration were looked at from customers and buyers perspective in Indian agri-food industry. So, there are gaps in the literature that need to be addressed and hence, this study endeavours to fulfil these gaps by looking at the impact of supplier collaboration on environment-friendly as well as socially responsible practices and sustainable (environment, cost and social) performance focusing on UK food industry.

2.12.4 Collaboration, Environment-Friendly, Socially Responsible Practices and Performance

There have been extensive studies on environmental practices in the SCs. However, much of the debate on environmental supply chain management or green supply chain management (GSCM) has been to determine the drivers, motivations, or pressures in undertaking environmental friendly initiatives and its influences on organisational performances (Green Jr *et al.*, 2012b, Lee *et al.*, 2012, Zhu *et al.*, 2012, Laosirihongthong *et al.*, 2013). However, only a few looked at socially responsible practices in general and food supply chains in particular (Pullman *et al.*, 2009, Pullman *et al.*, 2010). So, the question remains whether supplier collaboration can influence environment-friendly and socially responsible practices and help achieve sustainable firm performance. Hence, this study

attempts to fulfil this research by combining socially responsible practice with environment-friendly practices for sustainable performance in the UK FSCs.

Sustainability considering environmental practices in SCs has been widely researched in the previous literature in general, and food SCs in particular. Studies including Jones (2002) considered environmental impacts of transportation in food SCs and suggested to develop local production to enhance environmental efficiency; Mintcheva (2005) looked at environmental policy integration in food supply chains, and they proposed a set of environmental indicators for tomato Ketchup supply chains; Solér *et al.* (2010) looked at environmental information in Swedish food supply chain and found that environmental information is perceived and used differently at different stage of food SCs; Ala-Harja and Helo (2014) looked at green aspects of warehousing, transportation and distribution in food SCs and developed performance measures. However, studies on environmentally friendly practices in the food industry to improve firms' sustainable (environmental, cost and social) performance together are scarce in the literature. So, there is a knowledge gap in the literature that whether environment-friendly practices can improve sustainable (Environmental, Cost and Social) performance in the UK FSCs.

There are few studies on both socially responsible and environmentally friendly practices in general, e.g. Wilhelm *et al.* (2016) looked at implementing sustainability in a multi-tier supply chain. They found social and environmental sustainability as corporate strategies for sub-sub-suppliers are in focus. Studies focusing both on environmental and social practices in food SCs are handful including (Pullman *et al.* (2009), Pullman *et al.* (2010), Kaipia *et al.*, 2013). Pullman *et al.* (2009, 2010) investigated social and environmental sustainability practices and performance. However, they only considered quality, cost, and market and environment performance. They noted the need for collaboration, but they did not focus on that. So, whether environment-friendly and socially responsible practices can impact on improved environmental, cost and social performance is yet to be established.

2.12.5 Supplier Collaboration, Relational View and Performance

Relational view (RV) an extension of Resource-Based View (RBV) proposed by Dyer and Singh (1998) underpins this study to understand the phenomenon of interest. Relational view advocates that it is the relationship-specific assets that create relational rents (competitive advantage) for the organisation. Other words, the inter-firm relationship can create a superior firm performance.

To understand collaboration in the supply chain, many researchers incorporated RV theory. Studies including Mesquita et al. (2008) who used RV with RBV to understand knowledge transfer and vertical alliances; Vachon and Klassen (2008) underpins RV and Natural Resource-Based View (NRBV) to understand environmental collaboration with suppliers and customers for manufacturing performance; Wagner and Hoegl (2006) understand suppliers involvement for new product development; to highlight the collaborative paradigm in SCM to bring competitive advantage deployed RV and RBV; Cao and Zhang (2011) looked at collaborative advantage, and firm performance deploying RBV, RV and extended RBV; Zacharia et al. (2011) used knowledge-based View (KBV) and RV to examine the effects of absorptive capacity and collaborative process competence on the outcome of episodic collaboration; Omar et al. (2012) looked at RV for cooperation and coordination to achieve competitive advantage; Blome et al. (2014) looked at KBV and RV to understand SC collaboration and sustainability; Sancha et al. (2015) looked at social supplier development practices. However, they considered operational and economic performance only. Among them, only Sancha et al. (2015) extended RV for understanding collaboration in social aspects. However, they did not look at environmental practices and sustainable performance. So, it is evident that the RV has been used in the previous studies as a supporting theoretical lens along with other associated theories predominantly with RBV. However, in this study, the RV has been used as a main theoretical lens to guide this research. Secondly, the RV advocates for collaboration for competitive advantage by extension sustainable performance. So, this research has a unique opportunity to extend the RV from collaboration for sustainable performance to collaboration for

environment-friendly as well as socially responsible practices for sustainable performance. Also, this research takes the opportunity to expand RV in the UK food SCs context. Based on the reviewed literature, the following section will discuss the hypotheses development and the proposed theoretical framework.

3 Chapter 3: Development of Hypotheses and the Theoretical Framework

Based on the literature review discussed in the previous section, this part presents the hypotheses development and the conceptual framework of this study which has later been tested with empirical data. This chapter starts with the definitions of the variables identified from the reviewed literature, followed by the hypotheses developed from the literature and supported by the relational view theory and provided the research model before concluding the chapter.

3.1 Definition of Variables

This study considers supplier collaboration for sustainable performance which considers social, environmental and cost performance. For environment-friendly practices, this study considers product and process related environmental (product stewardship and process stewardship) practices in the supply chain and social practices as socially responsible practices in the supply chain. Supplier collaboration influences environmentally friendly and socially responsible practices that lead to sustainable performances in UK food SCs. Hence, the environment-friendly and socially responsible practices in the supply chain mediate the relationship between supplier collaboration and firms' sustainable performance.

This study argues that Collaboration is established based on a long-term relationship. Once there is a collaboration with the suppliers it is understood that a good level of trust, transparency and mutual dependability is already established. So, this study argues that once there is a collaboration with the suppliers, the focal firm can exert influences on the suppliers to adopt certain practices. So, if the focal firms try to achieve sustainable performance, they can achieve that by collaborating with the suppliers. This study also posits that environment-friendly and socially responsible practices can facilitate supplier collaboration to achieve sustainable performance in the supply chains. Collaborating with the suppliers through relational strength, firms can influence the suppliers' socially responsible and environmentally friendly practices in their as well as their

supplier's operations (2nd tier suppliers) and slowly to the entire upstream supply chains. So, this study takes the stance that collaboration with the suppliers enhances environment-friendly and socially responsible practices in the supply chain which will lead to sustainable performance. Definitions of variables used in this study and their sources are summarised below in Table 3:1

Table 3:1 Definitions of Variables

| Constructs | | Definitions | Sources |
|------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| SCOL | Supplier Collaboration | Supplier Collaboration is the participative direct involvement and monitoring of focal firms with its suppliers in harnessing mutual benefits through collaborative actions including information sharing and flows of supplies. | Based on (Vachon and Klassen (2008), Grekova et al., 2015, Wong et al., 2015) |
| EFPs | Environmental Friendly Practices | Environmental practices are the incorporation of environment-friendly product and process-oriented practices into Supply chains. | Based on (Pullman et al., 2009; Wong et al., 2012, Zhu et al. (2012), Graham and Potter, 2015) |
| SRPs | Socially Responsible Practices | Socially Responsible practice is strongly linked to corporate social responsibility (CSR) which comprises actions not required by law but furthering social good, beyond the explicit, transactional interests of a firm including employee-related and community-related social practices. | Based on (Elkington, 1998, Pullman et al., 2009, Sarkis et al., 2010, Ashby et al., 2012, Gimenez et al., 2012) |
| SFP | Sustainable Firm Performance | Sustainability performance is the combination of environmental, social and economic (cost) consideration in organisational bottom line or sustainable performance in this study. | (Seuring and Müller (2008), Gimenez et al. (2012)) |
| EP | Environmental Performance | Environmental performance can be viewed as the capability of the firms/plants in achieving the objectives set for environmental management efforts that include reducing Co ₂ emissions, water waste, solid waste and to minimise consuming hazardous and toxic materials. | (Zhu et al. (2008b), Graham and Potter (2015)) |
| CP | Cost Performance | Cost performance which denotes the financial dimension of sustainability refers the savings on purchasing price and process prices in the SCs. | Luzzini et al. (2015) |
| SP | Social Performance | Social performance can be seen as the improvement of health and safety and overall welfare of employees, community and society as a whole. | (Bansal (2005), Maloni and Brown, 2006, Paulraj et al. (2014)) |

From the scholarly evidence presented in this study, the following section will present the hypotheses and theoretical framework of this study.

3.2 Hypotheses Formation and Theoretical Framework Development

To develop the hypotheses, this study adopted the lenses of RV theory which has been used in the supply chain collaboration and SSCM literature (Simpson and Power, 2005, Carter and Rogers, 2008, Cao and Zhang, 2011). The RV takes networks and dyads of firms into consideration to explicate relational rents (Sancha et al., 2015). Relational rents are generated as a result of collaborative activities in which associates can interchange valuable knowledge and competencies through relation-specific investments, inter-firm knowledge-sharing routines, complementary resource endowment and effective governance mechanisms (Cao and Zhang, 2011). By collaborating, firms can generate a unique competitive advantage that they cannot get in isolation.

It is evident in the previous literature that collaboration with the suppliers does improve organisational performance. Previous studies suggested that collaboration with the suppliers, the firms can achieve improved performance. For example, Kähkönen et al. (2017) found that collaboration with the suppliers does improve the focal firm's innovation performance. Mandal (2017a) found supplier collaboration enhances performance in hospital supply chains. Lockström et al., (2010) suggested that to supply chain performance can be improved through supplier collaboration. However, McIvor et al. (2006) reported a mixture of positive and negative impact on performance due to supplier collaboration. This study thus proposes that supplier collaboration have the impact of the sustainable performance. Hence, the following hypotheses are posited.

- **H_{1a}= Supplier collaboration positively impact on firms' environmental performance**
- **H_{1b}= Supplier collaboration positively impact firms cost performance**
- **H_{1c}= Supplier collaboration positively impacts on firm's social performance.**

This study also considers that when buyer firms collaborate with their suppliers, they can have improved environmental and social practices in the SCs which will lead to improving relational rents (sustainable performance). Relational rents will be the results of firms' social and environmental practices which are better facilitated with firms' collaborative relationships with its suppliers. According to RV, supplying firms is the external source of resources and valuable knowledge that increase relational rents in the form of increased performance (TBL). Based on the relational view and above evidence from the literature, it can be deduced that supplier collaboration will enable firms' social and environmental practices which will lead to improvement of their social, environmental and economic performance.

The RV recommends that the outcome of the joint work between two partners (buyer and supplier) generates mutual benefits. This suggests that by working collaboratively on improving social and environmental practices, increase not only buyers' performance but also suppliers' performance as well. Supplier collaboration contributes to firms' product-related environmental practices (Product stewardship) to reduce waste, to save energy as well as to decrease environmental impact in all the process of the supply chain (process stewardship)(Wong et al., 2012). Through collaboration, real-time information will be shared for inventory, sales, forecasting, transportation, warehousing, temperatures of the Lorries/vehicles, dates of the products and so on. This mutual communication help reduces unnecessary waste in the food supply chains. In collaboration, suppliers can monitor the waste in every stage and through improved communication with the employees, through providing training to the employees for waste reduction and recycling wastes wherever possible(Graham and Potter, 2015). Also, firms can enhance practices that can reduce solid waste, they can invest in new technologies for product development to reduce waste, and they can also enhance their date checking practices of products through collaboration which will enhance waste reduction related practices in the supply chain(Rao and Holt, 2005). Simultaneously, through improved collaboration practices with the suppliers, firms can enhance their resource saving related

environmental practices. For example, they can monitor and improve (if necessary) energy uses during productions in the supply chains, proper communication can be established in buyers and suppliers firms for energy saving, training could be provided or another necessary measure could be taken if necessary to enhance resources saving related environmental practices in the supply chain (Graham and Potter, 2015).

Wagner and Hoegl (2006), highlighted that supplier involvement in New Product development (NPD) means the combination of buyers -suppliers R&D resources and utilisation of joint capabilities through strategic integration. Firms' abilities on social and environmental practices rely on the supplier's resources and competencies as well as the relational strengths of the partners. Hence, to engender inter-firm competitive advantage through collaborating with suppliers requires the firms to build up and preserve appropriate routines (environment-friendly and socially responsible practices) to collaboratively work with the suppliers who have complementary resources in the supply chains (Dyer and Singh, 1998).

Collaborating with the suppliers, a firm can also enhance its process stewardship. Process stewardship is process-oriented environmental management practice that focuses on reducing the environmental impact of the supply chain processes starting from production, distribution, and end of life management (Wong et al., 2012). Through collaboration with suppliers, firms can design production processes to reduce the consumption of resources in operations; they can deploy environmental technologies to preserve the environment throughout the process. They can control carbon emission, use cleaner means of transportation and they can also take back products for recycling from the market(Wong et al., 2012). So, supplier collaboration enhances these products and process related environmental practices (Product and process stewardship), and thus the following hypothesis is processed-

- **H_{2a} = supplier collaboration positively influences the environment-friendly practices in the UK food SCs.**

Simultaneously, supplier collaboration helps improve product and service quality, reduce cost and bring efficiency in the delivery of the products and services (Sancha et al., 2015). Also, collaboration creates synergies between the firms' activities which also assist social practices in the supply chain. Social practices by the focal firms in the supply chain makes the employees motivated because they believe they work for a more socially responsible organisation (Gimenez et al., 2012). Supplier collaboration due to a better mutual relationship can influence socially responsible practices in the food SCs. This means that through collaboration, the focal firm can exert pressures on suppliers to enhance their socially responsible practices and facilitate social practices for the focal firms. In this way, supplier collaboration influences socially responsible practices in the supply chain. Hence the following hypothesis can be posited.

- **H_{2b}= Supplier collaboration positively influences the Socially responsible practices in the UK food supply chains.**

Theoretical development of the RV shapes collaborative paradigm in the SC literature. This paradigm suggests that firms function within a structure of inter-dependent relationships established and nurtured through strategic integration. The prime importance of the research related to this view emphasis on actions relating to supply chain performance (Vachon and Klassen, 2006) such as improved quality, lower costs, enhance response time, improving social, economic and environmental performance. Vachon and Klassen (2008) stated that the value of collaboration in the SCs comes from the possibility of inter-firm learning. Inter-firm learning, which comprises a problem- solving routine combining supplier and customers, can be developed in the SCs and it can encourage extra competencies in the organisation (Dyer and Singh, 1998).

The RV of the firm advocates for idiosyncratic inter-firm associations that are key to achieve competitive advantage (Dyer and Singh, 1998). Relational rents referred to the supernormal profits made mutually by exchange relationships which a firm cannot generate alone and can be created by combining idiosyncratic resources, knowledge, and competencies of the firms. When firms

communicate in a way that expedites mutual knowledge sharing and synchronised actions (Dyer and Singh, 1998), the synergistic consequence of bundled assets is a source of competitive advantage. RV has traditionally been focusing on strategic associations and longstanding partnerships (Zacharia et al., 2011).

Businesses in the food supply chain receive pressures from various stakeholders to lessen environmental damages of their products and operations. Pullman *et al.* (2009) noted that environmental practices in an organisation help reduce products, purchasing, manufacturing, packaging, distribution-related impact of the organisation and thus improve environmental performance. Also, the food sector is facing massive challenges with food waste which damage the environment also make the food SC unsustainable. Food system(manufacturing, logistics and retailing) has a significant contribution to the Green House Gas (GHG) emissions amounting around 15-28% total GHG emissions in developed countries and is rapidly increasing in developing countries(Li *et al.*, 2014). If an organisation is caring to the environment, they proactively communicate and establish a relationship with their upstream partners in the supply chain (the suppliers) in various aspects including information sharing, mutual planning, forecasting to reduce the environmental impact of their mutual operations and so on. This positive impacts on achieving environmental performance.

Based on previous literature, it can be understood that environmental practices help reduce food waste, CO2 emissions, energy consumptions, harmful materials usages and thus enhance environmental performance. Hence, the following hypotheses can be posited:

- **H_{3a}= Environment-friendly practices positively influence the environmental performance in the SCs.**

The environmental practices are product and process related stewardship (Wong et al., 2012). While product stewardship considers minimising the environmental impact of the products in every stage

of product development including product design, packaging, and materials used through using renewable materials and avoiding hazardous substances (Wong et al., 2012), process stewardship, in contrast, is a process-oriented environmental practice that aims to reduce negative environmental impact in all stage of the SC processes ranging from production, distribution, and end of life product management (Wong et al., 2012, Graham and Potter, 2015). Product and process stewardship related environmental practices put emphasis on waste reduction and resource savings activities in food supply chains that involve the environment-friendly design of packaging, protective packaging for transportation, developing products that use less energy, fewer materials with extended product life and recyclable and reusable. That's how, the environment-friendly practices enhance the cost performance of the firm by reducing energy usages, recycling and reusing practices and eliminating wastes in the organisational practices. Hence, the following hypotheses can be posited:

- **H_{3b}= Environment-friendly Practices Positively influence Cost performance.**

Environmental practices also enhance social performance through fostering environmental practices that are linked with the community and social well-being in the society. The business organisation is a social entity. Every action an organisation takes to reduce ecological impact directly or indirectly affect the societal wellbeing. For example, reducing food waste in the supply chain helps reduce the environmental effect and at the same availability, time enhances the of those foods for the community or perhaps sending where there is a need for that foods. So, environment-friendly practices in the food supply chain are also for the betterment of society. Hence, the following hypotheses can be posited:

- **H_{3c}= Environment-friendly practices positively influence social performance.**

Based on RV, Lavie (2006) noted that firms could invest in a relationship that facilitates them to make relation-specific assets instead of firm-specific. This relational rent might be the relation-

specific assets, knowledge sharing routines, complementary resources or effective governance (Dyer and Singh, 1998). So, the aim of RV is creating inter-firm resource advantage or performance (Blome et al., 2014). Particularly, this research alludes to rents that may arise through the supplier collaboration for socially responsible and environmentally friendly practices of the firms in the supply network by focusing on environmental, cost and social performance as the relational rents.

Previous studies also deployed the relational view to explain the performance effect of SC collaboration in the field of sustainability (Vachon and Klassen, 2008, Blome et al., 2014). RV advocates that key resources can be spread outside the firm boundaries and relational rents can be achieved when the partners combine and share resources, knowledge, and competencies through relation-specific investments, complementary resource endowments and effective governance mechanisms (Cao & Zhang, 2010)(Rota *et al.*, 2013). Hence, *Lavie (2006)* argued that a relational rent could only be extracted from shared resources and through shared practices among the partners. Social practices by the firms in the supply chain helps employees to be motivated to enhance their environmental practices and to result in environmental performances. Socially responsible practices also enhance employee morale and boost their productivity which results in cost reduction. Also, health and safety practices in the organisation help enhance employees' satisfaction, through better products and services for customer satisfaction and thus improve social performance. So, based on this, the following hypotheses can be proposed.

- **H_{4a} = Socially responsible practices positively influence environmental performance.**
- **H_{4b} = Socially responsible practices Positively influence Cost performance.**
- **H_{4c} = Socially responsible practices positively influence social performance.**

The RV postulates inter-organisational relationships as a source of competitive advantage and relational rents created by dyad in collaboration. Relational rents can be derived through uniting complementary and related assets and capabilities, learning and knowledge sharing (Grekova et al.,

2015). Mutual competitive advantage created through supplier collaboration has the dimension of innovation, quality, process efficiency, flexibility and other business synergies(Cao and Zhang, 2011) including environmental, cost and social performance. So, supplier collaboration creates a synergy between suppliers and buyers for social and environmental practices that may lead to enhance environmental cost and social performance.

While it is argued in the literature that supplier collaboration enhances firms' sustainable performance. However, the supplier collaboration will not automatically improve environmental, cost and social performance without having certain environment-friendly and socially responsible practices in place. In spite of having the collaboration with the supplier, the firms might not be able to enjoy the relational benefits because of inefficient utilisation of partners resources in the organisational practices (Blome et al., 2014). It is suggested that collaboration with the suppliers facilitate firms leveraging mutual resources for effective environmental practices in the supply chain which will lead to improving environmental performance, save organisational costs and enhance the social performance of the company. Hence, the following hypotheses are proposed-

- **H5a= Environment-friendly practices mediate the relationship between supplier collaboration and environmental performance**
- **H5b= Environment-friendly practices mediate the relationship between supplier collaboration and Cost performance**
- **H5c= Environment-friendly practices mediate the relationship between supplier collaboration and Social performance**

It is argued in this research that the benefits of supplier collaboration can only be pursued by the firm, once environment-friendly and socially responsible practices are in place. It will, however, not generate better performance when there is a collaboration with the suppliers, but the firms cannot

use collaborative resources in their operational practices (environment-friendly and socially responsible). So, to achieve sustainable performance by collaborating with the suppliers, the firms need to have socially responsible practices along with environment-friendly practices in place. In other words, environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and sustainable performance in the UK food supply chains.

Through collaborating with the suppliers, the focal firm can improve its socially responsible practices including recruiting local employees, supporting the community, providing training on health and safety practices for employees, maintaining the foods quality and nutritional values and so on. This practice will improve social performance in the supply chain. Socially responsible practices such as such as responsible sourcing practices, fewer consumptions, savings will help save costs in the supply chain. Social practices are concerned with the management of social resources including employee's skills, expertise, institutions, relationships and social values(Sarkis et al., 2010).

Collaboration with the suppliers facilitate socially responsible practices such as employee development and providing training on environmental issues for their capability development, will help improve their environmental knowledge resulting in environmental performance. So, this study examined the impact of supplier collaboration on environment-friendly as well as socially responsible practices which will lead to Sustainable performance. This study thus proposes that socially responsible practices also mediate the relationship between supplier collaboration and the environmental, cost and social performance. Thus, the following hypotheses are anticipated-

- **H6a= Socially responsible practices mediate the relationship between supplier collaboration and environmental performance**
- **H6b= Socially responsible practices mediate the relationship between supplier collaboration and Cost performance**
- **H6c= Socially responsible practices mediate the relationship between supplier collaboration and social performance.**

Based on the literature review and proposed hypotheses, the theoretical research framework for this study is depicted in Figure 3:1.

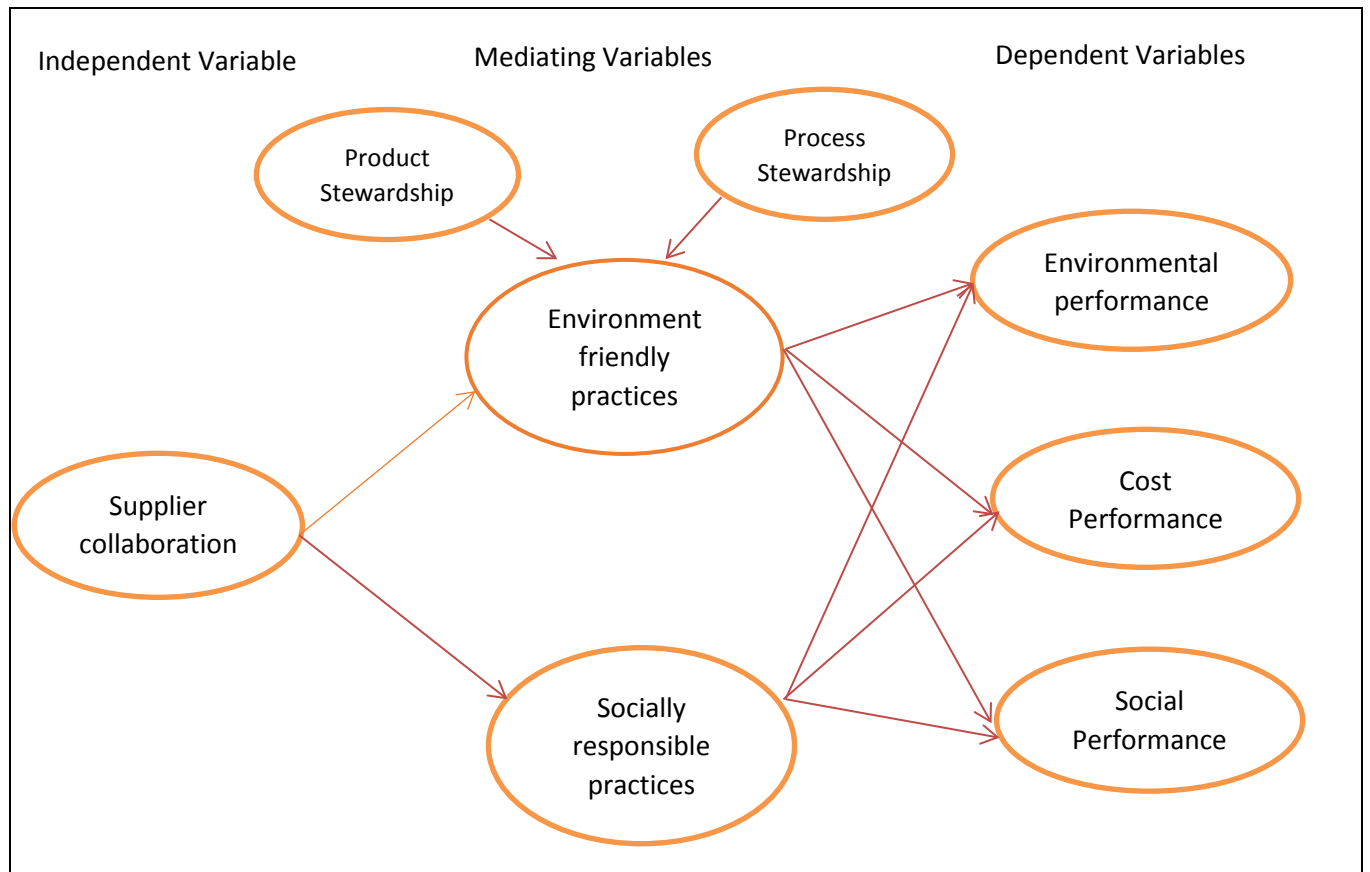


Figure 3:1 Research Framework

3.3 Chapter Summary

This chapter started with defining supplier collaboration, environment-friendly and socially responsible practices for organisational performance. The theoretical underpinning of this study, RV, has been explained to demonstrate the relevance of utilising this theoretical concept to this research. Supplier collaboration, environment-friendly and socially responsible practices in the UK food supply chains has been illustrated. Supplier collaboration, benefits and drawbacks of supplier collaboration, and the factors that affect supplier collaboration have also been critically evaluated. Finally, sustainability concepts focusing on TBL have been described, and organisational performance has been explained by environmental, cost and social performance aspects.

From the literature, it is evident that integrating environment-friendly and socially responsible practices in food SCs have become a necessity to survive in the long run and satisfy wider

stakeholders. Greening the SCs and enhancing social practices is the innovation to achieve competitive advantage and by extension sustainable performance. Environment-friendly and socially responsible practices require time, capability, commitment, and investment. However, individual firms find it difficult to fulfil that alone. Once there is a collaboration with the suppliers then much of them can be shared or at least supported by each other. Through mutual collaboration firms can enhance their social and environmental practices in the supply chains.

RV is used as an underpinning theory in this research. This implies that relation-specific assets can enhance relational rents (Dyer and Singh, 1998). In other words, a strong relationship or collaboration with supply chain partners can enhance performance (relational rents). This study proposes that collaboration or strong relationship with suppliers enhances firms' sustainable performance. Also, this study also proposed that environmentally friendly and socially responsible practices mediate this relationship. That means firms collaborate with their suppliers to integrate mutual activities (i.e. information sharing) which strengthen their relationships. This mutual relationship helps firms to enhance their social and environmental practices in the supply chain, and this social and environmental practice in return enhances a firm's sustainable performance.

Firms collaborate with their suppliers for environmentally friendly and socially responsible practices. However, research in supplier collaboration for enhancing environment-friendly and socially responsible practices is limited in the literature. Though there are a few studies on environmental practices on performance, but the results are inconclusive whether environmental practices improve performances (Zhu and Sarkis, 2004; Rao and Holt, 2005; Green Jr et al., 2012; Laari et al., 2016) having arguments from both the positive and negative performance outcomes. There were dissimilar components in measuring firm performance in previous literature as well. Tseng et al. (2015) claimed that environment-friendly practices and firm performance had been comprehensively studied, but firms are unlikely to perform well without depending on the resources of partners in the supply chain. The dependence of focal firms on their partners in the supply chain has become

critical due to the scarcity of their resources such as technological know-how, knowledge, and expertise, human and financial resources (Lee et al., 2012; Huang et al., 2015).

To minimise risks and complexities in the supply chains that are dispersed in various parts of the world, firms need to collaborate with their counterparts to improve firm performance. That is why the relational view was used in this study to understand the relational strength of the collaboration and its impact on performance implications. In this study, performance will be measured considering TBL dimensions (environmental, cost and social). The following section is dedicated to reporting the methods and the mythologies deployed in this study.

4 Chapter 4: Methodology

4.1 Introduction

Background of the previous studies laid the knowledge base for this research which has been presented through a comprehensive literature review in the prior section facilitating the methodology to be Discussed here. This chapter is dedicated to illustrating the choice of methodology which will help understand and examine the reliability and validity of this study. This chapter also provided the justification of methodology and methods deployed to carry out the research. To perceive the suitability of the research methodology, the assumptions and the philosophical viewpoints are highlighted along with the research design, research approaches and methods deployed in this study. The justification for choosing research methods, questionnaire design and development and ethical issues are presented in this chapter along with the methodological implications of this study. Also, data collection and data analysis together with sampling techniques, questionnaire design, research instruments and measurement scales (reflective/formative constructs) are stated. A short overview of the pilot study which was conducted before the main study to check the instruments and the modifications took place in the pilot study stage are also reported. Finally, this chapter concludes providing the summary of methods and methodologies deployed in this study in a research onion for this study.

4.2 Research Philosophy

For a research study, understanding the philosophical viewpoint and whether it is compatible with the research questions is crucial to deploy a suitable research methodology (Neuman, 2013, Saunders *et al.*, 2016). Easterby-Smith *et al.* (2012) noted three key motivations to understand the philosophy. Firstly, it helps to identify and refine the appropriate research methods to craft research strategy and answer the proposed research questions. Secondly, it facilitates evaluating available methodologies and methods for selecting the suitable ones for the study. Finally, whether the selected research area is appropriate or to be altered is also informed by the philosophical stance

of the researchers. So, it is important to understand the philosophical stance and issues associated with all the stages of the research process (e.g. data collection, analysing and reporting). Saunders et al. (2016) stated positivism and interpretivism as the two key research paradigms, and Bryman (2012) reported that these two paradigms had been the centre of debate among the scholars in the field of social science.

Research paradigm, according to Tashakkori and Teddlie (2010), is a set of beliefs that includes the proposed theories of a bunch of scholars to understand the underpinning research methods and their interpretations. Philosophical attachment and beliefs of the researchers significantly shape approaches in social research. Easterby-Smith et al. (2012), emphasised in understanding the importance of philosophical view in the research process. The philosophical preferences and beliefs formulate ontological base for the researchers.

4.2.1 Ontology

Ontology is the nature of reality (Saunders et al., 2016) and the researchers' worldview. Ontology is a Greek word came from 'Onto' means being, and 'Logos' means 'discussion, study or theory'(Johnson and Duberley, 2000). The ontological assumption is associated with the nature of being, reality and truth that exists (Bryman, 2012). Ontology resolves the concerns about what is in existence and what is assumed to be. Saunders et al. (2016), claimed that ontology raises concerns of the researcher's suppositions about the way the world is operated and their views in this regard. Ontological questions mainly raise two views one is as the reality exists through the experience of it and the other is as the reality exists independently.

Saunders et al. (2016) explained two aspects of ontology as objectivism and subjectivism. The objectivism is presumed that the natural and social reality is in existence irrespective of human understandings, opinions, and beliefs. So, the social phenomena and the research are distinct from each other. In contrast, subjectivism believes that social phenomena are created and influenced by social actors. It views that the reality is seen through the eyes of individuals as it is subjective and

varies depending on the contexts. While Objectivism refers the existence of social entities, in reality, external to social actors irrespective of their existence but subjectivism portrays that social phenomenon is derived from the perceptions of social actors and their consequent actions which social entities are concerned about their existence (Bryman and Bell, 2015).

An Objectivist ontology researcher likes to work with an observable social reality to bring out research findings which then can be generalised. In contrary, subjectivist ontology academics would like to study the situation holistically to perceive the reality or perhaps the underlying reality. How this reality or knowledge can be measured or what constitutes acceptable knowledge of that reality is in the domain of epistemology.

4.2.2 Epistemology

In research what forms acceptable knowledge is epistemology. Epistemology is the study and theory of knowledge and the way to understand it. Johnson and Duberley (2000) referred to epistemology as the background theory of knowledge. In other words, epistemology helps systematise and elucidate knowledge related to theories. Epistemological positions determine research methods as it illustrates the possible reliable and verifiable facts (Easterby-Smith et al., 2012) and it can differentiate dissimilar kind of knowledge as well as the way they are presented. There are several philosophical positions in the literature, including positivism, interpretivism, realism, critical realism, social constructionism and so on, which a researcher can assume depending on their ontological and epistemological predispositions. Thus, the methodological approach for a study is impacted by the ontological and epistemological beliefs of the researcher.

4.2.3 Axiology

Axiology which is a branch of philosophy refers to the individual judgment about the value (Saunders et al., 2016) because it is the individual value that dictates their activities. It is important for the researcher to understand the values and reflect on these values to shape the research process at every stage. Individual values help decide the research topic and research method. This is, in fact,

the demonstration of axiological understandings and skills. Using a survey technique to collect data instead of interviews would be seen as a value-based judgment. In this instance, it may be seen that collecting a larger dataset is preferred to have rich personal interactions. Hence, being thoughtful of own values in research and clarification is also part of the research process. It helps to strengthen transparency, reduce bias, justify the research choices and clarifies the personal value statements.

4.2.4 Positivism

Positivism is a popular philosophical stance in social science and is mostly associated with truth and reality. Neuman (2013) noted that one of the reasons for the wider acceptability of Positivism in social sciences because it facilitates the scientific technique of investigation. Collis and Hussey (2013) stated that positivism deals with examining human behaviour, attitude and activities numerically and measure them using a scale, range, and frequencies. Positivism is consistent with the theories, variables, hypotheses and numerical numbers which is supported by the statistical data analysis techniques (Neuman, 2013). He stated that scholars look for precise measurement scales and examine the causal hypotheses quantitatively for analysing the facts.

Quantitative data analysis technique usually tries to explicate and envisage about the present happenings in the social world, evaluate them and provide acceptable justification based on the facts and figures (Neuman, 2013, Saunders et al., 2016). According to Collis and Hussey (2013), Quantitative study mostly aligned with the positivist paradigm. Positivism believes in the objective nature of the data, and they view the reality exists independently of human observation which can be measured quantitatively. Researchers prefer to deploy scientific methods to investigate a social phenomenon to have reliable and valid data which can then be statistically analysed and reported (Tashakkori and Teddlie, 2010, Bryman and Bell, 2011).

Selection of research method (s) is linked with the philosophical stance of the researcher. Positivism paradigm supports the deductive approach which is theory testing related and interpretivism paradigm also known as phenomenology supports an inductive approach which is theory building

related (Easterby-Smith et al., 2012). The Positivists hold the view that research in management science engender laws which will administer the way an organisation should operate (Johnson and Duberley, 2000, Creswell, 2013). Generating a causal relationship facilitates managers to predict and control their environments more scientifically. Hence, it is imperative to comprehend the debate related to methodological paradigms before selecting the right method as their suitability may vary depending on the circumstances (Creswell, 2013).

4.2.5 Interpretivism

Interpretivism paradigm has also received significant attention in social research. One of the reasons could be attributed to the weaknesses of the positivist paradigm, for instance, the limitations of the availability of advanced statistical tools (Sekaran and Bougie, 2016). In the academia, there is a suggestion that studying social phenomenon helps form a belief, and the world cannot be perceived by objective reality. It should, however, need subjective understandings on human behaviour, interpretations, and experiments (Bryman and Bell, 2011, Neuman, 2013).

The researcher has individual interpretations of a phenomenon based on their subjective knowledge and experiences, and their viewpoints become comprehensible in their writings (Neuman, 2013). Through their viewpoints, the researchers can exert their understanding of how each part of the writing represents the complete phenomenon. According to Johnson and Duberley (2000), It is normally believed that the true meaning of a phenomenon hardly ostensive on the surface, however, in reality, it is mostly a dormant one. Hence, the scholars strive to understand and explain interpretively to construct a meaningful understanding of the complete phenomenon.

Interpretive paradigm is viewed by most researchers as qualitative research that is associated with exploratory research in data collection, observation, and interpretation to have a deep understanding of the phenomenon (Neuman, 2013). It facilitates in the understanding underlying meaning of a phenomenon and having a rich knowledge on that as the collected data is gathered with human interaction and direct involvement of the researcher.

For interpretive research, It is time consuming, costly and it requires direct personal contacts with the participants. Thus, these make it challenging to handle. Hence, it is evident from the understanding of both positivist and interpretivist viewpoint is that they are mutually exclusive and both have their advantages and disadvantages(Easterby-Smith et al., 2012, Saunders et al., 2016).

Distinctions between positivism and interpretivism paradigm as highlighted by Easterby-Smith et al. (2012) are outlined below.

Table 4:1 Distinction between Positivism and Interpretivism Paradigm

| No. | Positivism | Interpretivism |
|-----|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Positivists view the world is external to the reality and Objective. | The interpretivists view the world as socially formed and subjective. |
| 2. | In positivism, the researcher is not a part of what is observed, and the science is value-free in positivism. | The interpretivists view that the researcher is a part of what is observed and human interests drive the scientific reality. |
| 3. | Researchers in positivism emphasise facts, try to establish causal relationships and vital laws. | In interpretivism, the researcher emphasises the meanings and tries to perceive what is happening. |
| 4. | The researcher breakdown the phenomena into smallest parts articulates hypotheses and examining them. | The Interpretive researchers try to perceive the situation as a whole and induce ideas derived from the data. |
| 5. | The sample size is usually large, and the measurement took place single operationalising concept into measurable items. | Interpretive researcher deploys various methods to conceive the concept. The sample size is relatively smaller, but in-depth, meaningful understanding is a shout. |

4.2.6 Pragmatist Paradigm

Though quantitative and qualitative research paradigm has different features and focuses, they can, however, be deployed mixing pragmatically to study complex social issues (Bryman and Bell, 2011).

Pragmatist approach as Tashakkori and Teddlie (2010) noted, consists of with qualitative and

quantitative research. By combining both the approaches, the researchers seek to establish cross-validation and authentication of collected data and subsequent findings. Saunders et al. (2016) stated it is a pluralist phenomenon as a pragmatist view requires epistemological justifications of key research questions. A comparison of a different paradigm based on Tashakkori and Teddlie (2010) is presented in the below Table 3:2.

Table 4:2 Distinctions between Positivism, Interpretivism, and Pragmatism

| | Positivism | Interpretivism | Pragmatism |
|----|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1. | It usually focuses on quantitative methods | It deploys qualitative methods | Pragmatism combines qualitative and quantitative methods |
| 2. | It supports the deductive research approach | It supports inductive research approach. | It combines inductive and deductive together (abductive as suggested by Saunders et al. (2016)) |
| 3. | It supports objectivist epistemological viewpoint where the researcher and the research is separate | It supports the subjectivist epistemological stance where the research is a part of the research. | Objectivist and subjectivist approaches are amalgamated here. |
| 4. | The researchers look for cause and effect relationship or causal linkages in this paradigm | It is not usually possible to examine cause and effect relationship using this paradigm. | Researchers try to achieve cross validation here. |

In the above Table 3:2, it is clear that having pragmatist approach is about combining both the quantitative and qualitative methods to achieving cross-validation and it is useful when the phenomenon in context complex nature and a single approach is not enough to answer the proposed research questions and their justifications. It is a common practice in the literature to used mixed research methods to solve complicated research problems. However, Tashakkori and Teddlie (2010) argued that the dependability and validity of the outcome are challenging when

relying on any of these methods without proper understandings of the problems as contextual factors and complexities of the phenomenon is crucial.

4.2.7 Research Philosophy in SCM Research

In Supply chain management research, positivism viewpoint has played a key role (Mangan *et al.*, 2004, Golicic and Davis, 2012) because of its multidisciplinary nature of the field. In Positivism philosophy, usually, a deductive approach is used to develop a research model and to test hypotheses which were proposed based on reviewing literature deploying statistical methods. Hence, the fundamental of positivism is testing hypotheses from empirical data (Bryman and Bell, 2015). Besides, Golicic and Davis (2012) stated that logistics and SCM management researchers have predominantly used quantitative methods which reflects the positivist paradigm. In contrast, Mangan *et al.* (2004) cited that in logistic research a non-positivism viewpoint provides a crucial advantage for managerial insights instead of direct interpretation. However, the nature of this research supports a positivism angle considering that the Knowledge is out there and can be observed in reality through an organised approach.

4.2.8 Philosophical Stance of this Study

The philosophical underpinning of this research is directed through the ontological and epistemological dimension discussed above. Rigour of a particular study is influenced by the philosophical preference of the researcher and the selection of research methodology (Appleton and King, 2002) which has been selected based on research objectives. Research is a systematic process of data collection and interpretation to fulfil a definitive purpose. The principle of positivism, an objectivist paradigm (Grubic and Fan, 2010), is reflected in the philosophical underpinning of this study as the nature of the research dictates that the knowledge and reality can be observed and empirically examined (Bryman and Bell, 2011). The epistemology of positivism reflects the preference of the researcher to work with observable social reality in a value free-way (Saunders *et al.*, 2016). Some notable features of positivism philosophy in the literature as the

observer is independent, human interest is unrelated, causality should be illustrated in explanations, research involves hypothesis and deduction, concepts are measurable, analysis units are simple, generalization can be made via statistical likelihood and samples are large (Porter, 1980) (Porter, 1980) (Porter, 1980) (Porter, 1980) (Porter, 1980) (Porter, 1980) (Porter, 1980) (Porter, 1980) (Porter, 1980) (Porter, 1980).

However, Mangan et al. (2004) mentioned that a phenomenological paradigm which predominantly uses qualitative methodologies had drawn increased attention in research. This paradigm emphasises meanings instead of facts, hence the depth of understanding of small samples. This study, however, attempts to test the relationship between the study variables. These variables are derived from the comprehensive review of the literature in the domain, and the aim of this study is not to create a new theory rather expand the existing one (RV). This research intends used a questionnaire survey to collect data because the facts and figures are needed to test the relationship but not the inherent and in-depth meaning. Also, this study is expected to generalise the results in a similar setting though collecting data from a relatively large number of samples. Hence the research philosophy is justified.

4.3 Research Approach

Two types of research approaches namely deductive and inductive are highlighted by Saunders et al. (2016). These approaches are different and in many cases are opposite to each other. It is crucial to understand both the approaches to select the right one which will enrich the practicality of the study. Aligning the correct research approach with the research philosophies is crucial. For example, a deductive approach is mostly aligned with the positivist philosophy whereas inductive approach mostly supports the interpretivism. However, labelling these approaches is potentially misleading and may not provide any real value (Saunders et al., 2016). Differences between both the approaches and the research approach adopted in this study are presented below.

4.3.1 Deductive Approach: Theory Testing

Deduction mostly aligned with what we consider as scientific research. In deductive approach, the scholars usually test prevailing theories and concepts to validate the association among the variables or in other words; it involves the development of a theory based on a rigorous test (Saunders et al., 2016). Deductive approach is related to positivism paradigm, and it starts from developing a theory, hypothesis, and experiments after collecting data and information and finally confirmation or modification of the theory (Bryman and Bell, 2015). Hence it is a leading approach in natural science studies where the laws are the base for clarifications, phenomena to be anticipated, predict their happenings and allow them to be controlled (Collis and Hussey 2003).

One of the important features of the deductive approach is to explain causal relationships between the variables. Bryman and Bell (2011) noted that explanatory studies mostly attempt to establish associations between the variables and develop a set of hypotheses to test them. To test the developed hypotheses, the quantitative data collection (another feature of the deductive approach) is required. To ensure reliability, structured methodologies to be followed to facilitate replication. To enhance the scientific rigour, deductive approach suggests that the researcher should be independent of what is being observed. It also dictates that the concepts under study should be operationalised in such a way that allows the facts to be measured quantitatively. The principle of reductionism is to be followed to break down the concepts in the simplest measurable elements.

Another important feature of the deductive approach is to generalise the findings. To generalise the findings, it is required to have a sample size of sufficient numerical size. In the positivist viewpoint, the researcher mostly used deductive approach to examine theories, collect data develop and test hypotheses.

4.3.2 Inductive Approach: Theory Building

In an inductive approach, the researcher tries to understand and feel the nature of the problem by interviewing the respondents (Zikmund, 2002; Yin, 2009).

| The deductive approach to research | The inductive approach to research |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Deductive approach is related to positivism paradigm. It begins with a theory to create hypotheses which will be tested based on the collected data and information to prove their acceptance and solve the intended problems. | In Interpretivism paradigm inductive approach is used. The predefined theory is not essential here, but the researcher instigates tentative hypotheses and defines a theory based on observed data and information to resolve research problems. |
| Deductive approach generalises the result from specific findings. | This approach describes specific results from general findings. |
| The process of the deductive approach starts from an existing pre-defined theory, hypothesis, and experiments after collecting data and information and finally confirming the theory. | Here observation comes first, then formulating propositions to create a theory. |
| The studies that follow scientific rules can use the deductive approach to understand facts and figures. | Inductive approach is mostly to understand and interpret the meaning of the phenomena where scientific usage is subjective. |
| Techniques of Statistical data analysis can be used here | Usually, no tools for analysing data in a statistic format are used here. |
| The deductive approach ensures the reliability and validity of the data. | This approach focuses on the richness of the data. |

The researcher attempts to build theories based on the collected results (Sekaran and Bougie, 2010). In Interpretivism paradigm, the inductive approach is mostly used, and it helps bring out a new theory (Easterby-Smith et al., 2012, Saunders et al., 2016). While theory testing is related to quantitative research but theory building is supported by qualitative research (Bryman and Bell, 2015). The distinctions between the two approach and the selected research approach for this study is presented in Table 4:3

4.3.3 Research Approach Adopted in this Study

To choose the right research approach, it is useful to highlight the brief distinctions between the approaches displayed in Table 4:3. A comprehensive discussion of the research philosophy helped to understand the suitable research approach for this study. The nature of this study is to explain the causal relationships between the study variables and test the proposed hypotheses developed based on the existing theories. Also, this study is collecting data through a survey from a relatively large number of participants and the results are expected to be generalised. Hence, the deductive approach is the most suitable approach for this study because the theoretical framework and the hypotheses are developed based on reviewing the extant literature in the species research domain (Creswell and Clark, 2011, Saunders et al., 2016). Also, the ontological ground suggests that the objectivism dictates the social facts. The researcher is independent of what is being observed.

Moreover, this research is aimed at experimenting with existing theory (relational view). This study used quantitative methods to collect data and analyse them, the purpose of the study is not to create a new theory but to extend an existing one. Bryman and Bell (2015), Illustrated deduction process as the following diagram mentioned.

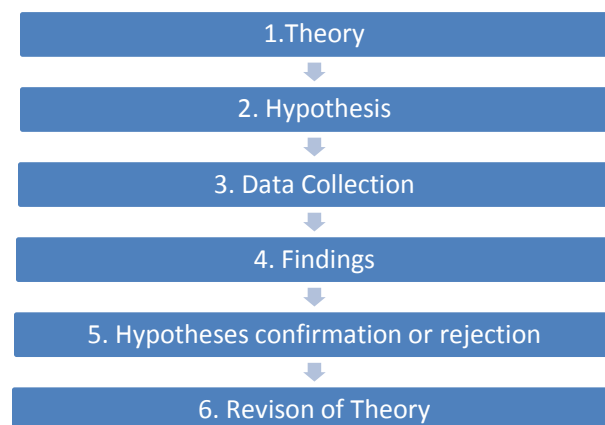


Figure 4:1 Deduction Process

This study is explanatory research as it focuses on measuring the relationship between the proposed variables (independent, mediating and outcome) and draw conclusions which then can be generalised in other similar settings. A set of hypotheses has been proposed based on the review of

extant literature, and a theoretical model is constructed using the lens of the relational view theory. This study aims to deduce findings based on the predestined theory instead of creating a new one (Creswell, 2013, Saunders et al., 2016). This study mostly aligned with the deductive approach as it investigates to measure the relationships between the variables and the ontological assumption of the researcher is that objectivism is necessary to understand social issues. The data for this research was collected from food business in the UK which may be used for generalisation purposes.

4.4 Research Methodology

The epistemological stance of this research is taken by the choices made at the ontological level of the research facilitating suitable study context in which methodology is theorised. The ontological stance of this study is that the truth or reality exists out there irrespective of researchers influence. The epistemological position of this research aligning with positivism viewpoint is the known knowledge in the study domain and gathering the various perspectives of that knowledge to fulfil the research objectives. This is selected not only to develop new knowledge but also providing a better understanding of the study area on supplier collaboration for a sustainable performance taking UK food SC as a study context.

Therefore, this research endeavours to empirically test the influence of supplier collaboration on environment-friendly as well as socially responsible practices and sustainable performance in the UK food supply chains. That means that this research inspects the reality that is in existence without the researcher's influence and that is needed to be investigated systematically.

To understand the methodological stance of this study, the philosophical viewpoints to be understood as different viewpoints have different methods of conducting research. It is also crucial to understand the philosophy so that it can suitably be applied to the research questions and contexts. Some research approaches and methodologies are suggested to choose from to examine

the research phenomena. A study can be of quantitative, qualitative or the mix of both in nature and this is determined by the research objectives and questions are under investigation.

The qualitative study tends to understand the real-world experience of people or situations and the researcher is in control of understanding the phenomenon and the data is gathered mostly through observations or interviews with open-ended questions. The purpose here is to build theory from the collected data. Though the qualitative study provides the opportunities to exert flexibility in understanding and explaining the investigated phenomena, subjectivity is the concern that needed to be tackled.

The quantitative study, on the other hand, is aligned with the positivism viewpoint where reality is perceived to be in existence outside the researcher's influence. Hence, the data is collected objectively to predict, compare or to examine relationships based on the collected data and where the researcher has little influence on the outcome. This is supported by the positivism viewpoint and deductive approach as discussed earlier. Here, the researcher and the reality have little interaction during data collection and analysis process as they are treated as separate units. The survey questionnaire is the most common method to gather data from a relatively large population to comprehend the cross-sectional status of the study at a certain point in time. The following section highlighted the distinctions between the quantitative and qualitative research followed by the justification of using a quantitative method for this study.

4.4.1 Quantitative vs Qualitative Research

Qualitative research is associated with examining the phenomenon by applying various methods such as interviews, focus groups or behavioural studies. In qualitative research, the researcher tries to get exploratory thoughts from the participants and then analyse this based on the investigation. Qualitative data can be found in a descriptive format. The data are meaningful; however, the researcher needs to interpret the data based on the research purpose. In qualitative research, the interview is the most common methods used to explore particular phenomena.

4.4.1.1 Interviews

Interviews are popular data collection techniques in qualitative research. The interview is defined by (Yin (2009), Bryman and Bell (2011)) as a decisive and intensive discussion between two or more people to gather in-depth knowledge about the study phenomena. Through the interview, the researcher can have a rich understanding of the particular issues to answer the research questions. Interviews are of three types such as structured interview that is used in quantitative research, semi-structured and unstructured interviews are mostly used in qualitative research. Semi-structured interviews are conducted using a standard set of questions where the aim is to have purposeful information to have a better understanding of a particular phenomenon (Creswell and Clark, 2011). According to Collis and Hussey (2013) through semi-structured interviews, similar questions generates a different kind of information from different people. This provides the various perspective of a particular phenomenon whereas unstructured interviews are conducted through posing open-ended questions. Open-ended questions facilitate the respondents with greater flexibility of their responses (Yin, 2009, Saunders et al., 2016). The participants are not bound to answer in a particular way, and the main purpose of this interview is to explore their experiences, feelings, and emotions about a particular issue (Creswell and Clark, 2011).

In contrast, quantitative research generates statistical information based on the survey, experimental research, structured interview or questionnaires. This collected data will then be treated to bring results in the form of understandable numbers, graphs, charts, and diagrams. In quantitative studies, the survey questionnaire is the most common data collection technique. A brief explanation of the survey questionnaire is highlighted below.

4.4.1.2 Survey Questionnaire

Questionnaire as a data collection technique mostly used in descriptive and explanatory studies designs but might not be appropriate for exploratory studies (Saunders et al. 2016). The questionnaire is preferred to interviews as a data collection tool in the business and social science

research as it is convenient, less costly and less time consuming to conduct efficient research (Frazer and Lawley, 2001). Questionnaires can be researcher administered where the researcher collects the responses from the participants or the participant administered where the questionnaires are sent to the participant via post, email, text or using various survey software.

Bryman and Bell (2011) Identified some distinctions between a qualitative and quantitative approach. They noted that the quantitative studies mostly based on facts and figures to analyse and illustrate the phenomena whereas the qualitative studies focus more on examining meanings and words. In quantitative research, the researcher does not need to take part in the research process rather can observe the way social reality exists. Whereas, in qualitative research, the researcher needs to take part in the research to understand and making sense the meaning of phenomenon and explain based on his or her understanding. In qualitative research, there are elements of subjective judgments for which expertise is crucial, and it is prone to bias judgment. However, this can be eliminated in the quantitative research because quantitative research focuses on objective reality, facts, and figures which are analysed and disseminate the results. Quantitative studies are highly structured, but qualitative studies are not. Quantitative data are solid, reliable and scientific, but qualitative data requires interpretation which judgemental. Quantitative studies usually deploy relatively large sample sizes whereas qualitative studies can be conducted with relatively smaller sample size. Through quantitative study, the results can be generalised to the sample characteristics whereas the generalisation is the purpose of a qualitative study. A qualitative study is suitable where the phenomena are unknown, or unexplored but quantitative studies mostly relied on existing theories and tried to prove the relationships based on the collected data

Many authors, i.e. (Kothari, 2004, Burns and Burns, 2008, Saunders et al., 2016) mentioned that quantitative data are more fact-based and scientific than qualitative. Quantitative data can be analysed using statistical techniques as these data are in a numerical form which shows increased objectivity. In contrary, qualitative data is naturally descriptive (Sekaran, 2013). This is a daunting

task for the researcher without being influenced by the subjectivity (the researcher's frame of mind). Collecting accurate information, interpreting and analysing these data framing in the context of the researcher's values and beliefs need a specialist's knowledge. However, qualitative data provide a thorough understanding of the context (Bryman and Bell, 2015). This study is intended to link the relationship between the variables which can properly be depicted to support positivist's epistemology in answering the research questions through quantitative data. That is why a survey questionnaire for data collection is considered suitable for this study.

4.4.2 Justification for the Quantitative Method

The quantitative method which is supported by the deductive approach is usually deployed to verify and validate the proposed hypotheses, test them and generalise the results in similar settings. Collis and Hussey (2013) stated that the quantitative method is the most common method to study business phenomenon as it is based on existing concepts and theories which underpins the research, construct a set of variables and verify their proposed relationships. Neuman (2013) noted that a quantitative study helps to verify, extend or expand existing theories and generalise them.

In social science research, quantitative method is capable of measuring cause and effect relationship among research constructs quickly which is also a reason for its wider acceptability (Collis and Hussey, 2013). Also, this study is examining whether collaboration with the suppliers influences sustainable (environmental, cost and social) performance in the UK food supply chains. This study also looks at whether socially responsible and environmentally friendly practices in the supply chain can mediate the relationship between supplier collaboration and sustainable performance in the UK food supply chains. In other words, this study is to establish a cause and effect relationship between the proposed variables. This study collected numerical data from the respondents through the questionnaire survey and concluded from analysing the collected data using statistical software PLS-SEM. Also, the study is based on existing theory (relational view) and tries to extend the theory.

Furthermore, results from analysing the collected data are expected to be used for generalisation purposes.

4.5 Research Design

Research design has several meanings starting from the narrow to broad (Blaikie, 2011). Creswell (2013), highlighted the experiment at the narrowest level of research design and the most other designs are viewed as compromises. This method of research design is common in typical psychology. However, Blaikie (2011) on the other hand stated that a broader view of research design consists of the plan, structure, and strategy of inquiry apprehended to answer research questions and to control the variance. The important issue is that the approach to research should reflect the requirements of the research questions asked. Various elements of research design need to be considered to answer the research questions (Blaikie, 2011). Hence, it is crucial to craft research design at the beginning and review the plan throughout the process to update as necessary. For this study, the following elements are to be considered – the complete plan of the study, including the variables to be included, the proposed relationship between the variables (hypotheses), the data collection methods and the data analysis process. Blaikie (2011) Suggested that the research design should include what to be studied, why to be studied and how to be studied. What and why elements represent the contexts and the importance of the study respectively and the how elements describe the processes associated with conducting the research. This can be broken down into the research strategy, ontological and epistemological assumptions of the study, data collection sources and the process of data collection and data analysis.

The research design is also referred to as the outline of overall research activities to answer research questions (Porter, 1980, Saunders et al., 2016) to achieve research objectives. Research design consists of clear research purposes, data source and data collection techniques, boundaries and ethical concerns of the research (Collis and Hussey, 2003, Sekaran, 2013). Creswell (2013) highlighted that a research design helps the researcher to understand the research setting, its

limitation, unit of analysis and other issues related to answering the proposed research questions. Positivism viewpoint underpins this research as the objectives will be reflected in the selection of methods. Research design significantly depends on the research purpose which Saunders et al. (2016) classified in three forms as exploratory, descriptive and explanatory.

4.5.1 Exploratory Research

Research that is exploratory tries exploring new knowledge. In other words, exploratory studies try to investigate research problems where there is little prior knowledge is available or limited research has been conducted (Saunders et al., 2016). Neuman (2013) mentioned that exploratory research hypotheses are developed instead of testing, excepting or rejecting or confirming them. In essence, bringing out new ideas and perceptions about any phenomenon is the key focus of exploratory research. The researcher does not know the necessary variables to be studied (Creswell, 2013) instead they need to study to find out the variables. In exploratory research, the researcher is open to different aspects of the problems, tries to gather information through various methods including reviewing extant literature, taking interview from the experts or conducting focus groups (Saunders et al., 2016). The advantage of exploratory research is that it is flexible and open to change as a result of the collected data. This is, however, suitable where the phenomena are not explored before or with relatively little prior knowledge about the phenomena.

4.5.2 Descriptive Research

Descriptive studies represent the nature of the phenomenon of interest and its interpretations. In other words, it facilitates the accurate description of persons, events or issues the way they exist. The researcher in descriptive studies pursues to gather information related to various factors including demography and it mostly deals with counting and frequencies. In descriptive research, it is essential to know the complete picture of the phenomena on which data are to be gathered before the data collection. Neuman (2013) stated that this data could be collected using survey methods for comparative studies or correlation analysis. It is usually deployed to describe the

features of the respondents, their percentages in different categories, average, standard deviation of the constructs and so on. However, descriptive studies cannot explain the mutual relationship among the study constructs (Saunders et al., 2016). Also, it may be criticised for being too descriptive which needs to be evaluated, synthesised and concluded. In business and management research, descriptive studies are well recognised however it should be the means to an end instead of the end in itself. That is, it can be termed as the pioneer to explanation.

4.5.3 Explanatory Research

Explanatory or casual research seeks to investigate the cause and effect relationship between the variables. In other words, it endeavours to test theories based on underlying principles to elucidate, define or envisage the issues under investigation. This research tries to explain the relationship between the variables. To examine the relationship, a set of hypotheses are proposed based reviewing the extant literature and tested to perceive whether there is any correlation or which hypothesis are accepted and which ones are rejected. These processes help to understand the results and generalise in a similar setting. Distinctions among this classification are given in the following Table 4:4.

| Exploratory | Descriptive | Explanatory |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| The exploratory design is a kind of investigation to find out innovative insights and judge them in a new way. | This depicts the actual profile of individuals, a phenomenon or situations. | The explanatory study is designed to find a relationship between variables. |
| It explores the details of identifying problems and solving procedures. | Getting a complete picture of the observable fact before collecting the data is regarded as essential here to | It investigates a fact or a problem to explain the relationship between the variables. |
| This design helps in qualitative approach where in-depth interviews, focus groups, literature searching, and pilot studies | This is mainly used in quantitative research which is based on secondary research, archival records, questionnaire etc. | It can be used in both Quantitative and qualitative research where interview, case study analysis, questionnaire and secondary data are concerned. |
| It allows the researchers being flexible to adopt new insights or results. | Sometimes it is regarded as the extension of or the ancestor to exploratory research or more often a piece of explanatory research. | Here the researcher does not only illustrate the facts but also goes far beyond into evaluating and clarifying why or how it is happening. |

4.5.4 Research Design for this Study

The research questions and objectives navigate the way research is designed and conducted. This study endeavours to develop hypotheses based on existing literature and theoretical underpinnings. Also, it also examined the association of variables. In other words, it endeavoured to understand the cause and effect relationship between the variables in the proposed hypotheses. Hence, an explanatory design is appropriate for the present study. The reasons for this study to be explanatory because of the supplier collaboration, environment-friendly, as well as socially responsible practices and sustainable performance, are relatively known phenomena in the supply chain domain. This study seeks to determine the relationships among the variables in the study. Based on the above

explanation, it is evident that this study developed hypotheses based on the extant literature to test their relationship. Though the study phenomenon is well known in the supply chain world, however, whether supplier collaboration has an impact on all three pillars of sustainable performance is yet to be established in food supply chains. Whether environment-friendly and socially responsible practices can mediate the relationship between supplier collaboration and sustainable performance in the UK food supply chain is also relatively unexplored phenomena. Simultaneously, this study did examine relationships between supplier collaboration for social as well as environmental practices and sustainable performances in the UK food supply chains. So, the explanatory purpose for this research is justified.

4.6 Research Strategies

A research strategy work as a step by step guide by which research questions are answered. Research strategy should look for methodological alignment. Methodological alignment underlines the necessity of connecting methodological choice with the research questions. Easterby-Smith et al. (2012) stated that methodological fit means the internal uniformity of four vital elements of research that includes extent literature, research questions, research design and theoretical contribution.

Based on the review of the extensive literature for this study, it is evident that there is little empirical research that validated the relationship. Such as a) between supplier collaboration and sustainable performance, b) between environment-friendly as well as socially responsible practices and sustainable performance and c) Environment-friendly and socially responsible practices as the mediator for supplier collaboration and sustainable performance in UK food supply chains. This study aims to contribute to filling this gap by answering four research questions with the help of the relational view as a theoretical lens.

Hence, this is a cross-sectional study at a particular point in time and data is collected via online survey software Qualtrics from the companies in the UK food industry by taking a deductive research approach (Creswell, 2013, Saunders et al., 2016).

Deductive approach is a process of theory testing to determine whether an established theory can be applied to specific instances such as TBL performance through supplier collaboration. So, this study endeavours to test the theory (relational view) by deducing hypotheses from it. If, in research, data supports the theory that the empirical evidence supports its usefulness. However, when the data do not support the theory then the theory either to be contested or modified (Blaikie, 2011).

Research strategy supports the view that the knowledge in social science can be advanced by way of trial and error process and thus it takes a few basic steps including-

- A conceptual framework based on the current literature from where relevant constructs are identified and explained
- A set of proposed hypotheses to test them to prove relationships and operationalisation of research constructs through measurable indicators.
- A survey instrument based on the literature review to collect primary data and
- Data analysis to either support or reject the hypotheses proposed.

Research strategies as suggested by Neuman (2013) is determined by the nature of the study (e.g. qualitative or quantitative). Research strategies help answer research questions and achieve research objectives. According to Saunders et al. (2016), there are various types of research strategies that used in different research settings, for example, experimental, survey strategies, case study, action research, archival studies, grounded theory, ethnography and so on. A brief explanation of the survey is provided below:

4.6.1 Survey

Survey as a research strategy in business research in general and supply chain research, in particular, has gained substantial popularity. Survey is associated with the deductive approach. According to Neuman, (2013) the popularity of the survey strategy could be attributed to its provision of precise, timely, valid and reliable information. Though the survey is a widely accepted research strategy, failure in considering the research questions and other associated facts may provide unexpected and inaccurate outcomes (Neuman, 2013). Saunders et al. (2016) noted that the survey strategy seeks to answer who, what, where, how much and how many kinds of questions. According to Johnson and Duberly (2000), the survey strategy is appropriate for the studies that are explanatory and follows a deductive approach. In the empirical quantitative method, data are usually collected using survey questionnaires or structured interviews to explain the relationship between the study variables through statistical analysis (Saunders et al. 2016).

4.6.2 Justification for Deploying the Survey Strategy

In SCM and operations management research, various research strategies have been deployed, and among these, survey is the most popular method deployed in this domain (Mentzer and Kahn, 1995, Sachan and Datta, 2005). Case study research also got popularity in supply and purchasing SCM research. Recently the use of mathematical modelling approach (Sachan and Datta, 2005) can be observed whereas ethnography and action research have not been that popular. A brief explanation of the research methods used in this research is provided below with the justification.

There are some reasons for the survey strategy to be popular which include the straightforward information from the participants and the cost-effective way of obtaining data from huge number respondents (Easterby-Smith et al., 2012). The survey strategy is authoritative (Saunders et al., 2016) as they are relatively easy to explain and understand. Survey-based quantitative research is increasingly used in logistics and supply chain research (Gammelgaard, 2004) in different formats including self-completed or interviewer-administered questionnaires to answer research questions.

In spite of being the most preferred methods in supply chain management research (Boyer and Swink, 2008), the survey method is criticised because of its perception measurement (Mangan et al., 2004, Singhal *et al.*, 2008), its single data source which raise concerns for biases and poor response rate(Boyer and Swink, 2008). However, these weaknesses can be mitigated by deploying appropriate statistical tools and techniques (Singhal et al., 2008) for instance to minimise potential bias, random sampling techniques or independent variable test can also be helpful (Boyer and Swink, 2008, Bryman and Bell, 2011). Research questions determine the appropriateness of research methods(Burns and Burns, 2008, Sekaran, 2013).

Based on the description of some of the commonly used research strategies above, the survey-based strategy is appropriate to answer the research questions in this study. This is because this research seeks to explain the relationship between the variables of this study as opposed to understand the in-depth meaning of the study phenomena. Also, this is cross-sectional research attempting to establish relationships between the variables at a particular point in time and the quantifiable data is collected to measure the associations (Bryman and Bell, 2015). Besides, the ontological and the objectivist epistemological stance of this study guided by the positivism viewpoint and deductive approach supports the deployment of the survey strategy. Participants for this study are the most informed senior executives responsible for supply chains, purchasing or operations in companies of the food industry across the UK. So, having their responses or taking their interviews might not be feasible given their busy schedule and the time constraints for this study. Also, the survey strategy is a convenient, cost-effective and efficient time-saving method of collecting data from a relatively large number of participants (Neuman, 2013, Sekaran, 2013) from the UK food industry.

This study deployed participants-administered survey questionnaire using an online survey software Qualtrics to email the link as well as through printed hard copies to gather primary data. A self-administered questionnaire to collect is conducted either by printed hard copies or through an email

attachment or a link (Zikmund, 2002). The survey is a popular data collection technique in social science research mostly because it facilitates collecting data directly from the participants about their perceptions, attitudes, and behaviours about a particular phenomenon. Creswell and Clark (2011) stated that collecting data through the survey is a precise method to understand information regarding the sample and the outcomes of the analysed data which facilitate concluding for generalisation purposes. This study aimed to collect comparatively a larger sample size to test the proposed hypotheses and draw conclusions from the findings for the generalisation purposes. So, the survey is a better-suited technique compared with other available data collection techniques for this particular study.

Research can be carried out using a single method or deploying multiple methods together (Mangan et al., 2004). Data is collected through a questionnaire survey which was administered using online survey software Qualtrics. The questionnaire has been designed based on previous literature to fulfil research objectives. The questionnaire has also been pilot tested to validate the instruments. These are explained in the subsequent sections.

4.7 Time Horizon: Cross-Sectional vs Longitudinal

Research should be time bound. Irrespective of the research methodology undertaken, considering time horizon is a fundamental necessity for the research design (Saunders et al. 2016). Research can either be for a short, specific point in time which is called cross-sectional or for a longer period to understand a particular phenomenon and the trends over a certain period in different waves. According to Saunders et al. (2016), a cross-sectional study is a snapshot of particular issues at a specific point in time. For a cross-sectional study, the survey is the preferred data gathering technique (Easterby-Smith et al., 2012). The nature of this study, which is to examine the impact of supplier collaboration for environment-friendly as well as socially responsible practices and sustainable performance at a certain point in time, dictates the time horizon as cross-sectional for this study.

4.8 Research Population and Sampling

The Population is the Universe of units (i.e. people, company, plants etc.) from which the sample is drawn, and a sample is the segment of the population that is selected for examination (Bryman and Bell, 2015). So, a sample can be defined as the subset of the total population for the study. It is difficult, expensive, unfeasible and unrealistic to get every member of the total population (apart from the census) in the study. The generalisation may be made to the entire population based on the results of the collected data using representative sampling (Kothari, 2004, Bryman and Bell, 2015). A sample ought to symbolise the total population in a positivist approach (Saunders et al., 2016).

Research sampling which is taken from a research population is a crucial step in conducting a social survey (Bryman and Bell, 2011). In conducting a survey, the targeted participants should possess some common features. Selection of samples from the total population should be based on the purpose of the study. An accurate characterisation of the total population is required from where samples will be selected. So selecting the right population and the proper sample is indispensable (Dawson, 2002, Collis and Hussey, 2003). Scholars have advocated a different kind of sampling techniques which can be categorised mainly in two ways-

- 1) Probability Sampling – where population size is known, and there are equal chances of every participant being selected from the entire population, and they will be randomly selected.
- 2) Non-Probability Sampling- where the total population is not well defined, and the chances of selecting a particular individual are not known and based on subjective judgment; the researcher can select samples (Saunders et al., 2016).

Various kinds of samples are highlighted in Figure 4.2 based on Saunders et al. (2016).

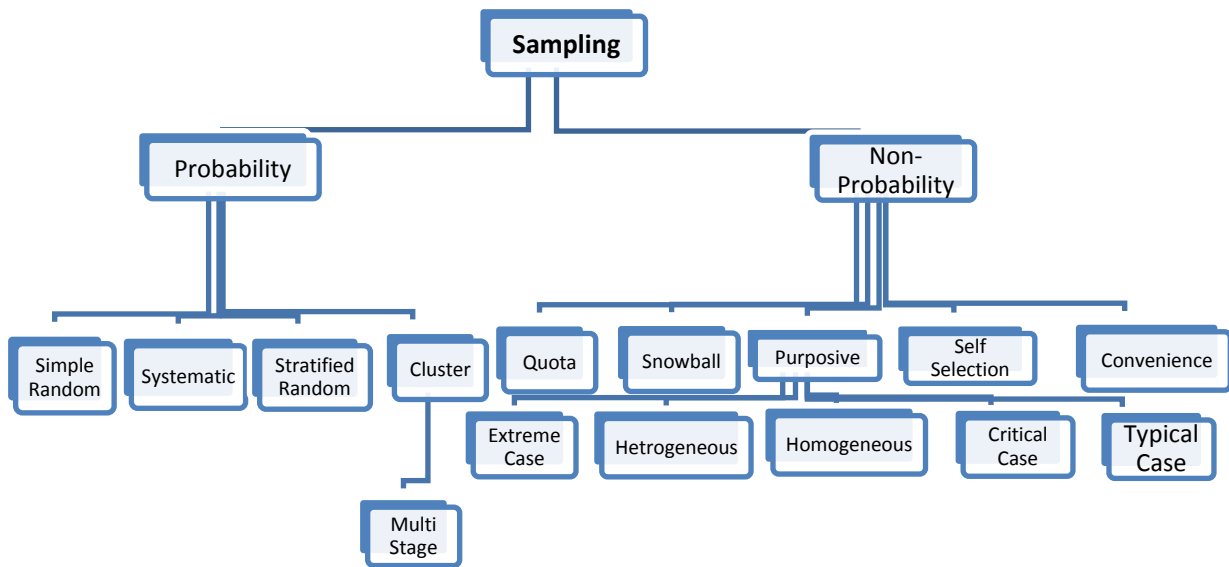


Figure 4:2 Sampling Methods

Source: Based on [Saunders et al. \(2016\)](#)

The population for the study consists of the companies in the UK food industry that includes food manufacturing, processing, wholesaling and retailing companies in the UK. For data collection, the targeted population is the food and beverage business spread across the UK.

The total number of such businesses in the UK food supply chains are not explicitly known, and it is unfeasible to have the exact number of those targeted companies and the respondents as there is no available database for this. Also, the data was collected from the supply chain, purchasing or operations managers in those companies and these roles vary across the organisation and in different names. Hence, having the exact targeted number of respondents for this study is unknown. In other words, the research population in this study is not well defined. Thus, the non-probability sampling is suitable for this study.

Companies are selected from the database of Forecasting Analysis and Modelling Environment (FAME) database, Food and Drink Federation directory and from food & Drink exhibition where companies in the food business across the UK attended. However, when using the FAME database, not all targeted respondents email and telephone numbers were available. So, the researcher had

to rely on the contacts who have an email address or telephone numbers available matching these specified roles. This falls under the non-probability sampling. Hence, a non-probability purposive sampling technique was deployed in this study.

Though the non-probability sampling is not relying upon the basis of probability theory, it surely does represent the target population (Creswell and Clark, 2011, Easterby-Smith et al., 2012) once the sample is selected as being skilled and knowledgeable about the study population and the phenomena under study (Kerlinger and Lee, 2000). However, every unit in the population does not have the equal opportunity to be selected as the sample, and there is no way to control the probability of including any particular population (Fawcett and Garity, 2008). Nonetheless, the extent to which the nonprobability sampling is representative of a population relies on the knowledge, expertise and the care taken by the research when selecting the sample (Kerlinger and Lee, 2000). Also, the probability sampling does not guarantee more representative samples of the population under study (Fawcett and Garity, 2008). Kerlinger and Lee (2000) recommended that the researcher should be knowledgeable about the population to be studied and the phenomena under investigation. Despite the issues with the representation of the population, Polit and Beck (2006) noted that purposive sampling is appropriate for selecting a sample of people who are experts in the research context. In this study the senior managers who are responsible for purchasing, supply chain or operations are the target respondents, and they are deemed to experts in their fields under study.

4.8.1 Sampling Context

The target population for this study is the businesses in the UK food and drink sector. The sampling is thus the firms involved in manufacturing, processing, distributing, wholesaling and retailing in the UK food sector. The rationale for keeping the research domain within the UK because the laws of land often vary across terrestrial borders. The Brexit (UK's exit from the EU) also made it inevitable

for the UK businesses, food sector in particular to have a better look for achieving sustainability in the food SCs through collaboration with the upstream SC partners.

Moreover, the reason for limiting only within the food sector as the supply chain across various sectors are different than that of food because of the perishable nature of the foods, their processing, their transportation, and consumption. Also, Waste in the food sector, in general, is massive that impact the environment as well as the organisational, economic bottom line. Besides, the Food sector is labour-intensive, so social practices for the employees and for the community to enhance social performance is crucial to be investigated.

However, this narrow focus on a particular industry in a particular country will certainly limit the generalisability of the findings of this study. Nonetheless, this should pave the way for future research in this domain. Also, this study may be applied with caution in a similar context with the similar settings. The reasons for including various industry types (manufacturing, processing, wholesaling, retailing and so on) in the food sector because this study is concerned with the food supply network which consists of producers, processors, wholesalers, retailers and other service providers. Hence, to understand the sustainable performance of supplier collaboration in the food supply chains, getting the data across the network is important. The target respondents are the supply chain managers and purchasing executives or operations or senior managers who deal with supply chain and has extensive knowledge in sourcing about the company and its suppliers. The sampling criterion was designed to ensure that the respondents have the right set of practical knowledge in supplier relationships and collaboration as well as the performance in the supply chain regarding its social, cost and environmental dimensions. This approach to studying collaboration in the supply chain, through the survey is widely practised in the field of operations management(Boyer and Swink, 2008).

4.8.2 Sampling Unit

The sampling unit consists of a specific group of individuals selected to collect the data (Neuman, 2013). It is necessary for the researcher to select the research unit which can be based on geography (e.g. country), social unit (e.g. community), industrial setting (e.g. food industry) or even based on individuals (e.g. operations manager) (Saunders et al. 2016). As this study seeks to examine the impact of supplier collaboration on environment-friendly as well as socially responsible practices and sustainable performance in the UK food supply chains. So, it is important that the data are collected from the companies in the food supply chain (i.e. manufacturer, processor, wholesaler, retailer and so on), and the purchasing, supply chain or operations managers were the respondents in those selected companies. To collect accurate information, the most informed persons about the supply chain, purchasing or operations management related information of the company were targeted.

The sampling frame is the entire list of the population from which a sample is taken. However, the sampling frame for this research is not entirely known. This is because the list of companies and their purchasing, supply chain or operations managers' details are not easily available or is not feasible to obtain given the time and resource limitations for this study. The FAME database is considered as a comprehensive database for the companies in the UK and Ireland. FAME was used as because of easy access, usages, and availability of information as it contains firms name, address, key contact persons, telephone numbers, number of employees and financial information. A list of 16412 companies contacts details were collected from the FAME database however only 6484 email addresses were available for the target respondents such as purchasing, supply chain, operations or senior managers. So, it is not very likely to have the complete list of the targeted respondents from where probability sampling technique can be adopted. Hence, a non-probability purposive sampling is appropriate for this study. Also, this study considered firms who maintain a good relationship with their suppliers and who falls explicitly under UK food and Drink sector. Besides, the firms who

employees less than five people were not considered as they are micro firms. In survey questionnaires, participants are free to withdraw their participation at any time without providing any justification. The sampling technique is fitting because the purpose is to select a participant who will help complete the survey.

4.8.3 The Sample Size

The sampling as mentioned earlier is crucial for research design because collecting data from an entire population is not feasible (Tabachnick and Fidell, 2014, Saunders et al., 2016). For this study, a non-probability convenience sampling technique is adopted. The sample size for this study is calculated using two different criteria: a) based on variables and b) based on a necessary margin of error (Tabachnick and Fidell, 2014).

Sample size can be determined based on variables used in this study to ensure that the sample size is large enough to carry out subsequent statistical analysis (Stevens, 1996, Tabachnick and Fidell, 2014). According to Stevens (1996), for each independent variable 15 responses are essential to fulfilling the reliability criteria for statistical analysis. In this study, there are three independent variables (the antecedents of TBL performance) are supplier collaboration, environmental practices, and social practices.

So, as per the suggestion of Stevens (1996) the sample size can be calculated as-

Sample size= 15 x m

= 15 x Number of independent variables

= 15 x 3

=45 responses.

Simultaneously, Tabachnick and Fidell (2014) suggested the following formula to calculate the sample size sufficient enough for statistical analysis.-

Sample Size= $N > 50 + (8 \times m)$

Where,

M= Number of Independent variables

N= Sample size

So, the sample size should be= $N > 50 + (8 \times 3)$

= $N > 74$ responses.

On the other hand, Saunders et al. (2016) recommended margin of error technique to ensure that sample size is sufficiently large for fulfilling reliability needed. In business and management research with a 5 % margin of error, a minimum sample size of 384 is required for a population up to 10 million (Saunders et al., 2016; p. 280). As the total population is not explicitly known in this study, so it would not be wise to consider this as a base.

However, the sample size to a great extent influence the model fit in the Structural Equation Modelling (SEM) technique as it facilitates statistical convergence, power, and accuracy of the parameter estimates (Monecke and Leisch, 2012, Hair Jr et al., 2017). This study considered the rules of thumb that are mostly used as requirements for the multivariate data analysis technique such as PLS-SEM (variance based).

According to Garson (2012), a sample size of minimum 100 to 200 is required to use Partial Least Square (PLS) method. This is also further supported by Kline (2015) recommending a sample size of 100 and more for the PLS model whereas Hair Jr et al. (2017) noted that the minimum sample size should be 10 times the maximum number of arrowheads pointing at a latent variable anywhere in the PLS path model. However, they also mentioned that in PLS-SEM, the researcher should keep in mind the background of the model and data characteristics to determine the sample size. This study collected a total of 203 useable responses which is a decent data set to work SEM-PLS as recommended by the experts outlined above.

As the sample size influences model fit indices, So, to have a relatively stable and consistent model fit where there are latent independent variables, a total of 250 or above sample size is recommended for co-variance based SEM using AMOS (Anderson and Gerbing, 1988, Hu and Bentler, 1999). The sample size for this present study is less than 250 but over 100 which support the deployment of variance-based SEM (PLS-SEM) as a data analysis technique.

4.8.4 Access to Data

In order to get access to sample data it is essential to have complete understanding about the unit of analysis, data sources, data collection techniques, the targeted respondents, geographical locations, measures that will be used, total number of expected respondents and so on (Kalleberg et al., 1990, Bryman and Bell, 2011). Supply network is the unit of analysis in this study as the data was collected to test the relationship between the collaboration with the suppliers and its impact on the supply chains. So, the data are collected from the senior managers responsible for supply chain and purchasing in different stages of the supply chain including manufacturing, processing, wholesaling and retailing foods across the UK. A single respondent technique is used to collect data from every organisation.

While accessing the data in research is a daunting task. This study collected a list of 16412 supply chain and purchasing professionals' contact details in UK food and drink sector (manufacturing, processing, wholesaling and retailing) from the FAME database. Among them, only 6484 had email addresses or managed to collect them. They have been contacted creating a survey link in the Qualtrics software and had emailed them in 2 waves. Altogether 141 responses were received using Qualtrics. Due to low response rate the researcher also contacted targeted respondents from the directory of UK Food and Drink Federation, Local food business in London and Luton as well as attending an International food and Drink exhibition in London.

4.9 Pilot Study

Once the questionnaire has been designed it is crucial to check the developed questionnaire is fit for the purpose. This part of the study presents the purpose of the pilot study and pilot study procedures for this study. Results and lesson learned from this pilot study and main data collection followed by a summary of the process.

4.9.1 Purpose of Pilot Study

A Pilot study is a small study to verify research protocols, research instrument, strategies for sample recruitment and other research techniques in preparation for a larger research project (Van Teijlingen and Hundley, 2002, Zailinawati *et al.*, 2006, Beebe, 2007). Flynn *et al.* (1990) considered pilot testing as a fundamental part of questionnaire development. De Vaus (2001) suggested a pilot test to maximise the reliability and validity of the survey and to reduce measurement faults. Pilot study helps refine and modify the questions (Beebe, 2007) to maximise the responses and the outcome of the responses. The pilot test is a reality check of the questionnaire developed based on previous literature. The pilot study facilitates the researcher to evaluate the questionnaire to see whether the questions are understandable by the respondents and the items fulfil the intended measurement scales (Thabane *et al.*, 2010). In other words, the objective of the pilot study is to understand whether the questions accomplish the research objectives. For the pilot study, convenience sampling is acceptable (Flynn *et al.*, 1990).

4.9.2 Pilot Study Procedures

The Pilot study was conducted to check the validity and reliability of the instrument. For the pilot study, instruments were developed from the literature review and experts from academia and industry were consulted (Cao and Zhang, 2011).

Before sending the questionnaire to the participants for a pilot run, a series of checks and corrections have been conducted. After the initial draft, views from experts and colleagues in the academia were taken and based on the feedback initial corrections have been made. Initial concerns

from academics were about the wordings, complexities of the sentences and using technical terminologies.

Once corrections were done, the second round of feedback was collected with academics and industry experts to detect any problems and enhance responses. In this stage, concerns raised about the number of questions, time to complete the survey, wordings and spelling errors. After correcting these, the final questionnaire was emailed as a first wave to the respondents. To collect data, in total 380 selected respondents were contacted, and 28 useable responses were collected which is around 7% of the response rate.

From the FAME database 16412 UK food business contacts were collected. To obtain list from FAME database, search criteria followed as- UK SIC (2007): Manufacture of food products, processing and preserving of meat and production of meat products, processing and preserving of fruit and vegetables, manufacturing of dairy products, manufacture of soft drinks, production of minerals, waters and other bottled waters, food and beverage service activities. The Industry sector was within the UK food sector, and the number of employees was selected as a minimum of 5 to eliminate Micro firms in the samples.

From the contact list, 340 participants were contacted through email and telephone. After one week of the first wave of email, a second email was sent to the participant to remind them to complete the survey. As the survey was anonymised, to detect the non-respondents is not possible. Two weeks after the questionnaire was sent, the response rate was comparatively lower than expected. Altogether, a total of 43 responses were received, among them five were incomplete; two were filled with only strongly agree and strongly disagree and eight respondents were excluded from taking the survey because they selected "No" to one of the two screening questions. Therefore, 28 useable responses were collected for this pilot study. The procedures of the pilot study are presented below in figure 4.3.

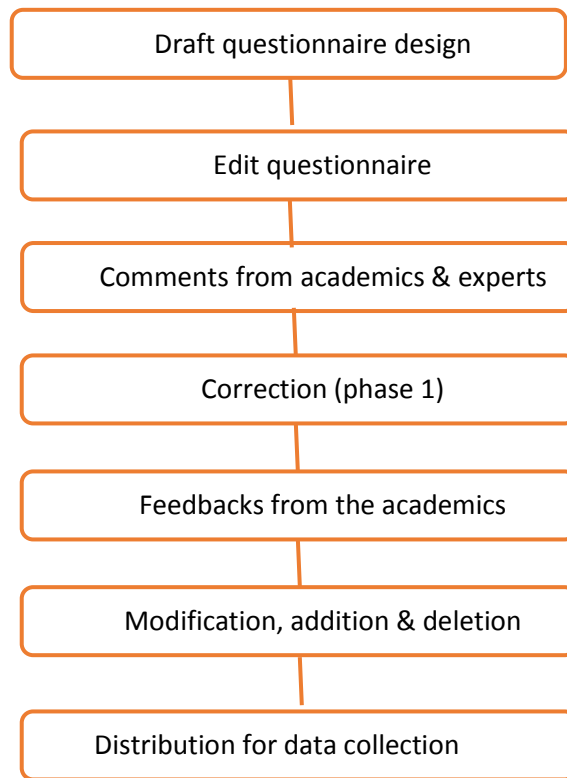


Figure 4:3 Pilot Study Procedures for this study

4.9.3 Information of Participants and Firms

As there are only 28 usable completed questionnaires, it was not suitable to analyse the data and infer the result for the main study. This was also not the intention of the pilot study. However, the purpose of this pilot was to check the reliability and validity of the instrument. Moreover, the pilot study has indicated the percentage of expected response rate, the wording of the instrument, timing and so on.

Among 28 respondents 35% were involved in the food business, 25% food manufacturing, around 18% are food wholesaling, 14% were in food distribution, and 7% of the respondents were engaged in other food businesses. Regarding the role of participants, around 28% of respondents held supply chain or operations managerial role, 25% as general manager, 21% as director and 18% as owner. Only descriptive statistics were checked, and Reliability test based on Cronbach Alpha was conducted to check the internal consistency of the items in the dimensions. Cronbach alpha values in all the dimensions are more than recommended level .70 (Cronbach, 1951) demonstrating sufficient internal consistency of the items in the variables.

4.9.4 Lessons Learned from the Pilot Study

Some of the key lessons learned from this pilot study are discussed here along with the measures taken in preparation for the final data collection procedures.

- Initially, the questionnaire was developed, cross-checked and validated. However, once the questionnaire was distributed feedback received from respondents were concerns related to technical terminologies, spelling errors in an online questionnaire. However, these were later corrected.
- For data collection, after gathering information via telephone or other ways emailing survey link to the participants were considered the only technique to collect data. However, emails or telephone calls were not enough to collect data from the companies, personal face to face visit is required as well to collect data from them giving pre-printed hard copies in exhibitions.
- The Online response rate is lower than expected.
- Initially, it took around 20 minutes to complete the survey. However, some concerns were about a very long time. So, the concentration was made to make it simpler for collecting necessary information only.
- Questions developed based on previous research to measure variables, but some of the items wording was similar and made participants confused (I.e. In supplier collaboration section which then revised and modified)
- Initial target respondents were 400, but the Pilot study indicated that the response rate is very low.
- Initially, some of the demographic questions were thought to be useful, but a couple has been removed, and wordings of few questions were modified.

The real world in the field is different than the research world in the research office. Based on the pilot study experience, the questionnaire was modified and simplified. Research strategy has been

updated. Instead of only relying on online survey tool to collect data, visiting business premises and distributing hard/soft copies, using smartphones texting the links and visiting the food business exhibitions were considered.

4.10 Main Data Collection

In this section, the main data collection process is highlighted. Once the research is designed, data need to be collected because data provide life to a research project. Data collection technique helps in collecting appropriate data to answer research questions (Sekaran, 2013, Bryman and Bell, 2015). There are two sources of data as primary and secondary (Saunders et al. 2016). Primary data need to be generated by utilising various techniques. It can be quantitative or qualitative as discussed earlier. The former is collected through survey questionnaires or structured interviews, and the latter is collected using semi-structured or unstructured interviews, observations, case studies and so on. In contrary, secondary data are easily available and can be found internally or externally in the public domain as a form of published research or company information and so on. Therefore, data collection techniques are strongly related to primary data.

One of the crucial parts of a research design is collecting data which involves gathering experiences, opinions and beliefs of the participants on the studied phenomena (Sekaran and Bougie, 2010). Survey questionnaires and interviews can be deployed to collect primary data along with other methods discussed earlier. Various techniques can be used to gather data for instances interviews can be undertaken using telephones, video conferencing, or via face to face. Simultaneously, the survey can be researcher administered or mail survey using postages, emails and using various electronic survey software (Zikmund et al., 2012, Saunders et al., 2016), i.e. Qualtrics. According to Creswell and Clark (2011), an unequivocal understanding about the elements of data collection techniques including the research samples, research questions, accessibility of the research participants, cost and time involved, types and number of questions and language in the survey instruments are necessary to consider.

4.10.1 Survey Questionnaire Design and Update

The questionnaire is a useful data gathering technique for measuring the variables for the study to fulfil research objectives (Neuman, 2013, Sekaran, 2013). However, the survey questionnaire might not always be precise and clear to the respondents in the first instance. This may create misunderstandings of the questions. Hence, the questionnaire in this study was kept simple, short and provided a survey link with a brief explanation of the research. The questionnaire was developed based on the set of objectives for this study (Veal, 2005). Based on that, the study measures were taken from the extant literature and having multiple items for each variable and conducting a pilot (stated in the Pilot Study section) study before the main study.

Frazer and Lawley (2001) suggested that to prepare the questionnaire; it is essential to carefully develop contents, wordings, questions formatting and the layout itself. Zikmund et al. (2012) claimed that the quality of responses and the response rate increase when the well-designed questionnaire is deployed using techniques such as positive questions and only one statement per question. In this study, simple language was used, jargons were avoided, and ambiguity was minimised as much as possible. Questions were carefully crafted so that the participant needs minimum time, thoughts and efforts to complete the survey (Hair et al., 2008). Different response format was used, and the questions were randomised using the Qualtrics software to avoid response bias. Five-point Likert scale questions were used to collect the extent to which the respondents agree with stated statements. Questions in the questionnaire were clustered in a logical sequence based on the study constructs deploying the 'funnel' approach where questions start with broad scope and get narrower at the end.

A brief and concise statement regarding the study was placed in the questionnaire stating the rationale for the study, confidentiality, anonymity, and thanks for taking part in the survey. The researcher contacts detail along with the University logo in the questionnaire was used if needed to contact. The questionnaire is in **Appendix A**. The questionnaire is kept only within four pages of A4

paper to avoid intimidating the participants (Neuman, 2013). The pilot study helped to modify and update face validity and content validity.

Primary data for this study was collected through a questionnaire survey from Purchasing, Operations, SC managers or senior managers (responsible for SC related activities) in the UK food businesses with the specific criteria mentioned earlier. The questionnaire is developed based on the reviewed literature, and the questionnaire is developed keeping the data analysis technique in mind. Likert scale was employed to ensure the consistency of coding to form dependent and independent variables.

Tabachnick and Fidell (2014) suggested a few points which were considered when designing the questionnaire that includes-

- Using simple and easily understandable language
- Using questions that measure the variables
- Avoiding negatively worded questions
- Avoiding technical jargons and words with equivocal meanings
- Avoiding unexplained abbreviations

During the pre-pilot stage, iterative efforts are made to ensure that the questions are easy to understand and are measuring the intended variables. The timing to complete the questionnaire is crucial too. Whether the questionnaire can be completed in the stipulated time was checked too. To minimise bias, the purpose of the study was also elucidated to the respondents.

The questionnaire has three sections. The first section (Section A) has two screening questions to make sure that the data are collected from the specifically targeted respondents. The first section has two screening questions. At this stage, the eligibility of the respondents is checked whether the respondent's company collaborate with their suppliers and whether the company is operating within the UK food Sector. If any of this answer is no, then the respondents will not be allowed to take the survey to maintain the research purpose. The data will be collected from organisations who

are involved in food businesses including food producing, manufacturing, processing, distributing, wholesaling, retailing and so on.

Moreover, as this research is to have data from the food industries of various types and size, this study will consider collecting data that have more than five employees in their operations. The second part of the questionnaire which consists of 10 questions is to understand the basic and demographic information about the respondents' company. Information such as business area, participants' gender and position in the company, annual turnover, number of employees, number of suppliers and so on were explored.

Section C is Likert's scale questions (55) for the six latent variables- Supplier collaboration has 8, Environmental Practices have 11, Social practices have 10, Environmental performance has 7, Cost performance has 9, and social performance has 10 items. All the questions in this part are measured based on 5-point Likert's scales. Strongly disagree (1) to strongly agree (5). The items in this survey design were drawn and modified wherever needed from previous studies, including (Carter and Jennings (2002), Zhu and Sarkis (2004), Bansal (2005), Corsten and Felde (2005), Maloni and Brown (2006), Vachon and Klassen (2007), Pullman et al. (2009), Flynn et al. (2010), Pullman et al. (2010), Gimenez et al. (2012), Wong et al. (2012), Gimenez and Sierra (2013), Zhu et al. (2013), Paulraj et al. (2014), Graham and Potter (2015), Grekova et al. (2015), Sancha et al. (2015), Vu *et al.* (2017a)).

4.10.2 Questionnaire Administration

The survey was administered using a survey software Qualtrics. An email was sent out to the target respondents with a brief purpose of the research along with the process of how to complete the survey and the approximate time it will take. There was a short explanation of the anonymity and confidentiality of the data and the maintenance of the ethical standards of the University. In the email, the Survey link was attached. The respondents could answer instantly wherever they are, and the responses were automatically recorded in the Qualtrics software where it was easily downloaded in an excel or SPSS format. There were also paper-based questionnaires distributed in exhibitions and the business premises where the respondents have given their answer, and then

they were later recorded to the data file. The contents and formats of the offline survey was a replica of the online survey link (Dillman, 2011). The survey was conducted for three months, and a total of 203 useable response were collected for analysis.

Altogether 234 responses were received of which 24 of those responses were screened out as they had selected either one of the two screening questions in the survey (because they were neither operating their businesses within the UK food and drink Industry nor maintaining collaborative relationships with their key suppliers) to determine their eligibility, 5 responses were removed because of more than 15% values were missing and 2 responses were discarded as they were deemed unengaged because they selected only one anchor (i.e. 1 or 3) throughout the survey. Finally, a total of 203 valid responses were used for the analysis.

The data collection for a study is the crucial part for a research design. The collecting data for this study, the survey was deemed to the most appropriate method because of the suitability of the methods to answer the research objectives and questions. Bryman and Bell (2015) noted that there are two types of questionnaire such as researcher completed or the self-completed. The later was adopted in this study based on the respondents' profile, sample size and the number of questions in the survey (Saunders et al. 2016).

Data was collected from the supply chain, purchasing or procurement, operations, and senior managers responsible for supply chains in the UK food businesses. The population for this study is the companies in the UK food supply chains (i.e. Manufacturer, wholesaler, distributor, and retailer). Samples are selected based on the supplier collaboration, environment-friendly and socially responsible practices consideration of the firm. Businesses who collaborate with their SC partners and they receive support from them as well regarding information sharing, training, product designing, delivery and so on. Companies that are in the food businesses, practising and are committed to social and environmentally friendly practices and employs more than five people were contacted to take part in the survey. Unit of analysis for this study is the companies in the food supply networks, and data is collected using single respondents per organisation. Only one response

from well informed and responsible persons was collected. This is justified because data is collected from the well informed senior figure in the company who has extensive knowledge in the company supply Chains and the relationships with the suppliers. In this study, the Data collection process is conducted using a survey instrument through online survey software Qualtrics. This collected data has then been tested to prove the proposed relationships among them. The Questionnaire was developed based on reviewing literature which contains questions to explore supplier collaboration, social and environmental practices in food SCs to save costs, improve environmental performance and social performance.

4.11 Study Measurement

In the research process, it is regarded as crucial to have a precise, relevant and accurate instrument designed and selected to achieve the research aim and objectives (Zikmund et al., 2012). It is essential to bear in mind during instrument design and selection process that the instrument should provide construct validity (what is to be measured in this study) and construct reliability (how it should be measured). Frazer and Lawley (2001) suggested three fundamental steps in designing a suitable research instrument such as 1) contents should be developed through selecting items, categorise them using scales and code them before the analysis 2) carefully crafted and chosen words for the instrument 3) and an appropriate layout of the instrument. These steps guided the development of the research instrument for this current study.

This study deployed independent, mediating and outcome (dependent) variables. While the supplier collaboration is the independent variable to measure environment-friendly practices, socially responsible practices and sustainable performances (as dependent variables), and environment-friendly and socially responsible practices as independent variables to measure the relationship with sustainable performance (environmental, cost and social performance), in another setting, environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and sustainable performance.

Measurement items, which mostly form the human attitude and experiences, of the variables used in this study were drawn from previously validated scales. Sekaran and Bougie (2016) stated that scales in a study could be used as either rating (various types) or ranking. This study adopted rating scales as a five-point Likert scale. In survey research, the Likert scale is a popular and convenient method for data collection (Sekaran and Bougie, 2016). According to Saunders et al. (2016) that in a positivist survey research, human attitude and behaviours can conveniently be measured by Likert scale questionnaires.

This study deployed various measures drawn from previous literature to maintain conformity among the variables. All but demographic questions in this study used a five-point Likert scale (where 1= Strongly disagree and 5= Strongly agree and 3 = Neutral). To eliminate un-informed response mistakes, the 'Neither agree nor disagree' as an option also included in this study (Frazer and Lawley, 2001). To ensure that the data are collected from the targeted individuals, two screening questions were used to understand the suitability of the respondents.

4.11.1 Formative and Reflective Variables

Before devising and formulating questionnaire, it is crucial to understand and develop study measures that will be used to examine the study variables (Roy et al., 2012, Hair Jr et al., 2017). According to Christophersen and Konradt (2012), it is important to be accurate and precise when the measurement model is developed to form hypotheses as it is based on a theoretic exercise. Hence, a concise theoretical definition for each measurement construct is necessary. Comprehending the process of measuring the construct is also important before the data collection. Conceptual understanding and the operational processes of the proposed constructs should correspond to each other. A construct can be formative or reflectively operationalised or modelled. If the conceptualisation is reflective, then it ought to be operationalised reflectively or the other way around (MacKenzie *et al.*, 2005, Finn and Wang, 2014).

Either of these measurement models (formative or reflective) can be deployed to measure latent variables (Bollen and Lennox, 1991, Wong, 2013). In a formative model, it is the indicators that form

the construct whereas it is the construct that decides the indicators in a reflective model(Hair Jr et al., 2017). According to MacKenzie et al. (2005) items in the formative construct are not supposed to co-vary, and the formative measures are regarded as the cause of the latent variable. It is important to note that in formative measurement model, the arrows go from the indicators to the construct whereas in reflective model arrows goes from the construct to the indicators and they (formative and reflective constructs) are different from each other (MacKenzie et al., 2005, Roy et al., 2012, Hair Jr et al., 2017). This study, however, has only the reflective indicators for the model.

4.11.2 Measurement items for Variables in this Study

The measurement items for this study were derived from previous studies in the domain of supply chain collaboration, social and environmental practices in the supply chain as we as social, environmental and cost/economic performance measure used in the previous studies considering sustainability, supply chain, and food industry. The measurement items of Supplier collaboration were drawn from the previous studies, i.e. (Corsten and Felde, 2005, Vachon and Klassen, 2007, Vachon and Klassen, 2008, Flynn et al., 2010) on SC collaboration and integration. The items are highlighted in the below Table 4:5.

Table 4:5 Measurement items of Supplier Collaboration

| Construct | Items | Sources |
|------------------------|----------------------------------------------------------------------------|-------------------------------------------------------|
| Supplier Collaboration | We exchange information frequently with our key suppliers | (Vachon and Klassen (2007), Flynn et al. (2010)) |
| | We share information related to demand forecast with our key suppliers | Flynn et al. (2010) |
| | We share procurement plans with our key suppliers | Vachon and Klassen (2007) |
| | We share inventory level with our key suppliers | Flynn et al. (2010) |
| | We have joint product designs and development with our key suppliers | Vachon and Klassen (2007) |
| | We have joint process designs (e.g. transportation) with our key suppliers | (Corsten and Felde (2005), Vachon and Klassen (2008)) |
| | We have mutual education and training programs with our key suppliers | Gimenez and Sierra (2013) |
| | We cooperate with our key suppliers for innovative practices | Vachon and Klassen (2007) |

Table 4:6 Measurement items for Environmentally Friendly Practices (Product and Process Stewardship)

| Construct | Items | Sources |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------|
| Environment-friendly practices | Environment-friendly materials are used for packaging and producing foods | Wong et al. (2012) |
| | Products and packaging are designed to be reusable and recyclable | Wong et al. (2012) |
| | Packaging is designed to reduce food waste | Wong et al. (2012), Graham and Potter (2015) |
| | Products are sourced from environmentally friendly suppliers | Zhu and Sarkis (2004) |
| | We design our products for consuming low materials and energy | Zhu and Sarkis (2004), Wong et al. (2012) |
| | Environment-friendly technologies are used to save the environment | Wong et al. (2012) |
| | The production process is designed to reduce consumptions of resources in operations | Pullman et al. (2010), Wong et al. (2012) |
| | We use eco-friendly (e.g. fuel efficient) transportations | Wong et al. (2012) |
| | Our production and delivery processes are designed to reduce carbon dioxide emissions | Wong et al. (2012) |
| | We provide environmental training to the staff | Graham and Potter (2015) |
| We conduct environmental audits (e.g. Sudden visits) to our suppliers | Zhu and Sarkis (2004) Lee et al. (2012) | |

Table 4:7 Measurement Items for Socially Responsible Practices

| Construct | Items | Sources |
|--------------------------------|---------------------------------------------------------------------------------|-----------------------|
| Socially responsible practices | We source products from our local suppliers | Pullman et al. (2010) |
| | We source products from socially responsible (e.g. child labour free) suppliers | Pullman et al. (2010) |
| | We ensure a better quality of life (e.g. work-life balance) for the employees | Pullman et al. (2010) |
| | We ensure a safe working environment for the employees | Pullman et al. (2010) |
| | We provide training for employees' both personal and professional development | Pullman et al. (2010) |
| | We ensure fair compensation for the employees | Pullman et al. (2010) |
| | We ensure that the employees are satisfied with their job | Pullman et al. (2010) |

| | | |
|--|--------------------------------------------------------------------------------------------------------|-------------------|
| | We encourage and promote workplace diversity irrespective of race, gender, and background of our staff | Vu et al. (2017b) |
| | We maintain good nutritional values of our products for consumers' health | Vu et al. (2017b) |
| | We contribute to local community events/activities for social and environmental awareness. | Vu et al. (2017b) |

Table 4:8 Measurement Items for TBL Performance

| Constructs | Items | Sources |
|--------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------|
| Environmental Performance (last two years) | The food waste generation has been reduced | Grekova et al. (2015) |
| | Recycling practices of waste material have been increased | Grekova et al. (2015) |
| | Raw material usage per unit of product has been reduced | Graham and Potter (2015) |
| | Carbon dioxide emissions per unit have been reduced | Graham and Potter (2015) |
| | The use of hazardous/harmful materials has been reduced | Graham and Potter (2015) |
| | Water usage for per unit of product has been reduced | Graham and Potter (2015) |
| | Energy usage for per unit of product has been reduced | Graham and Potter (2015) |
| Cost Performance (last two years) | Purchasing cost of materials per unit has been reduced | (Pullman et al. (2010), Graham and Potter (2015)) |
| | Overall cost saving has been increased through recycling and reusing | (Pullman et al. (2010), Graham and Potter (2015)) |
| | Energy usage cost per unit has been reduced | Grekova et al. (2015) |
| | Cost of water per unit has been reduced | Grekova et al. (2015) |
| | The cost of waste treatment and disposal has been reduced | Grekova et al. (2015) |
| | Transportation cost per unit has been reduced | Graham and Potter (2015) |
| | Inventory cost per unit has been reduced | Zhu et al. (2013) |
| | Savings on labour cost per unit have been increased | Zhu et al. (2013) |
| New product development cost per unit has been reduced | | |
| | Employee job satisfaction has been improved | Pullman et al. (2009) |
| | Our customer satisfaction has been improved | |
| | Our employees' welfare facilities have been improved | Paulraj et al. (2014) |

| | | |
|----------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------|
| Social Performance (Last two years) | The health and safety training for the staff have been improved | Paulraj et al. (2014) |
| | Our overall business reputation to suppliers, customers, and other stakeholders have been improved | Gimenez et al. (2012) |
| | The locally sourced products have been increased | Pullman et al. (2010) |
| | The relationship with our key stakeholders (i.e.suppliers) has been improved | |
| | Our community welfare services have been improved | Paulraj et al. (2014) |
| | The working environment of our supply chain has been improved | Sancha et al. (2015) |
| | The socially responsible practices have been improved | Carter and Jennings (2002) |

4.12 Data Sorting and Analysis

Collected data were analysed using structural equation modelling (SEM) method in PLS software. SEM is a multivariate method that examines the covariance structure of variables. There are two kinds of multivariate methods (Hair et al., 2006); Measurement models for examining hypotheses about the relationship between latent and observed variables, and structural models for the casual relationship between latent and observed variables (Easterby-Smith et al., 2012). A study portrays SEM findings by describing the conceptually developed model, measuring, structuring and diagnosing the model. There are some statistical packages available to suit SEM such as PLS, LISREL, EQS, AMOS, and Mplus.

It is essential to have a clear understanding of data analysis techniques before avoid drawing incorrect results (Neuman, 2013). Data collected using Qualtrics were downloaded in SPSS format. Data collected using hard copies had a code assigned on each measurement items to reduce data processing time, and it also enhances the accuracy of the collected data through the survey (Hair Jr et al., 2017). So, all the data were entered and saved in an SPSS file (Version 22.0).

Data tabulation including one-way and cross-tabulation was deployed to calculate summary statistics for some questions. A simple statistical summary including means, standard deviations, percentage was used to understand the respondents' profile and their responses. Through

descriptive statistics such as means, and standard deviations help understand the resemblances and variations of received responses.

Reliability and validity of the study are crucial. While the reliability is the degree to which measures are fault free and generate steady outcomes (Zikmund et al., 2012, Sekaran, 2013) whereas the validity is the precision of the measurement. Hair Jr et al. (2017) noted that operational definition should reflect the fundamental concepts to be measured. Though it is not feasible to have the absolute reliability and validity in the field research, this study considered several strategies to enhance the validity and reliability of the measures. This study deployed PLS-SEM to analysis the collected data. The justification for using PLS-SEM is stated in the following sections.

4.12.1 Structure Equation Modelling (SEM)

SEM is a data analysis tool to examine proposed hypotheses statistically. It has become a popular tool recently where there are relationships among the variables to be studied (Monecke and Leisch, 2012, Hair Jr et al., 2017). For measuring the complex relationship among the variables, SEM is the preferred technique. Also, SEM is deployed to measure the relationship and their effect between latent variables (LVs). SEM is a momentous 2nd generation data analysis tool. In a model or path, the order of the LVs and their mutual relationships should be considered as they represent the hypotheses and the relationships. Descriptive statistics such as means and standard deviations of the measures were conducted using SPSS to have a clear understanding of the average responses and other basic information.

There are a few frequently used terms to be familiar with in SEM such as Exogenous and Endogenous constructs (Hair Jr et al., 2017). An endogenous construct will have at least a path leading to it (inward arrows) that means it signifies the effect of other constructs whereas an exogenous construct has the path pointing outwards not inwards (Wong, 2013, Hair Jr et al., 2017). These constructs are identified as the independent and dependent variables in regression analysis (Kline, 2015).

The variables are of two types, latent (unobserved) and observed. The latent variables are abstract concepts in nature and can not be directly measured whereas the observed variables can directly be measured with observable items. Observed variables, which is treated as the outer model part in the measurement model, facilitate deducing the latent variables (Finn and Wang, 2014).

In SEM, causal relationships among the latent constructs are examined to measure the path in the model, overserved variables and their item loadings in the respective constructs (Schumacker and Lomax, 2012).

SEM is conducted in two steps which includes a measurement model and structural model. In the measurement model, internal consistency, reliability, and Average Variance Extracted (AVE) are calculated using PLS-SEM. In contrast, path analysis is conducted at the structural model (Kline, 2015) (Hair Jr et al., 2017). Both the steps noted above indicate how the endogenous variables are predicated on the exogenous variables in the model. It is worth noting that every exogenous construct has a residual value associated with it and this is represented in the structural model by the error terms (Kline, 2015). The error terms can also be used in the measurement model to denote that observed variables are not the perfect indicator of the construct. According to (MacKenzie et al. (2005), Wong (2013)) once the measurement model is confirmed, then the structural model where the relationship among the variables are measured. In path analysis where the structural model is measured multiple regression models are considered simultaneously (Kline, 2015).

SEM is different from the typical regression model as because a variable in SEM can act as independent or dependent. This is one of the reasons for the SEM to be a popular as a second-generation data analysis technique in various disciplines in social science (Tenenhaus et al., 2005, Hair Jr et al., 2017). SEM helps in examining the consistency between the collected data and the developed theoretical model. In SEM, the variables and the paths are combinedly measured in a complete structural model. Also, the SEM has some distinctive characteristic that made it a preferred data analytical tool in comparison with regression-based technique(Kline, 2015). In SEM, multiple equations can be measured at the same time, and for complex model SEM is convenient.

Also, it considers error terms to avoid measurement errors and enhance the accuracy of the measured outcome.

In this study, the two steps SEM techniques are used as proposed by (Anderson and Gerbing, 1988, Hair Jr et al., 2017). The developed hypotheses for the research model in this study consists of several variables including supplier collaboration, environmental-friendly practices, socially responsible practices and environmental, cost and social performance. In the first stage, the measurement model was measured using observed data, and in the second stage, the structural model was assessed. Analysing both the models facilitate assessment of the constructs, convergent validity, discriminant validity and examining the hypotheses.

4.12.2 Justification for PLS-SEM

In PLS-SEM, multiple variables of measurement and structural model can simultaneously be measured. It facilitates this by explaining the variance in the dependent constructs of the research while analysing the model. PLS-SEM is an alternative data analysis technique of Covariance-based SEM (CB-SEM) such as AMOS. According to Hair Jr et al. (2017), PLS-SEM should be used when the key purpose is to predict the targeted constructs when the structural model is complex when the sample size is small, and the data is nonnormally distributed. It is a useful technique to develop theories in exploratory research (Hair Jr et al., 2017). Hair Jr et al. (2017) also argued that when the theory is not well developed, which is the case in for this research, PLS-SEM should be considered as an alternative to CB-SEM data analysis technique. Rigdon (2012) further elucidated this by claiming that this is true when the fundamental objective of employing SEM is to predict and explain the targeted constructs.

PLS-SEM emphasise explaining the variance of the contrasts whereas CB-SEM emphasises the covariance of the constructs. PLS-SEM is also called as a soft modelling technique because it facilitates measuring the maximum explained variance, minimum sample size requirements, measurement scales and residual distributions (Monecke and Leisch, 2012, Hair Jr et al., 2017). Also, PLS is generally assessed with regression-based method whereas Analysis of Moment Structure

(AMOS) and Linear Structural Relations (LISERAL) are usually assessed with covariance based method (Hair Jr et al., 2017). PLS-SEM has the advantage of measuring both the formative and reflective variables in the model. According to Finn and Wang (2014), PLS can work with 1 or even two items in the constructs, but this is not the case in AMOS or LISERAL.

This study aims to examine whether collaborating with the suppliers helps achieve environmental, cost and social performance in the UK food supply chain. Also, whether socially responsible as well as environmentally friendly practices can mediate the relationship between the supplier collaboration and the performance (environmental, cost and social) in the UK food SCs. This study underpins the relational view theory which is relatively less developed in the supply chain in general and food supply chain in particular to achieve sustainability. So, this study is trying to examine, whether, through collaboration with the suppliers, relational specific assets enhance the competitive advantage or by extension sustainable performance in the supply chains. Also, whether socially responsible and environmentally friendly practices can mediate the relationship between relation-specific assets (supplier collaboration) and sustainable performance. Hence, this study explored a less developed theory and justified the uses of PLS-SEM. In the situation where the data is not normally distributed, PLS-SEM is a recommended method (Tenenhaus et al., 2005, Hair Jr et al., 2017). Besides, this study has 203 useable response which is a decent number to use PLS but ...recommended to have a relatively large dataset usually more than 250 to use CB Based method (i.e. AMOS). Considering all the reasons above this using PLS-SEM is justified.

4.13 Ethical Issues

In research, ethical consideration is crucial starting from sketching the ideas until the completion of it (Bryman, 2012). To maintain ethical standards, ethical approval has been taken (see **Appendix G**) from the University of Bedfordshire, and the guidance was strictly followed. For data collection, a list of food and drink business in the UK has been obtained using the FAME database. The list contains names of the companies, contact persons, and contacts emails. Data was collected through

online survey software Qualtrics. Before sending out the link/questionnaire to the participants, an email was sent to them detailing the purpose of the research and the research process to get their consent. Where possible, visiting the business premises and making telephone calls to the prospective participant's consent has been obtained. Participants are assured about the anonymity and the confidentiality of the provided information. Personal data will only be used for research purposes by the researcher and the supervisors only and will not be shared with any other parties. For the pilot study, collected data were imported into SPSS file from Qualtrics for analysis purposes. The Names of the participants or participating organisation is not collected. So, the collected data are anonymised. Only summative information will be presented in the thesis. Once research is completed, the outcome of the research will be informed to the participants through email should they select to receive that. Personal data will be stored and secured with great caution in a password protected laptop where only the researcher has access. University of Bedfordshire's guidelines to maintain anonymity and security of the data will be strictly followed. Moreover, participants are free to withdraw their participation at any stage without giving any reasons. There will have no physical or mental health risk in this study as the participants are voluntarily participating and they only give their opinions based on the experiences.

4.14 Chapter Summary

The research methodology is crucial for any research endeavour. Hence, there are multiple questions to answer through this research, so, a set a research method which outlined in the research design is justified.

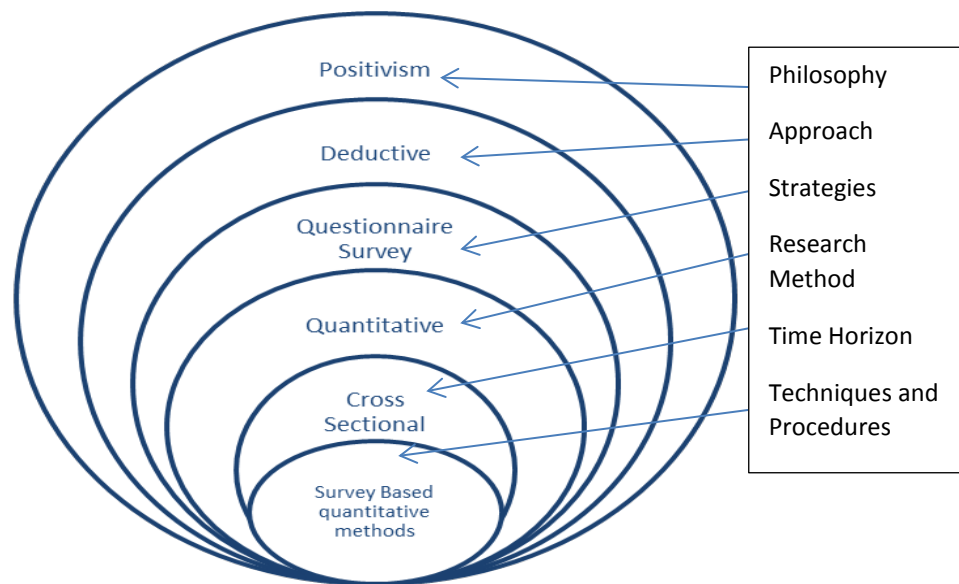


Figure 4:4 Research Onion for this Study

(Source: Based on Saunders et al. 2016)

Moreover, this study deployed quantitative research methods which also influenced by the philosophical stance of the researcher. The approach of this research is deductive which is also congruent with the positivism philosophy of this study because the main purpose of the research is not to bring in new theory rather develop existing ones and examining the relationship among constructs. For quantitative data analysis purposes, Structural Equation Modelling a popular, up-to-date statistical method for quantitative data analysis was deployed. The total methodology of this research at a glance can be shown in the following research onion as suggested by Saunders et al. (2016).

5 Chapter 5: Data Analysis and Findings

5.1 Introduction

Data analysis and the findings, based on quantitative data analysis technique using PLS-SEM, are presented in this chapter. This is a quantitative study that pursues to examine proposed hypotheses. For data collection purposes, a survey questionnaire was deployed and distributed among the selected respondents to collect data regarding supplier collaboration, environment-friendly and socially responsible practices and the sustainable performance (environmental, cost and social) in the UK food supply chains. Collected data were statistically analysed using SPSS 22.0 to prepare the data and SmartPLS3 to test the developed model.

This chapter starts with the data screening where missing data and outliers were dealt with, and a demographic analysis of the responses was conducted. Common method bias and non-response bias are also addressed in this section. This is followed by the measurement model where the reliability and the validity of the constructs were assessed. This chapter also tested the proposed hypotheses (structural model) that include evaluating the path coefficients in the specified model. The developed model in this study attempted to assess the impact of supplier collaboration on sustainable performance in the UK food SCs. It also seeks to examine whether environmentally friendly and socially responsible practices can mediate the relationship between the supplier collaboration and sustainable performance in the UK food SCs.

5.2 Data Preparation

Data screening or data preparation is an important step before data analysis. It helps to understand the data, its missing values, outliers and so on. According to Hair Jr et al. (2017), understanding the data well is important especially when the researcher considers deploying SEM techniques. Data screening also facilitates fulfilling the conditions required for the chosen data analysis tool. Tabachnick and Fidell (2014) stated that in data screening stage, observing the missing values, detecting the outliers and conducting normality tests are conducted. This study, however,

considered observation of missing values and detection of outliers. The normality test was not considered in this study as because the PLS-SEM works based on the prediction-oriented measures (Chin, 1998) and the normality of the data is not necessary. A total of 234 responses were received of which 24 of those responses were screened out because they have selected 'No' to either one of the two screening questions (they are operating their business within the UK food and Drink industry and they have better information sharing/relationships with their key suppliers).

5.2.1 Missing Data

Data can be missing when the participants in a survey fail to respond to one or more questions consciously or unconsciously (Veal, 2005). According to Neuman (2013) in social science research, dealing with missing data is a common problem. If the missing data in a questionnaire surpasses 15%, the observation should be removed from the dataset (Hair Jr et al., 2017). The observation can also be deleted if the percentage of the missing data is below 15%. The data can be missing in a survey for several reasons such as because of sensitive nature of the questions if the respondents do not answer the question or the respondents forget to answer some questions or deliberately skipped some questions.

Kline (2015) noted that questionnaire design might also contribute to missing data for example unnecessary long questionnaire may intimidate the respondents or discourage respondents to answer some questions. Missing data may distort the result or may generate bias results (Hair Jr et al., 2017).

In this study, the missing values were detected with the help of Excel. The data were copied from the SPSS file and paste it into Excel. Using Countblank formula in Excel (=countblank (select range of cells) and press enter), the blank cells in the dataset were calculated and presented in descending order. From there, a total of five observations were removed due to having more than 15% of the missing values. The removal represents around 2.4% of the collected responses which according to Tabachnick and Fidell (2014) should not create anomalies in the analysed results. After removing

the missing values, the total usable responses were 205 before detecting the unengaged responses and outliers.

5.2.2 Unengaged Responses

Unengaged responses are also taking place in the survey data. This happens when the participants do not engage in the survey or just chose only one anchor in their responses such as selecting 1 or 2 or 3 throughout the survey questions. If the respondents give the same answer to all or most of the questions without much variation in their responses, then this data might not generate meaningful results. Hence, these observations should be deleted.

Unengaged responses were calculated using the standard deviation of the items, and this can be done in Excel. Similar to the Countblank formula, to find out the unengaged responses, STDEV formula (=STDEV (select range of cells) and press enter) in Excel can be used. Standard Deviation= 0 represents that the respondent endorsed only one anchor throughout the survey. These data are not useful. A total of two responses were deleted based on the STDEV. One of them selected 1 and another one selected 3 throughout the survey.

5.2.3 Detecting Outliers

The outliers in a dataset are the unusual or extreme values appeared in one or more variables. According to Zikmund et al. (2012), the outlier in an observation is the unusual distant points than rest of the other observations. The analysed results based on the dataset with outliers may generate negative variance estimates and may provide distorted statistical results which should not be the basis of generalisation (Brown, 2014). Outliers in a dataset can happen for several reasons including entering incorrect values in the data set, or unidentified missing values in the dataset (Hair Jr et al., 2017). Outliers according to Kline (2015) can be of univariate (unusual values in a single variable), bivariate or multivariate.

Univariate, bivariate or multivariate approaches are suggested to located outliers in the literature.

However, this study considered a univariate and multivariate approach to detect outliers. The

bivariate approach was not compatible with the current research as it needs a large number of graphs and testing two constructs at the same time (Kline, 2015). To detect univariate outliers, each variable is examined to detect unique observation, and the multivariate method usually analyses each construct across the combination of various variables in the study. Frequency distributions of Z-scores are employed to locate univariate outliers. According to Pallant (2010), there will be outliers in the univariate dataset if the Z-score is >3.29 with $P < 0.001$ (two-tailed). In the dataset for this research, no influential outlier is detected as such please see the **Appendix C**.

Multivariate outliers are the combination of scores of two or more variables. Multivariate outliers can be detected through the Mahalanobis D^2 test in SPSS in which each observation is checked across a range of selected variables (Hair et al., 2011). The degree of freedom (D^2/df) in this test generally higher than 2.5 and 3-4 in relatively larger samples. This study collected responses using the five points Likert's scale (between 1 and 5) except for demographic questions. So, for Likert scale questions, the outliers should not be an issue. The answer should be between one and five only. However, in the demographic section, there might be outliers which need checking. For multivariate outliers, Mahalanobis test was conducted in SPSS 22.0. Through that, one possible outlier was detected however after checking the data it was not showing anomalies. So, it is decided not to remove the variable.

5.3 Common Method and Non-Response Bias

Survey-based research might be biased in several ways. Common method bias and non-response bias are widely recommended approach to check for research to eliminate bias. For this study, the non-response and Common method bias were checked whether there is any potential bias in the dataset or the research in general.

In data collection, non-response bias takes place when certain questions are not answered, or a random sample cannot be implemented, or someone refused to participate in a survey. Non-response bias can be minimised through a better survey design, carefully worded questionnaires,

the length of the question, practical and appealing of the survey, being timely, communication methods and so on. There are several ways to deal with non-response bias including case deletion and mean replacement.

Non-response bias was evaluated following the procedures as suggested by Armstrong and Overton (1977) by comparing early and late respondents on two important demographic variables (number of employees and turnover). The t-test results revealed no significant statistical difference in the stated category means for the number of employees and the turnover. Thus, non-response bias is not a major concern in this study.

As the data were collected as a single respondent from every company, common method bias might be an issue (Podsakoff, 2003). To evaluate the common method bias, Harman's single factor test (Harman, 1976) was used to check whether a single factor accounted for the majority of covariance between the predictor and criterion variables (Hair et al., 2011). The results (please see **the Appendix D**) indicated that one factor explained around 25.26% the variance. This indicated that common method bias should not be an issue in this study.

The common method bias also checked in PLS-SEM by calculating VIF as suggested by (Kock, 2015). "The existence of a VIF greater than 3.3 is proposed as an indication of pathological collinearity and also as an indication that a model may be contaminated by common method bias. Therefore, if all (factor level) VIFs resulting from a full collinearity test are equal to lower than 3.3 the model can be considered free from common method bias" (Kock, 2015, P.7). In this study, all VIFs including factor level ones are below the recommended level (Please see **the Appendix E**). So, the common method bias is not a concern in this study.

5.4 Demographics

Table 4.1 gives the details of demographic characteristics of the respondents:

Table 5:1 Demographics Features of the Sample in this Study

| Characteristics | Category | Frequency | Percentage |
|---------------------------------------------|-------------------------------------------|-----------|------------|
| Type of business | Food Manufacturing | 89 | 43.8 |
| | Food Processing | 35 | 17.2 |
| | Food Wholesaling | 44 | 21.7 |
| | Food Retailing | 31 | 15.3 |
| | Others | 4 | 2 |
| Number of Employees in the company | Less than 25 | 91 | 44.8 |
| | Between 25-50 | 51 | 25.1 |
| | Between 51-100 | 18 | 8.9 |
| | Between 101-250 | 22 | 10.8 |
| | Over 250 | 21 | 10.3 |
| Number of suppliers of the company | Less than 25 | 58 | 28.6 |
| | Between 25-50 | 24 | 11.8 |
| | Between 51- 100 | 44 | 21.7 |
| | Between 101- 200 | 41 | 20.2 |
| | Over 200 | 36 | 17.7 |
| The intensity of information sharing | Daily | 128 | 63.1 |
| | Weekly | 56 | 27.6 |
| | Fortnightly | 2 | 1.0 |
| | Monthly | 17 | 8.4 |
| Annual Turnover | Less than 250000 | 22 | 10.8 |
| | Between 250000 and less than 500000 | 46 | 22.7 |
| | Between 500000 and less than 1 Million | 45 | 22.2 |
| | Between 1 Million and Less than 5 Million | 42 | 20.7 |
| | Over 5 Million | 48 | 23.6 |
| Respondent's Profile | Supply chain Manager/Director | 17 | 8.4 |
| | Purchasing Manager/Director | 34 | 16.7 |
| | CEO/Managing Director | 99 | 48.8 |
| | General Manager/Operations Manager | 43 | 21.2 |
| | Other (Please specify) | 10 | 4.9 |
| Length of Company operations | Less than 2 years | 6 | 3.0 |
| | Between 2 and less than 5 years | 19 | 9.4 |
| | Between 5 and less than 10 years | 63 | 31.0 |
| | Over 10 Years | 115 | 56.7 |
| Respondents' level of experience | Less than 2 years | 5 | 2.5 |
| | Between 2 and less than 5 years | 24 | 11.8 |
| | Between 5 and 10 years | 67 | 33.0 |
| | Over 10 years | 107 | 52.7 |
| Environmental Certification | Yes | 63 | 31 |
| | No | 140 | 69 |
| Social Certification | Yes | 22 | 10.8 |
| | No | 181 | 89.2 |

Table 5.1 presents the demographic profiles of the samples used in this study. Some of the key facts about the demographic information in this research are explained below.

The study received 203 useable samples among which over 40% of the participating organisations were involved in food manufacturing or producing related operations. Around 38% of the businesses in this survey were involved in food wholesaling and retailing. It is important to note that around 70% of the participating organisations fall under small business criteria with less than 50 employees. In contrast, just over 10% of participating organisations were considered as large with over 250 employees. It is also important to note that around 90% of the companies participated in this study had communicated with their suppliers on a daily/weekly basis. This indicates the intensity of information sharing between the firms and closeness of their relationships.

It is evident that 40% of the responding firms had less than 50 suppliers, 20% of the firms over 50 but less than 100 suppliers whereas 38% have more than 100 suppliers. Also, 45% of the participating firms have an annual turnover of over a million pounds whereas 10% of the firms have less than £250,000. It is noted that around half of the respondents were CEOs or Managing Directors of their companies, and 21% of the respondents were General Managers or Operations Managers. Approximately 86% of the respondents have more than five years of industry experiences and around one-third of the participating firms had gained an environmental certification, and 11% of the firms have social certification. Though these firms were adopting some form of environmental and social practices, most of them needed improving their social and environmental practices and gain relevant social and environmental certifications.

5.5 Descriptive statistics

Descriptive statistics helps to understand the mean, median, standard deviations and other basic information of the study variables. Through descriptive statistics, the data are presented in such a way that helps understand and interpret the key features of the sample (Zikmund et al., 2012, Neuman, 2013). In this study, the survey data were collected for the items of the latent variables

using five-point Likert's scale where '1' denoted strongly disagree and '5' denoted strongly agree.

The mean values presented in Table 5:2 indicate the trend of a solid agreement on the statements in the survey. The mean and standard deviation are highlighted in the below.

Table 5:2 Mean and Standard Deviations of Items of the Constructs

| Constructs | Items | N | Mean | Std. Deviation |
|--------------------------------|-------------------|-----|------|----------------|
| Supplier Collaboration | SupplierCol_1 | 203 | 4.21 | .899 |
| | SupplierCol_2 | 203 | 4.19 | .860 |
| | SupplierCol_3 | 203 | 4.20 | .839 |
| | SupplierCol_4 | 203 | 3.74 | 1.074 |
| | SupplierCol_5 | 203 | 3.63 | 1.273 |
| | SupplierCol_6 | 203 | 3.63 | 1.129 |
| | Supplier Col_7 | 203 | 3.62 | 1.164 |
| | Supplier Col_8 | 203 | 3.46 | 1.260 |
| Environment Friendly Practices | EnvPractices_1 | 203 | 4.02 | .949 |
| | EnvPractices_2 | 203 | 4.18 | .743 |
| | EnvPractices_3 | 203 | 4.53 | .565 |
| | EnvPractices_4 | 203 | 4.41 | .585 |
| | EnvPractices_5 | 203 | 3.77 | 1.090 |
| | EnvPractices_6 | 203 | 4.00 | .827 |
| | EnvPractices_7 | 203 | 3.86 | .957 |
| | EnvPractices_8 | 203 | 2.96 | 1.293 |
| | EnvPractices_9 | 203 | 3.96 | .801 |
| | EnvPractices_10 | 203 | 3.87 | .940 |
| | EnvPractices_11 | 203 | 4.22 | .787 |
| Socially Responsible Practices | SocialPrac_1 | 203 | 3.92 | .763 |
| | SocialPrac_2 | 203 | 3.19 | 1.250 |
| | SocialPrac_3 | 203 | 4.17 | .827 |
| | SocialPrac_4 | 203 | 4.17 | .725 |
| | SocialPrac_5 | 203 | 4.51 | .566 |
| | SocialPrac_6 | 203 | 4.38 | .653 |
| | SocialPrac_7 | 203 | 4.38 | .536 |
| | SocialPrac_8 | 203 | 4.37 | .524 |
| | SocialPrac_9 | 203 | 4.30 | .606 |
| | SocialPrac_10 | 203 | 4.39 | .565 |
| Environmental Performance | EnvPerformace_1 | 203 | 4.60 | .575 |
| | EnvPerformace_2 | 203 | 4.53 | .600 |
| | EnvPerformace_3 | 203 | 4.28 | .679 |
| | EnvPerformace_4 | 203 | 4.51 | .616 |
| | EnvPerformace_5 | 203 | 4.57 | .596 |
| | EnvPerformace_6 | 203 | 4.29 | .703 |
| | EnvPerformace_7 | 203 | 3.52 | .891 |
| Cost Performance | CostPerformance_1 | 203 | 3.67 | .893 |

| | | | | |
|--------------------|----------------------|-----|------|-------|
| | CostPerformance_2 | 203 | 3.15 | 1.104 |
| | CostPerformance_3 | 203 | 3.89 | .953 |
| | CostPerformance_4 | 203 | 3.49 | .982 |
| | CostPerformance_5 | 203 | 3.13 | 1.007 |
| | CostPerformance_6 | 203 | 3.65 | 1.068 |
| | CostPerformance_7 | 203 | 3.54 | .986 |
| | CostPerformance_8 | 203 | 3.20 | 1.044 |
| | CostPerformance_9 | 203 | 3.18 | .979 |
| Social Performance | SocialPerformance_1 | 203 | 3.40 | .903 |
| | SocialPerformance_2 | 203 | 4.10 | .724 |
| | SocialPerformance_3 | 203 | 4.23 | .673 |
| | SocialPerformance_4 | 203 | 4.12 | .675 |
| | SocialPerformance_5 | 203 | 4.23 | .666 |
| | SocialPerformance_6 | 203 | 4.26 | .610 |
| | SocialPerformance_7 | 203 | 3.23 | 1.142 |
| | SocialPerformance_8 | 203 | 4.13 | .663 |
| | SocialPerformance_9 | 203 | 3.99 | .745 |
| | SocialPerformance_10 | 203 | 4.13 | .658 |

5.6 Evaluation of the Measurement Model

PLS-SEM helps test the relationships between one or more exogenous and endogenous variables. According to Wong (2013), PLS-SEM is used to measure the extent to which the collected data support the proposed constructs. The measurement model encircles the unidirectional predictive relations between the Latent constructs and their observed Items. At this stage, multiple relations are not examined rather the variables are linked with a single latent construct (Hair Jr et al., 2017). PLS-SEM is also believed to have a better predictive capability of the model and judge the quality of the proposed model (Hair Jr et al., 2017). Unlike observed variables, the latent variables cannot be measured directly but are measurable through a set of observed items (Henseler et al., 2009, Hair et al., 2011). Also, PLS-SEM is a popular approach to propose a value perspective for developing less explored theory in the field of social science (Hair Jr et al., 2017).

Smart PLS can handle a complex set of variables with the multidimensional relationship at the same time efficiently. The relationships between the variables are simultaneously measured in the measurement model (Hair Jr et al., 2017). In PLS-SEM, to do that correctly, proper prior knowledge

is essential (Wong, 2013). Hence, the theoretical framework, proposed hypotheses and the relationships among the variables should be developed based on a comprehensive literature review (Tabachnick and Fidell, 2014).

This study deployed PLS-SEM to assess the measurement and structural models. Non-parametric testing procedures which also exercises measures like bootstrapping are the basis for both models (Hair Jr et al., 2017). PLS-SEM is a variance-based approach and is often used in the studies that aim for developing existing theories. So, it tests and validates the exploratory model as well as it measures the complicated research model with various latent constructs and their items (Chin, 1998).

It is not necessary for PLS-SEM to have normal data and a large sample size because it can handle linear and non-linear relationships (Chin, 1998). Hair Jr et al. (2017) noted that the reflective and formative variables and the associations between the variables in the study are dealt with in PLS-SEM. Reflective constructs refer that the indicators are influenced by the same underlying concept or in other words the indicators are the functions of the latent constructs (Finn and Wang, 2014). On the other hand, in the formative constructs, the indicators form the latent constructs and changing the indicators will lead to changes in the latent construct (Hair Jr et al., 2017).

The analysis in this study is conducted in 2 stages. At first, the measurement model where the association between the research items and their corresponding latent variables are identified (outer model). In the second stage, the relationship between the exogenous and endogenous variables are measured (inner model). A reflective model is estimated based on Individual reliability, construct reliability and validity (convergent and discriminant) to understand the internal consistency of the measures whereas the convergent validity, collinearity among the items, significance and the relevance of the outer weights are used to measure the formative model (Hair Jr et al., 2017).

5.7 Assessment of the Reflective Measurement Model

It is essential for the researcher to distinguish the formative and the reflective constructs at the beginning when the measurement model is assessed (Roy et al., 2012, Finn and Wang, 2014). The reason is that the measurement model is important to facilitate the statistical significance of the path coefficient and the model fit. According to Hair Jr et al. (2017), the reflective measurement models are assessed using the internal consistency (Cronbach's alpha, composite reliability), Convergent validity (indicator reliability, average variance extracted) and the discriminant validity. The measurement of formative constructs has, however, different features to be assessed as the conceptualisation and the operationalisation of both the models are different. The criteria for the reflective measurement model for this study is outlined below.

5.7.1 Internal Consistency Reliability

Internal consistency reliability is the first criteria to be looked at, to measure the reflective model. The Cronbach's Alpha, which provides an estimate of the reliability based on the intercorrelations of the observed indicators, is typically used as the measures of internal consistency (Hair Jr et al., 2017). Cronbach's alpha assumes that all observed indicators are equally reliable, or they have the equal outer loadings on the constructs (Tenenhaus et al., 2005). PLS-SEM, according to Hair Jr et al. (2017), emphasise the indicators based on their reliability. Scholars consider the Cronbach's alpha as a conservative measure of internal consistency (Monecke and Leisch, 2012). However, the Cronbach's alpha is sensitive to the number of items in the scale, and this may misrepresent the internal consistency of the constructs. According to Briggs and Cheek (1986), the fewer items in a scale, the lower the Cronbach's alpha may be generated. Due to the limitations of Cronbach's alpha, different measures of internal consistency known as Composite Reliability (CR) is technically the preferred method (Hair Jr et al., 2017). The CR considers different outer loadings of the indicator variables (Henseler et al., 2009). The CR is usually interpreted as similarly to Cronbach's alpha between 0 and 1. In exploratory studies, the CR value of .60 to .70 is acceptable, and the values

between .70 and .90 are satisfactory. However, the value above .90 and definitely above .95 are not desired as they indicate the indicators are measuring the same phenomena and might not be the valid measure of the constructs(Hair Jr et al., 2017). It is evident from the below Table 5:3 that composite reliability of the constructs is above .80 which is satisfactory, and this indicates that there is no deficiency of internal consistency among the constructs.

Table 5:3 Cronbach’s Alpha and Composite Reliability of the Constructs

| Constructs | Cronbach's Alpha | Composite Reliability |
|---------------------------|----------------------------|------------------------------|
| Supplier Collaboration | 0.770 | 0.849 |
| Environmental Practices | Formative Construct | Formative Construct |
| Process Stewardship | 0.684 | 0.826 |
| Product Stewardship | 0.655 | 0.814 |
| Social Practices | 0.681 | 0.802 |
| Environmental Performance | 0.880 | 0.890 |
| Cost Performance | 0.841 | 0.887 |
| Social Performance | 0.850 | 0.892 |

5.7.2 Individual Item Reliability

Individual item reliability was also evaluated through combined loadings. This has been conducted to ensure that the items of the study load on to their respective theoretical latent constructs. It is evident in the below Table 4:4 that a total of 29 items in this study had necessary internal consistency and they have loaded onto their respective latent variables. However, 21 items from all the variables had to be deleted due to low reliability. Hence, they were deleted from the dataset. The value of these items should be between -1 and +1 (Tenenhaus et al., 2005, Wong, 2013). The loadings should be above 0.50, and the P-value of the respective items should be <0.05. Table 4:4 presented that all the items loaded onto their respective constructs and the P-value was <0.001. It is evident from the table that the items loaded onto their respective constructs and all items except three were <.70 which is greater than the recommended level. The loadings for the rest three items including Suppliercoll4, SocialPrac5, and Socialprac9 were greater than .62 (<.62) yet it is within the accepted range (Hair Jr et al., 2017). Hence, it is clear that the measurement items fulfil the set criteria and have the individual item reliability at the acceptable level.

Table 5:4 Outer Loadings of the Study Constructs

| Items | Supplier collaboration | Product stewardship | Process stewardship | Social Practice | Environment Perform | Cost Performance | Social Performance | p-value |
|-------------|------------------------|---------------------|---------------------|-----------------|---------------------|------------------|--------------------|---------|
| SuppColl_1 | 0.660 | | | | | | | <0.001 |
| SuppColl_2 | 0.874 | | | | | | | <0.001 |
| SuppColl_3 | 0.879 | | | | | | | <0.001 |
| SuppColl_4 | 0.622 | | | | | | | <0.001 |
| PrdStw_10 | | 0.703 | | | | | | <0.001 |
| PrdStw_2 | | 0.854 | | | | | | <0.001 |
| PrdStw_4 | | 0.748 | | | | | | <0.001 |
| ProcStw_11 | | | 0.774 | | | | | <0.001 |
| ProcStw_7 | | | 0.772 | | | | | <0.001 |
| ProcStw_9 | | | 0.803 | | | | | <0.001 |
| SoclPrac_5 | | | | 0.641 | | | | <0.001 |
| SoclPrac_6 | | | | 0.798 | | | | <0.001 |
| SoclPrac_8 | | | | 0.707 | | | | <0.001 |
| SoclPrac_9 | | | | 0.686 | | | | <0.001 |
| EnvPerf_1 | | | | | 0.840 | | | <0.001 |
| EnvPerf_2 | | | | | 0.782 | | | <0.001 |
| EnvPerf_3 | | | | | 0.714 | | | <0.001 |
| EnvPerf_4 | | | | | 0.775 | | | <0.001 |
| EnvPerf_5 | | | | | 0.818 | | | <0.001 |
| CostPerf_1 | | | | | | 0.754 | | <0.001 |
| CostPerf_2 | | | | | | 0.735 | | <0.001 |
| CostPerf_4 | | | | | | 0.759 | | <0.001 |
| CostPerf_5 | | | | | | 0.820 | | <0.001 |
| CostPerf_8 | | | | | | 0.835 | | <0.001 |
| SoclPerf_2 | | | | | | | 0.813 | <0.001 |
| SoclPerf_3 | | | | | | | 0.747 | <0.001 |
| SoclPerf_4 | | | | | | | 0.798 | <0.001 |
| SoclPerf_5 | | | | | | | 0.800 | <0.001 |
| SocilPerf_8 | | | | | | | 0.788 | <0.001 |

5.7.3 Convergent Validity

According to Saunders et al. (2016) validity is the ability of a construct to measure what it is intended for and it should match with the real world. Convergent validity is the extent to which measure correlates positively with alternative measures of the same constructs (Hair Jr et al., 2017). Petter et al. (2007) referred convergent validity as how well the items in a construct load or converge together on to their theoretically justified constructs. Items of reflective constructs are considered differently to estimate the same constructs. So, the indicators of a particular construct should converge or share a high proportion of variance (Hair Jr et al., 2017). Convergent validity of constructs is usually evaluated by the scholars using the outer loading of the items and the average variance extracted.

The higher outer loadings on a construct refer that the indicators have much in common to share that is covered by the construct. The outer loadings which are also known as the indicator reliability, at a minimum, should be statistically significant and the standardised outer loadings should be 0.708 or above. However, if the number of the indicator is less than for a construct, the outer loading of above 0.50 is accepted (Hair Jr et al., 2017). Items on a construct can be considered for deletion between the loadings of 0.40 and 0.70 if their deletion improves the composite reliability or AVE above the minimum required level. The minimum required level of AVE is 0.50 and according to Chin (2010) greater than this is considered as good for reliable validity.

Table 5:5 Convergent Validity of the Study Constructs

| Constructs | Average Variance Extracted (AVE) |
|-------------------------------|-----------------------------------------|
| Supplier Collaboration | 0.633 |
| Process Stewardship | 0.613 |
| Product Stewardship | 0.595 |
| Socially responsible Practice | 0.500 |
| Environment Performance | 0.872 |
| Cost Performance | 0.611 |
| Social Performance | 0.624 |

Table 5:5 above indicated all the latent variables in this study has AVE of greater than 0.50. This refers that the rule of convergent validity is satisfied in this study (Hair Jr et al., 2017).

5.7.4 Discriminant Validity

According to Hair Jr et al. (2017), discriminant validity refers to the extent to which a construct is distinct from other constructs by empirical standards. That means ensuring discriminant validity implies that the construct is unique, and the phenomena are not represented by any other constructs in the model. This clarifies that there are no strong relationships between the latent constructs (Chin, 2010). If there is an issue of high inter-correlated items among the constructs, then verifying discriminant validity is needed to have confidence in the research findings (Tabachnick and Fidell, 2014).

Discriminant validity is usually measured using two criteria – the cross-loadings and the Fornell-Larcker criterion (Hair Jr et al., 2017). The Cross loadings infer that the indicators outer loadings should be greater than any of its cross-loadings on the other constructs. This has been demonstrated in Table 4:4 above with the outer loadings of the study constructs and the table also highlighted there was no discriminant validity issue. On the other hand, The Fornell-Larcker criterion which compares the square root of AVE values with the latent variable correlations. The square root of AVE should be greater than its highest correlations with any other constructs (Fornell and Larcker, 1981). The rationale behind the Fornell Larcker method is that a construct shares more variance with its respective indicators than with any other constructs.

The Table 5:6 below illustrated that the Square root of AVE is Grater then the correlations among all the latent constructs except the formative construct. According to Hair Jr et al. (2017) stated that the AVE value for formative constructs and single item construct are not meaningful and thus they are not reported for evaluating Fornell-Larcker criterion. However, the required conditions are fulfilled for reflective constructs in this study. The Latent variable Correlations are stated below.

Table 5:6 Latent Variable Correlations

| Variables | CP | EFPs | EP | SCOL | SP | SRPs |
|-----------|--------------|------------------|--------------|--------------|-------------|-------------|
| CP | 0.782 | | | | | |
| EFPs | - | Formative | | | | |
| EP | 0.308 | 0.453 | 0.787 | | | |
| SCOL | 0.179 | 0.237 | 0.259 | 0.768 | | |
| SP | 0.433 | 0.407 | 0.433 | 0.402 | 0.79 | |
| SRPs | 0.209 | 0.465 | 0.393 | 0.45 | 0.394 | 0.71 |

Note: the square root of AVE is displayed in bold in the table.

5.8 Assessment of Formative Construct

This part illustrated the measurement of the formative construct and its findings. There are differences between the measurement procedures of formative and reflective constructs. This requires dissimilar tests to be carried out to draw the findings in both the approaches (Finn and Wang, 2014, Hair Jr et al., 2017). It is assumed, particularly in PLS-SEM, that formative indicators can cover the total content domain of the specific constructs. Hence, other measures should be used in assessing formative constructs instead of deploying measures like composite reliability or AVE.

Henseler et al. (2009) stated that the reliability aspect of reflective models is highly expected, but this is not the case for formative constructs as they are not necessarily highly correlated. The Construct validity will be compromised if correlations pattern is used to measure the validity (Hair Jr et al., 2017). According to Chin (2010) measuring discriminant validity in formative constructs using similar measurement standards as formative constructs are not meaningful. In this part, the criteria required to assess formative constructs are outlined. This includes bootstrapping procedures that allow PLS-SEM to estimate indicator weights (Hair Jr et al., 2017). For measuring formative constructs, Hair Jr et al. (2017) suggested some steps that are outlined below.

5.8.1 Convergent Validity

It is essential to focus on configuring content validity before the empirical measurement of the constructs. According to Henseler et al. (2009) assessing formative constructs should be initially

assessed using theoretical justification. In this study, the formative construct is the Environmental practices, and it has two lower order components as product stewardship, and process stewards and both of them have individual reflective items. The formative construct (EFPs) has been validated in the study during the framework development stage. Also, the measurement items were generated based on a comprehensive literature review of related empirical studies and a pilot run of the survey instrument. Thus, it can be drawn that the developed construct in this study was theoretically grounded.

Validity can also be assessed through statistical analysis at indicator as well as construct levels. At constructs level, it is necessary to understand whether the constructs act between the hypotheses as expected. The interaction between the formative and other constructs in the path model should be strong and significant. At the indicator level, it is necessary for the formative indicators to represent the intended meaning.

Convergent validity is that defined by Hair Jr et al. (2017) as the extent to which a measure positively associate with other measures in the same constructs. It is necessary to understand whether the measurement of formative constructs is highly correlated with the measurement of the reflective constructs. This is also referred to as 'redundancy analysis'. The researchers use formative measured constructs as an exogenous variable and predict endogenous latent construct operationalised through one or more reflective indicators. The strength of path coefficients between the two constructs is suggestive of the validity of the chosen set of formative indicators in tapping the specific construct (Hair Jr et al., 2017).

5.8.2 Assessment of the Collinearity Issues among the Indicators

In the formative constructs, it is not expected to have high correlations between the items (Henseler et al., 2009). High correlations between the formative indicators represent collinearity and having collinearity in the formative construct is challenging both from methodological as well as the

interpretational viewpoint(Hair Jr et al., 2017). It is called multicollinearity when more than two indicators are involved.

Collinearity can be acute when two formative indicators are listed in the same block with exhibiting the same information (i.e. they are perfectly correlated). Evaluating collinearity issues are important as their existence may affect model estimation (MacKenzie et al., 2005). It is necessary to consider the significance of the estimated indicator in formative constructs (Tenenhaus et al., 2005, Chin, 2010).

In the context of PLS-SEM, a tolerance value of 0.2 or lower and a Variance Inflation Factor (VIF) value of 5 or above represent the possible collinearity issue (Hair et al., 2011). When the VIF is above 5, the researcher needs to think whether to delete the indicator. However, Westlund et al. (2001) recommended that the VIF values for all predictor constructs should be between 1.0 and 10.

Deleting indicators should be considered only when the remaining indicators still can cover the full content of the constructs from the theoretical ground (Hair Jr et al., 2017). Table 5:7 displayed the VIF values of the indicators, and the constructs of the model and all of them are below the recommended level. This confirms that there are no collinearity issues to be considered in this study. Hence, this facilitates the researcher to measure the outer weights and to interpret the contributions of formative indicators in both absolute and relative terms.

Table 5:7 VIF Values of the Indicators and the Constructs

| Environment-friendly Practices | | | |
|---------------------------------------|-------|----------------------------|-------|
| Product Stewardship | | Process Stewardship | |
| Items | VIF | Items | VIF |
| Envp2 | 1.557 | Envp7 | 1.291 |
| ENVP4 | 1.405 | Envp9 | 1.401 |
| Envp10 | 1.178 | Envp11 | 1.322 |
| Inner VIF Values | | | |
| Lower Order Components | | VIF Values | |
| Product Stewardship | | 1.892 | |

| | |
|--------------------------------|-------|
| Process Stewardship | 1.896 |
| Formative Construct | |
| Environment-Friendly Practices | 1.276 |

5.8.3 Significance and Relevance of the Outer Weights

Outer weights of an indicator are also an important criterion to evaluate the contribution to form a formative construct and their relevance (Hair Jr et al., 2017). The outer weights are generated based on the multiple regression analysis outcomes. The outer weights values are standardised and hence can be compared with each other. The outer weights signify the influence on the construct or its comparative importance in establishing the construct. It is important to note that, the value of the outer weight of formative indicators is normally lower compared to the outer loadings of the reflective indicators.

However, whether formative indicators accurately contribute to establishing the construct is a question that can be answered by testing the level of significance of the construct following bootstrapping procedures. According to Henseler et al. (2009), the indicator's weights are used to evaluate the validity of a formative measurement model. The weights and P values of the indicators are provided in Table 5:8.

Table 5:8 The Outer Weights and Significant Testing of Formative Constructs

| Formative Construct | Lower Order Components | Reflective Indicators | Outer Weights | Outer Loadings | P Values |
|--------------------------------|------------------------|-----------------------|---------------|----------------|----------|
| Environment Friendly Practices | Product Stewardship | ProdStew2 | 0.483 | 0.854 | <0.001 |
| | | ProdStew4 | 0.388 | 0.748 | <0.001 |
| | | ProdStew10 | 0.422 | 0.702 | <0.001 |
| | Process Stewardship | ProcessStew7 | 0.433 | 0.773 | <0.001 |
| | | ProcessStew9 | 0.425 | 0.802 | <0.001 |
| | | ProcessStew11 | 0.418 | 0.771 | <0.001 |

Table 4:8 above indicated that the p- values of the indicators in the formative construct (Environmental practices) are statistically significant at P <0.001. The outer weights, outer loadings and the P-values (level of significance) are all within the accepted and recommended level. Hence,

no item was removed. This supports the theoretical justification that environmental practices which are formed by product and process stewardship have an impact on sustainable performance.

5.9 Evaluating the Structural Model

From the previous sections, it is evident that the constructs in this study are reliable and valid. In this part of the study, the structural model also known as the inner model was assessed and reported. The structural model of this study consists of several latent constructs such as supplier collaboration, environment-friendly practices, socially responsible practices, environmental performance, cost performance and social performance. Environmental performance, cost performance and social performance in this study are outcome variables whereas supplier collaboration is an independent variable. Environment-friendly practices and Socially responsible practices work as independent, mediating and outcome variables. According to Hair Jr et al. (2017), the evaluation of the structural model helps identify whether and to what extent the collected data support the existing theories and concepts. The purpose of evaluating this is to find out the explanatory power of the research model and examining the proposed hypotheses. Also, it incorporates the predictive capabilities of the model and the associations among the exogenous and endogenous constructs (Hair Jr et al., 2017).

To assess the structural model, Hair Jr et al. (2017) suggested assessing collinearity issues, level of significance between the study constructs, estimation of R^2 values, effect sizes f^2 and the predictive relevance Q^2 . Essentially, the crucial measures to assess the structural model are the R^2 value of endogenous constructs and whether the path coefficients are significant or not. Primarily, the purpose of this prediction-oriented approach is to explain the variance of endogenous constructs. The higher the R^2 value is better. However, the R^2 value of >0.50 is recommended. It is important to note that the Goodness of fit measures of the model is not important in PLS-SEM method (Tenenhaus et al., 2005). Instead of measuring the goodness-of-fit, the structural model mainly evaluated by heuristic criteria that are set by the model's predictive competences.

The model is evaluated regarding how well it predicts the endogenous variables (Hair Jr et al., 2017). PLS-SEM normally contemplates AVE to evaluate the measurement model and average R^2 to evaluate the structural model. The structural model helps identify the causal relationship between the study constructs and assesses the research model(Wong, 2013).

The overall model fit is assessed deploying the fit indices that includes evaluating the average path coefficient, average R-square and average VIF (Hair Jr et al., 2017). It is recommended to have average path coefficients and R^2 as significant ($P < 0.05$) and the VIF should be below 5. Bootstrapping is used to generate more stable resample path coefficients and consistent P-values. According to Chin (2010) for this path coefficients and significant levels, the effect size (f^2) is used to evaluate the extent to which the antecedent latent variable affects the outcome variables.

Table 5:9 The Evaluation Criteria of the Structural Model

| Criteria | Description | Acceptance level |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R^2 of endogenous variables | R^2 value or the coefficient of determination is a measure of the model's predictive power. This represents the amount of variance in the endogenous constructs can be elucidated by all the exogenous constructs related to it(Hair Jr et al., 2017). | The R^2 value ranges between 0, and 1 with the higher levels indicate the better predictive precision. The R^2 values of 0.75, 0.50 and 0.25 for endogenous latent variables are considered as substantial, moderate and weak respectively(Henseler et al., 2009, Hair et al., 2011). |
| Effect size f^2 | The effect size allows measuring the contribution of an exogenous construct to the R^2 values of an endogenous latent variable (Hair Jr et al., 2017). | f^2 values of 0.02, 0.15 and 0.35 of an exogenous construct are considered small, medium and large effect respectively on an endogenous construct (Chin, 1998, Hair Jr et al., 2017). |

| | | |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Predictive relevance Q ² | Q ² value is an indicator of Models out of sample predictive power or predictive relevance. In other words, the model's ability to predict R ² by sample cross-validation(Hair Jr et al., 2017). | Q ² values greater than 0 represent the predictive relevance of the study constructs, and the values 0 or less than 0 denote lack of predict relevance (Hair Jr et al., 2017) |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

5.9.1 The Coefficient of Determination (R² Value)

According to Chin (2010), the determination of coefficient (R²) represents the exogenous latent constructs' effect on endogenous latent constructs. It represents the predictive power of the model. The R² values range between 0, and 1 with higher the values are, the better the predictive capability of the model is considered. However, it is difficult to set an acceptable level of R² as it depends on various factors such as the complexity of the model and the study discipline (Hair Jr et al., 2017). R² values of 0.19, 0.33 and 0.67 are considered as weak, moderate and significant respectively (Chin, 1998). However, Hair Jr et al. (2017) suggested the R² value of 0.75, 0.50 and 0.25 as significant, moderate and weak respectively in research discipline such as marketing. However, R² values are affected by the number of exogenous constructs measuring in the model. In addition to that more number of arrows pointing toward a particular construct may generate higher R² values. Nonetheless, higher R² values are recommended for a better research model.

Table 5:10 The Results of R² and Q² Values

| Latent Constructs | R ² Value | Q ² Value |
|--------------------------------|----------------------|----------------------|
| Environment-friendly Practices | 0.17 | 0.043 |
| Socially Responsible Practices | 0.203 | 0.175 |
| Environmental Performance | 0.247 | 0.220 |
| Cost Performance | 0.231 | 0.215 |
| Social Performance | 0.219 | 0.185 |

The outcome indicated that the predictor variables such as supplier collaboration, Environmental practices, and social practices do explain variances of 0.247, 0.231 and 0.219 on environmental

performance, cost performance and social performance respectively. Also, Supplier collaboration does explain the variance of 0.203 on social practices. It is worth mentioning that the p-values of the endogenous latent constructs are significant at <0.001 . It should be noted that environmental practice is a formative latent construct, so the R^2 value is not reported here when it is predictor variable. However, when environmental practices are predicted by the supplier collaboration, this is reported based on latent variable scores to avoid swamping out effect as the formative construct - environment-friendly practices which are consists of two lower of components. Measuring them requires calculating the latent variable scores to avoid distortions (Hair Jr et al., 2017).

5.9.2 Estimates of Path Coefficients and Hypotheses Testing

Once the PLS-SEM is calculated, the measurement of relationships for the structural model is attained along with the path coefficients that signifies the hypothesised relationship among the study variables (Wong, 2013). The standardised value of path coefficients ranges between +1 and -1 with the closer to +1 denotes the strong positive relationship (and the opposite for the negative (-1) values) that are generally statistically significant (Tenenhaus et al., 2005, Hair Jr et al., 2017). The path coefficients closer to '0' denotes a weaker relationship and very close to 0 may mean no significant relationship.

Standard error, which can be attained through bootstrapping procedures, determines whether a coefficient is significant. The bootstrapping procedures allow computing the empirical t-values and p-values for all structural path coefficients. When the t-value is higher than the critical value, it is decided that the coefficient is statistically significant at a certain error probability (significance level). Widely used critical values for the two-tailed test at 5% significance level is 1.96 (Hair Jr et al., 2017). So, that means if the t-value of path coefficient is higher than 1.96, the relationship is statistically significant.

Also, the strength of path coefficients can also be assessed by measuring the direct and indirect effects. The summation of direct and indirect effect is known as a total effect, and it is useful when

one or more mediating variable/s are measured (Hair Jr et al., 2017). The proposed hypotheses were tested to comprehend the size and statistical significance of the estimated path coefficients between the study constructs. The higher the path coefficients are, the stronger the relationships between the variables will be.

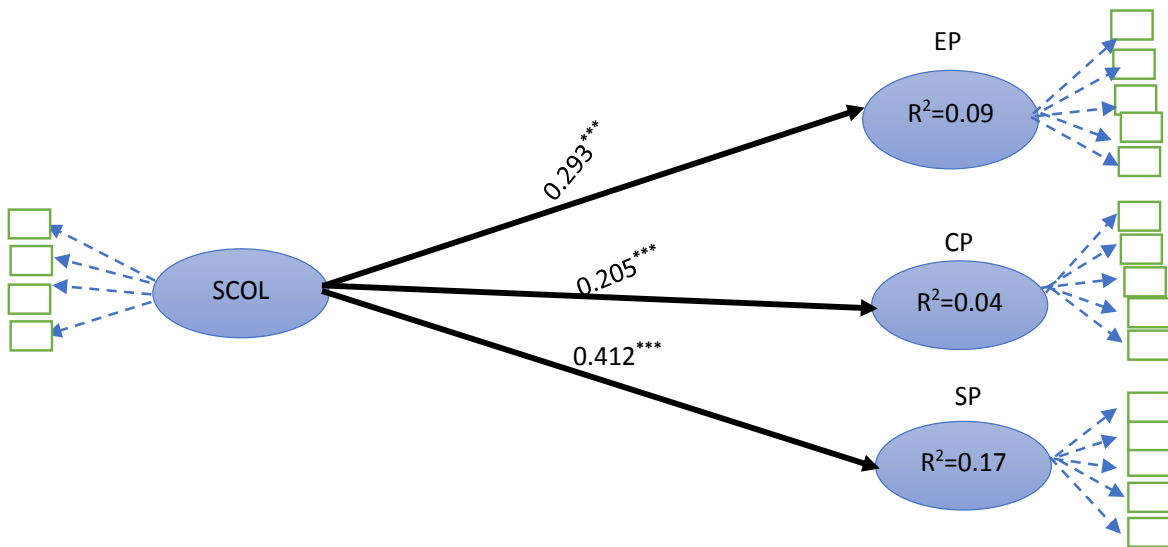


Figure 5:1 Structural Model with Direct Effect

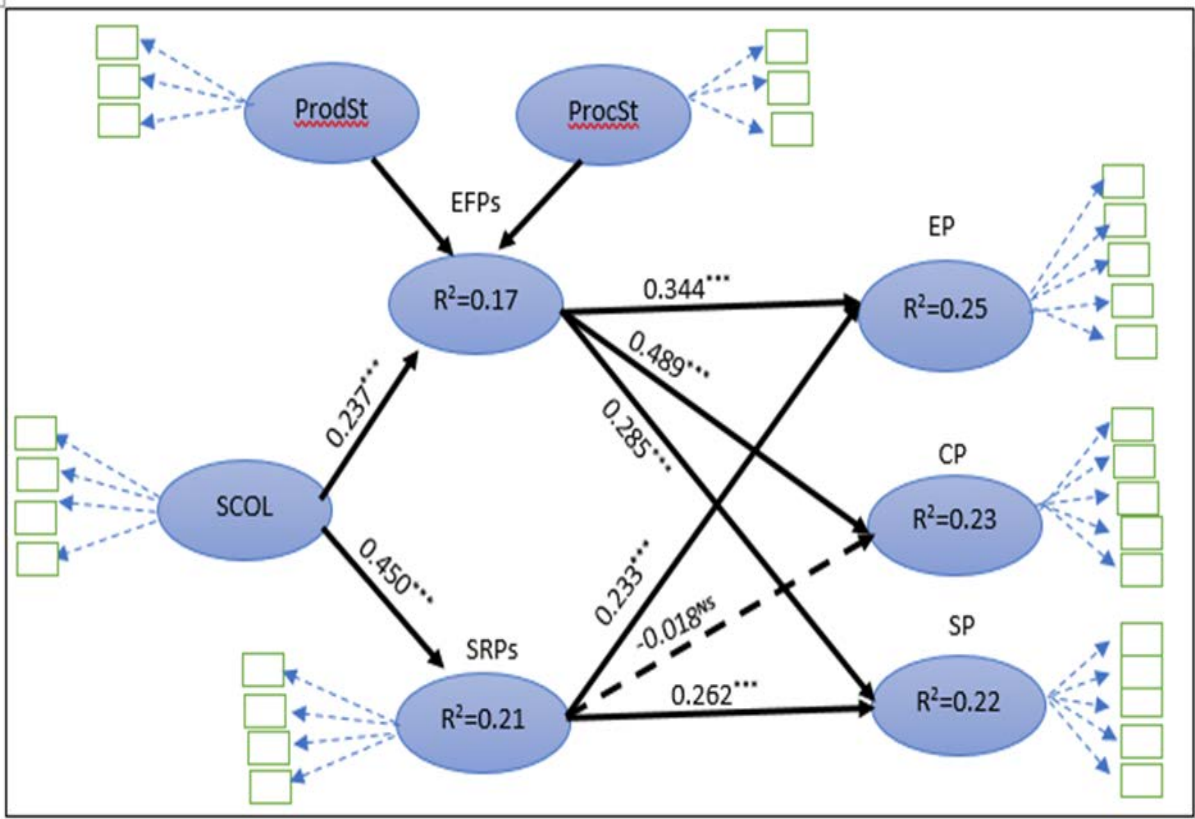


Figure 5:2 Structural Model with Mediating Variables

Note: *** represent $P < 0.001$ and dash line in the inner model denotes non-signification (NS) relationship

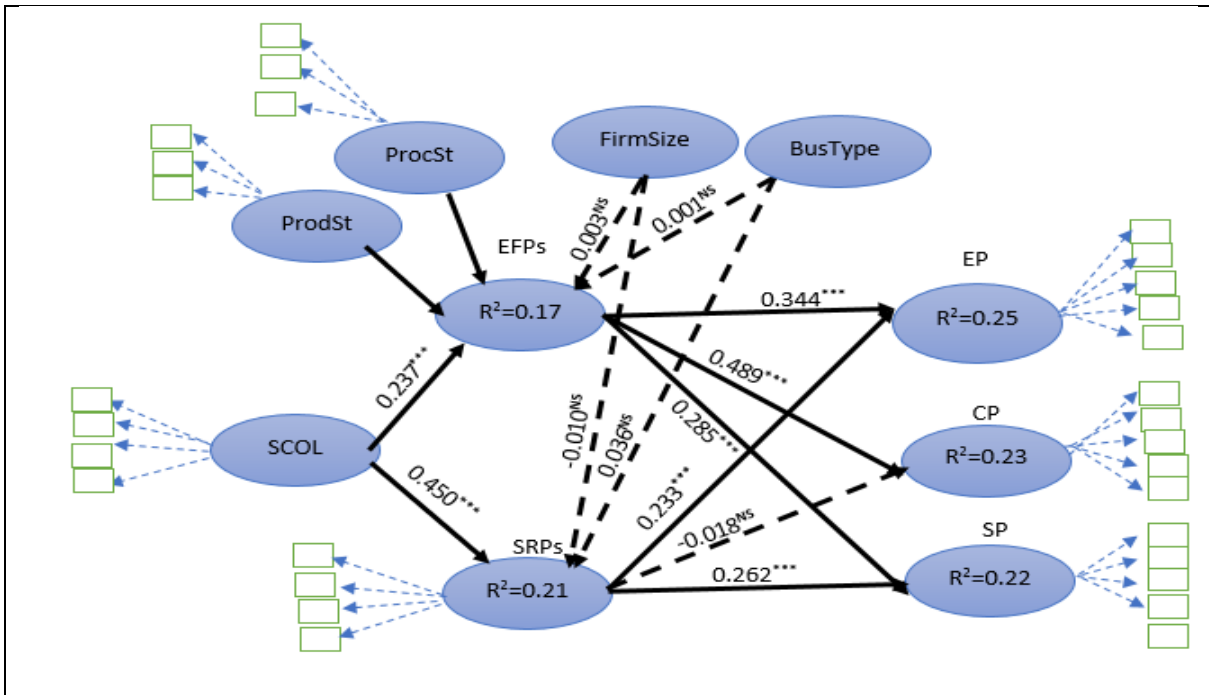


Figure 5:3 Structural Model with Control Variables

Note: *** represent $P < 0.001$ and dash line in the inner model denotes non-signification (NS) relationship

Table 5:11 Summary Table of Hypotheses Testing

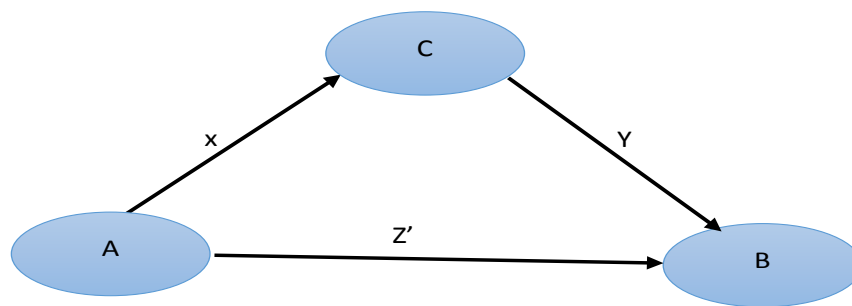
| Direct Effects | | | | | |
|------------------|---------------------|----------------------|----------------------|----------------------|-------------------|
| Hypotheses | Exogenous Variables | Endogenous Variable | Path Coefficients | Inference | |
| H1a | SCOL | EP | 0.293 ^{***} | Supported | |
| H1b | SCOL | CP | 0.205 ^{***} | Supported | |
| H1c | SCOL | SP | 0.412 ^{***} | Supported | |
| H2a | SCOL | EFPs | 0.237 ^{***} | Supported | |
| H2b | SCOL | SRPs | 0.450 ^{***} | Supported | |
| H3a | EFPs | EP | 0.344 ^{***} | Supported | |
| H3b | EFPs | CP | 0.489 ^{***} | Supported | |
| H3c | EFPs | SP | 0.285 ^{***} | Supported | |
| H4a | SRPs | EP | 0.233 ^{***} | Supported | |
| H4b | SRPs | CP | -0.018 ^{NS} | Not Supported | |
| H4c | SRPs | SP | 0.262 ^{***} | Supported | |
| Indirect Effects | | | | | |
| Hypotheses | Structural Paths | Path Coefficients | | Direct Effect | Mediating Effect |
| H5a | SCOL-EFP-EP | SCOL-EFPs | EFPs-EP | SCOL-EP | Partial Mediation |
| | | 0.240 ^{***} | 0.416 ^{***} | 0.160 ^{***} | |
| H5b | SCOL-EFPs-CP | SCOL-EFPs | EFPs-CP | SCOL-CP | Full Mediation |
| | | 0.238 ^{***} | 0.465 ^{***} | 0.067 ^{NS} | |
| H5c | SCOL-EFPs-SP | SCOL-EFPs | EFPs-SP | SCOL-SP | Partial Mediation |
| | | 0.239 ^{***} | 0.329 ^{***} | 0.322 ^{***} | |
| H6a | SCOL-SRPs-EP | SCOL-SRPs | SRPs-EP | SCOL-EP | Full Mediation |
| | | 0.446 ^{***} | 0.349 ^{***} | 0.103 ^{NS} | |
| H6b | SCOL-SRPs-CP | SCOL-SRPs | SRPs-CP | SCOL-CP | Full Mediation |
| | | 0.445 ^{***} | 0.163 ^{***} | 0.105 ^{NS} | |
| H6c | SCOL-SRPs-SP | SCOL-SRPs | SRPs-SP | SCOL-SP | Partial Mediation |
| | | 0.446 ^{***} | 0.269 ^{***} | 0.279 ^{***} | |

Note: ^{***} represent P<0.001 and ^{NS} represents non-signification (NS) relationship.

It is important to note from the above Table 5:11 that when both the indirect and the direct relationships are significant, it is a partial mediation and when the indirect effect is significant, but the direct effect is not then it is full mediation. There will be no mediation when none of the relationships is significant, and this is not the case in this research.

5.9.2.1 Confirmation of Significant Effects (Mediator)

A basic model is demonstrated in the below Figure 4:4 where A is the independent variable (IV), B is the dependent variable (DV) and C is the mediating variable (MV). Whereas the standardised path coefficient from IV to MV is represented by X and MV to DV is represented by Y, but the standardised path coefficient from IV to DV is represented by Z'. If the standardised coefficients of X and Y are significant, then there is mediation (Iacobucci et al., 2007, Preacher and Hayes, 2008). A basic mediation model for explanation is shown figure 5.4.



Iacobucci et al. (2007) stated that the mediation which represents the relative size of indirect vs direct paths are recognised by associating the scale of the indirect to total effects (direct + indirect effects). The following equation may help to achieve this-

$$\text{Mediation} = \frac{X * Y}{(X * Y) + Z'}$$

Table 5:11 summarised the mediation effect of this study. It is evident that the direct effect of supplier collaboration and environmental performance is significant as well the indirect effect between the supplier collaboration and environment-friendly practices, environment-friendly practices, and environmental performance are significant. So, there is partial mediation in H5a.

H5b revealed that the indirect effect of the supplier collaboration and cost performance, which was formed as supplier collaboration vs environment-friendly practices, environment-friendly practices

vs cost performance, was significant. Hence the full mediation is found. In H5c, direct effect, as well as the indirect effects, were significant. So, a partial mediation is reported.

In H6a, there is a full mediation effect of socially responsible practices between supplier collaboration and environmental performance as the indirect effect is significant, but the direct effect is not. Socially responsible practices also fully mediate the relationship between supplier collaboration and cost performance denoted in H6b. Finally, socially responsible practices partially mediate the relationship between supplier collaboration and social performance, H6c.

Baron and Kenney (1986) set out principles of mediations where they stated that mediation mainly focuses on theoretically grounded indirect effect between exogenous and endogenous variables through a mediator variable (Hair Jr et al., 2017).

According to Baron and Kenny (1986), a variable can be treated as a mediator when the following characteristics are fulfilled-

- There will have a significant association between Independent variables and dependent variables.
- Independent variable should significantly be associated with the mediator variable.
- Independent variable and mediating variable should be significantly associated with the dependent variable.
- Finally, the introduction of a mediator in the equation should change the level of significance.

Baron and Kenny also suggested that a full mediation happens when the impact of independent variable become non-significant due to introducing a mediator variable. If the introduction of a mediator reduces the impact of the independent variable to some extent but not to the zero is known as partial mediation. The outcome of this study fulfils the Baron and Kenny's

recommendations displayed in the summary Table 4:11. Hence, it is concluded that the proposed hypotheses (H5a, H5b, H5c and H6a, H6c, H6c) are fully supported.

5.9.3 Effect Size (f^2)

Also, to evaluating the R^2 values of all endogenous constructs, the effect size of the construct can also be evaluated through observing the changes in the R^2 values when a particular construct is omitted from the model and their impact on the endogenous constructs (Hair Jr et al., 2017). Theoretically, the fluctuations in the R^2 values are measured by assessing the PLS path model twice. The path coefficients of the inner model may be decreased when the number of indirect relationship increases, and this will result in direct relationship non-significant (Wong, 2013).

Chin (1998) noted that for model fit, keeping the total effect (direct and indirect effect in the inner-model) comparatively constant is important. The effect size is calculated using the Cohen's (1988) f^2 function, and it is comparable to typical F-test. According to Hair Jr et al. (2017), F-test facilitates assessing the increases in R^2 values compared to the extent of remaining unexplained endogenous variables.

In contrast to F-test, the sample size is not discussed in f^2 , but the basic population of analysis does. Hence, the degree of freedom is not necessary to calculate the value of f^2 . The f^2 values of 0.02, 0.15 and 0.35, respectively, signifies small medium and large effects of the exogenous latent constructs (Cohen, 1988). The f^2 values below 0.02 denote no effects.

The below table highlights the effect size of the constructs in this study-

Table 5:12 Effect Size of the Constructs in this Study (f^2)

| Latent Constructs Paths | f^2 | Inference |
|-------------------------|-------|---------------|
| SCL-EP | 0.072 | Small effect |
| SCL-CP | 0.033 | Small effect |
| SCL-SP | 0.192 | Small effect |
| SCL-EFP | 0.006 | Small effect |
| SCL-SRP | 0.254 | Medium effect |
| EFP-EP | 0.123 | Small effect |

| | | |
|--------|-------|---------------|
| EFP-CP | 0.243 | Medium effect |
| EFP-SP | 0.082 | Small effect |
| SRP-EP | 0.056 | Medium effect |
| SRP-CP | 0.000 | No effect |
| SRP-SP | 0.069 | Small effect |

It is evident that all the latent constructs paths have small or medium effect except the socially responsible practice and cost performance paths. So, there is no effect found between socially responsible practices and cost performance in this study.

5.9.4 Predictive Relevance (Q^2)

Further to assessing the extent of the R^2 values to evaluate the predictive accuracy, it is recommended to assess Stone-Geisser's Q^2 value (Geisser, 1974; Stone, 1974). It is the out of sample predictive power of the model or the predictive relevance. It can be calculated using the blindfolding procedures in the PLS for a specified omission distance (D). The blindfolding also known as sample reuse method which facilitates measuring the cross-validation of the model (Chin, 1998, Henseler et al., 2009).

The blindfolding procedure can relate the original values with the predicted values. When the predicted values are close to the original values, then the path model has better predictive precision. The Q^2 value greater than '0' implies that the model has predictive relevance for certain endogenous constructs whereas the values below '0' refer to lack of predictive relevance. The Q^2 values can be measured by deploying a couple of distinct approaches such as the cross-validated communality and Cross-validated redundancy. The latter approach builds on path model estimates of both the structural and measurement model of data prediction. Hence, the PLS-SEM approach supports the cross-validated redundancy approach.

In contrast, the cross-validated communality approach considers only the construct scores assessed for the endogenous target construct without considering the structural model information to predict the eliminated data points (Hair Jr et al., 2017). According to Chin (1998), the cross-validated

commonality can be attained by predicting the eliminated data points in the measuring variable block which consists of the underlying construct.

Hair Jr et al. (2017), however, recommended using the cross-validated redundancy to measure Q^2 as it considers the structural model, the key elements of the path model to predict the omitted data points. The quality of the structural model is measured by the cross-validated redundancy taking the measurement model into account. Predictive relevance for this study was calculated using the blindfolding procedure (presented in the Table 5:10) which is a parameter estimation method where some data for a specific block is omitted from the sample and considered as missing values and the process continues until every data point was eliminated and measured (Hair Jr et al., 2017). Chin (1998) suggested the omission distance between 5 and 10. This study considers the omission distance $D=6$. Table 4:10 demonstrated a significant predictive relevance of the latent constructs and which suggest a robust predictive relevance and a good level of model fit. It is worth noting that none of the study construct's indices was negative that implies a good estimate of the constructs (Tenenhaus et al., 2005)

5.9.5 Control Variables

This study considered a couple of control variables firm size and business types there are evidence in the literature that firm size does impact on organisational practices (i.e. environment-friendly and socially responsible) (González-Benito and González-Benito, 2005). Firm size was divided based on the number of employees (Jabbour, 2015) as Micro (less than 25), Small (between 25-50), small to medium (between 50-100), medium to large (between 100-250) and Large (over 250) employees in the organisation. Business types are the food manufacturer, food processor, food wholesaler, food retailer and the others (e.g. food distributors). With regards to the control variables (firm size and business type) as shown in Figure 4:3, their results found (Please **the Appendix F** for details) that there is no effect of the control variables in the model.

5.9.6 Conclusion

In this chapter, the outcome of the analysis was presented. The results of the proposed hypotheses were revealed that seeks to examine the impact of supplier collaboration on sustainable performance and the mediating role of environment-friendly and socially responsible practices between supplier collaboration and sustainable performance in the UK food supply chains. The analysis was conducted by assessing the measurement model (reflective and formative) and the structural model. A series of construct validation processes, including reliability and validity of the variables as well as the measurement items, were deployed to evaluate the reflective and the formative measurement models. It is noted that the unreliable measurement items were eliminated, and the models were re-examined. It is evident above that the measurement model has robust reliability and convergent as well as discriminant validity. The results displayed adequate robustness to examine the associations between the study constructs of the structural model.

The structural model was evaluated through the extent of variance elucidated by R^2 , effect size (f^2) and the explanatory power of the structural model. The results disclosed that the model has an adequate predictive relevance to predicting the endogenous constructs. The proposed hypotheses were examined considering the signs, size, statistical significance of the path coefficients between the constructs in the structural model. One but all proposed hypothesis concerning the relationship between the constructs were supported. The supported hypotheses are significant at $p < 0.001$. The next chapter presented the discussion of the findings and conclusions.

6 Chapter 6: Discussion of Findings

6.1 Introduction

This chapter summarises and discusses the key results of the empirical findings of the quantitative analysis presented in the previous chapter. This has been outlined considering the research aim and objectives of this research. All research questions are specifically discussed in relation to the proposed hypotheses and their results from the empirical findings. Also, discussions from the findings of data analysis in this study highlight the key facts of phenomena under investigation. In this part of the research, the study questions were fundamentally revisited and evaluated. The evaluation of the empirical findings of this study was based on the existing research and available literature in this domain to lay the foundations for the contribution and opportunities for future studies.

6.2 Research Questions Revisited

The overarching aim of this study is to examine the impact of supplier collaboration on environment-friendly as well as socially responsible practices and sustainable (Environmental, Cost and Social) performance in the UK food SCs. To achieve the aim of this study, this study has investigated four different research questions as outlined in the first chapter of the study.

- (1) The first question empirically examined whether Supplier Collaboration has an impact on Sustainable (environmental, cost and Social) performance.
- (2) The second questions in this research tested whether supplier collaboration has an impact on Environment-Friendly Practices (EFPs) as well as Socially Responsible Practices (SRPs).
- (3) The third question assessed whether EFPs and SRPs have an impact on Sustainable (Environmental, Cost and Social) Performance.

- (4) The final research questions assessed the simultaneous relationships in the structural model and examined the mediating effects of EFPs and SRPs between SCOL and all three (Environment, Cost and Social) sustainable performance constructs.

It is important to note that the research questions were developed based on the existing relevant literature in the study domain. This study is mostly explanatory and guided by positivism viewpoint and deductive approach which lead to survey-based data collection and quantitative data analysis techniques to examine the relationship between the study variables. The study was guided by the Relational View (RV) theory which has been extended in this study. While addressing the research questions, the following sections also present the study findings in detail regarding the relationship for particular research questions and whether the findings support or contradict the previous empirical investigations are also reported.

6.3 Discussions of the Findings

In this part, predominantly the findings generated from the research questions for this study are reported. Precisely, the research questions and the identified research gaps from the literature review conducted in Chapter two and the presented analysis of results in Chapter 5 are discussed in this part to evaluate the findings with existing literature. The current study has developed several hypotheses based on the literature review and subsequently analysed them using the quantitative technique. The empirical findings of this study are enormously important because while some findings are consistent with the existing literature and some findings can be the new additions to the existing literature, while other findings contradict those in the existing literature. Based on the findings from this study, the detailed discussions of the research questions are presented below.

6.3.1 Impact of Supplier Collaboration on Sustainable Performance in the UK FSCs- RQ1

This research question attempted to identify whether collaborating with the suppliers help improve firms' sustainable performance. The sustainable performance is measured in three dimensions

environmental, cost and social. To evaluate the impact of supplier collaboration for sustainable performance, the following hypotheses were tested.

H_{1a}= Supplier collaboration positively impact on firms' environmental performance

H_{1b}= Supplier collaboration positively impact on firms cost performance

H_{1c}= Supplier collaboration positively impacts on firm's social performance.

These hypotheses were measured, and the results were reported in Chapter 5 (Figure 5:2) the direct effects between supplier collaboration and environmental performance ($\beta=0.293$, $t= 3.99$), Supplier collaboration and cost performance ($\beta=0.205$, $t= 3.83$); and the supplier collaboration and social performance ($\beta=0.412$, $t= 6.37$). This suggests that the relationships between the SCOL and all three dimensions of sustainable performance (EP, CP, and SP) are positive and statistically significant. Hence, the hypotheses (H_{1a}, H_{1b}, H_{1c}) are supported.

These results are significant because they confirm that by collaborating with the suppliers, firms in the UK Food SCs can achieve the environmental, cost and social performance or sustainable performance. While there are studies available in the literature that investigated collaboration for sustainable performance, combining all the three aspects of sustainable performance is rare in the extant literature, and more importantly, this study provides new insights in the UK food SCs context.

These findings are in line with the previous studies in this domain. However prior studies investigated supplier collaboration for improving performance from different angles. For example, Kähkönen et al. (2017) found supplier collaboration for innovation performance in Finnish firms. Corsten and Felde (2005) focused on buyer-supplier collaboration and found that it enhances innovative, cost reduction and financial performance of a Swiss industry. Aggarwal and Srivastava (2016) through qualitative investigation considered Indian agri-food SCs and found that SC collaboration enhances profitability, reduce waste and brings SC efficiency. Cao and Zhang (2011) found that SC collaboration improve financial performance and this relationship is mediated by the

collaborative advantage created through collaboration. Green Jr et al. (2012a) found environmental collaboration and monitoring practices improve environmental and organisational performance. Blome et al. (2014) investigated SC collaboration for sustainability, and they found that a higher level of sustainability collaboration improves sustainable performance and market performance and the sustainability of production is a mediator. Chen et al. (2017) conducted a comprehensive systematic literature review on collaboration for sustainability. While they provide a very good synthesis of the extant literature on collaboration for sustainability, it is a theoretical paper. Mandal (2017b) found hospital supplier collaboration improve hospital SC performance. Grekova et al. (2015) considered Dutch food SCs and found that collaboration with SC partners improve market gains and cost savings. Chang (2017) found a positive effect of buyer-supplier collaboration on knowledge and product innovation considering manufacturing firms in China. Fearne et al. (2006) based on buyer-supplier collaboration in soft fruit SCs considering UK supermarkets and found that demand management can be effectively handled by collaborating with the suppliers in the food supply chain. Feng et al. (2017) found the positive and significant impact of Guanxi, which emphasises the international relationship, on SC integration and operational performance considering automobile manufacturing in China.

The findings of the performance impact of supplier collaboration on TBL (EP, CP, and SP) performance are in line with the previous studies. For example, Yu et al. (2017) found green supplier collaboration has a positive and significant relationship with the environmental and operational performance using RBV as a theoretical lens. However, the study considered the automotive manufacturers in China. Vachon and Klassen (2008) investigated and found the positive impact of environmental collaboration on product and process-based manufacturing performance. However, their outcome was not based on the food industry, and they did not look at sustainable performance aspects. Frohlich and Westbrook (2001) showcased that better performance can be achieved through collaboration with upstream and downstream supply chains partners. Das et al. (2006)

showed that deviations from supplier collaboration deteriorate performance, in other words, the better collaboration is recommended. Corsten and Felde (2005) found a significant positive relationship between supplier collaboration and buyer-supplier performance regarding innovative capabilities and financial results considering Switzerland as the study domain.

Kopfer et al. (2005), found that supplier collaboration has a positive effect on firm performance regarding innovative capability and financial results considering relational constructs trust and dependence as the key elements for supplier relationships. Chiou et al. (2011) highlighted that firm supplier's integration in the product innovation can enhance firm performance. Kumar and Rahman (2016) found that a better buyer-supplier relationship positively impacted the triple bottom line of sustainability which comprises environmental, cost and social performance measures. However, it was in Indian Automobile contexts. Yu et al. 2017 found that green supplier collaboration is significantly and positively related to both environmental and operational performance using RBV as a theoretical lens. Kähkönen et al. (2017) found that collaboration with the suppliers does improve the focal firm's innovation performance. Mandal (2017a) found supplier collaboration enhances performance in hospital supply chains. Lockström et al., (2010) suggested that to supply chain performance can be improved through supplier collaboration. Supplier collaboration also enhances cost reduction through facilitating Collaborative planning, forecasting, and replenishment in the supply chain (Dubey et al., 2017).

The current study, however, also contradicts the findings of Hollos et al. (2012) who did not find a significant direct effect of sustainable supplier co-operation on cost reduction and operational performance. This could be because the co-operation mechanism did not work well with the suppliers or the level of trust was not maintained properly. It is recommended that along with the supplier co-operation a set of internal (i.e. environment-friendly and socially responsible) practices could improve the performance (Hollos *et al.* 2012). However, McIvor et al. (2006) reported a mixture of positive and negative impact on performance due to supplier collaboration.

While the performance impact of collaboration is widely studied and validated, supplier collaboration for sustainable performance is limited in the literature, and for food industry it is scarce and the findings on whether supplier collaboration has impact on TBL performance was inconclusive. This study, nevertheless, has provided fresh insights into food supply chains, UK food SCs in particular. This study found that supplier collaboration does have a positive and significant impact on improving environmental, cost and social performance in the UK food SCs. Combining all three aspects of TBL performance for supplier collaboration considering the UK food SCs as a study domain is a significant contribution of this study.

This research proposed that environmentally friendly practices and socially responsible practices are the mediators between the supplier collaboration and sustainable firm performance. The direct relationships as mentioned earlier are significant. However, the findings of the same relationships become non-significant when the mediating variables are introduced (see **Appendix B**). When the mediating variables (environment-friendly and socially responsible practices) are added, the relationship between supplier collaboration and environmental performance ($\beta=0.091$, $t= 1.471$) and the relationship between supplier collaboration and cost performance ($\beta=0.089$, $t= 1.324$) reported non-significant predicting the relationship around 9.1% and 8.9% respectively. However, Supplier collaboration and social performance ($\beta=0.272$ $t= 3.102$) was reported as significant. These suggest the existences of the mediating effect, and this is discussed in detail below.

6.3.2 Influence of Supplier Collaboration on Environment-Friendly and Socially Responsible Practices in the UK Food SCs- RQ2

The buying firm can support its suppliers for reducing waste and CO₂ emissions in the chain (Hollos *et al.* 2012). Supplier collaboration decreases the dangers of supplier non-compliance issues and hence improving sustainability (Lee and Klassen, 2008). Supplier collaboration should also improve the environmental and social practices through generating encouraging learning effects over time. The focal firm can only be as sustainable as its suppliers (Hollos *et al.* 2012). The company is the

product of the suppliers. That means the activities of the company significantly depend on the activities of its suppliers. To improve environment-friendly and socially responsible practices, collaboration with the suppliers is critical. Environment-friendly and socially responsible practices refer the practices in the internal operations of the company as well as encouraging the extended suppliers in the network to improve their practices (Zhu and Sarkis, 2007; Pullman et al. 2009). The buying firms can collaborate with their suppliers to improve their environmentally friendly and socially responsible practices. The question of whether supplier collaboration leads to environmentally friendly and socially responsible practices in the UK food SCs was tested using the following hypotheses.

- H_{2a} = supplier collaboration positively influences the environment-friendly practices in the UK food SCs
- H_{2b} = Supplier collaboration positively influences the Socially responsible practices in the UK food supply chains.

The results reported in the analysis section in Chapter 4 presented that supplier collaboration has a significant positive impact on environment-friendly practices in the UK food SCs. The path coefficients between supplier collaboration and environment-friendly practices ($\beta=0.237$, $t= 2.826$) highlighted that there is a significant positive relationship between supplier collaboration and environment-friendly practices. This result indicated that any changes in the supplier collaboration tend to predict 23.7% changes in EFPs which is significant (t -values $2.829 > 1.96$). Hence, the hypothesis H_{2a} is supported meaning that the supplier collaboration influences the environment-friendly practices in the supply chain. This finding supports the findings of Hollos et al. (2012) where they found sustainable supplier co-operation improve green practices. However, the current study considered supplier collaboration in the UK food industry to improve environment-friendly practices. Collaboration in the supply network is the key to achieve environment-friendly practices in the supply chain (Vachon and Klassen, 2006). Fearne et al. (2006) revealed that both the supplier

and the retailer derived benefit from the collaboration regarding reducing wastage, increased sales, enhanced customer services, and improved bottom line.

Simultaneously, Supplier collaboration for socially responsible practices (SRPs) also found to have a positive and significant relationship. The path coefficients ($\beta=0.450$, $t= 4.667$) indicated that changes in the SCOL could predict 45% changes in the SRPs and this is significant (t -values $4.667>1.96$). This indicates that the hypothesis H_{2b} is supported meaning supplier collaboration does have significant influences on socially responsible practices in the UK food SCs. This also supports the previous findings of Hollos et al. (2012), but the current study considered collaboration with the suppliers in the UK food industry only.

Achieving environmental performance depends to a great extent on the firm's inter-organisational practices through collaboration (Cantor *et al.*, 2013, Wong *et al.*, 2015). Dubey *et al.* (2017) highlighted the supplier collaboration as the driver for sustainable practices (environment-friendly and socially responsible). However, the previous studies mostly considered supplier environmental collaboration for performance implications (Zhu *et al.*, 2013, Grekova *et al.*, 2016). Lee (2010) reported that companies such as Sony, HP, Electrolux, and Braun managed to save 35% recycling and disposal cost by collaborating with their suppliers. Blome *et al.* (2014) reported that to achieve sustainability, it is essential to have collaboration in the supply chain and internal sustainability practices that can be linked with environment-friendly and socially responsible practices. Chiou et al. (2011) discussed the environmental collaboration that leads to product and processes related practices such as lowering the energy consumptions, re-using the materials and using clean technology and so on. Patrucco et al. (2017) noted that supplier collaboration facilitates innovative practices (environment-friendly and socially responsible) in the operations. Blome et al. (2014) stated that supplier collaboration facilitates product and process related sustainability practices which will lead to sustainable performance. It is worth mentioning that in the previous studies collaboration for green or environmental practices are widely recognised. However, whether the

supplier collaboration improves environment-friendly practices, food SCs, in particular, is very limited.

Supplier collaboration for socially responsible practice has not received much attention from the extant literature. Though the previous studies have documented collaboration to achieve long-time strategic advantages, however, supplier collaboration to improve socially responsible practices is scarce in the extant literature.

Chiou et al. (2011), claimed that long-term strategic benefits could be secured by collaborating with suppliers. Kumar and Rahman (2016) seek to identify the factors affecting sustainability adoption in the Indian automobile supply chain and the inter-relationships exist between the buyers and the suppliers. They suggested that external influence and expected sustainability benefits positively affect top management's commitment towards the adoption of environmentally friendly practices, but they did not consider socially responsible practices. Dai et al. 2017 argued that the collaboration with the supplier firms helps improve green process innovation which also works an instrument for firms' operational performance. To promote environment-friendly and socially responsible practices, a growing number of companies are collaborating with their suppliers.

Hollos et al. (2012) found that sustainable supplier co-operation influences on the environment and social practices considering western Europe as a study domain. However, they found only environmental practices lead to cost and operational performance, not the social practices.

It is very significant from the findings that there is a growing recognition and emphasises on collaboration with the suppliers for environment-friendly practices whereas collaboration with the suppliers to improve socially responsible practices in the SCs has been ignored for far too long. The findings from this study are very important for the scholars and for the academics to demonstrate that collaboration with the suppliers, the focal firm can improve not only their environment-friendly but also their socially responsible practices which will lead to improving their sustainability

performance. So, this study supported the existing notion of supplier collaboration for environment-friendly practices along with its extension to social dimensions in UK food supply chain claiming and revealing that collaboration with the suppliers helps improve environment-friendly and socially responsible practices in the UK food SCs.

6.3.3 Impact of Environment-Friendly and Socially Responsible Practices on Sustainable Performance in UK Food SCs- RQ3

Whether Environment-friendly practices (EFPs) have an impact on sustainable performance (environmental, cost and social) were tested using the following hypotheses.

- H_{3a} = Environmentally friendly practices positively influence environmental performance in the SCs.
- H_{3b} = Environmentally friendly Practices Positively influence the Cost performance in the SCs.
- H_{3c} = Environmentally friendly practices positively influence social performance in the SCs.

It is evident from the PLS-SEM result reported in Chapter 5 (Figure 5:1) that the relationship between EFPs and all three dimensions of sustainable performance EP ($\beta=0.344$, $t= 5.679$), CP ($\beta=0.489$, $t= 9.60$) and SP ($\beta=0.285$, $t= 3.281$) are positive and significant. These means that changes in the EFPs can predict 34.4%, 48.9% and 28.5% changes in the EP, CP and SP respectively and they are positively significant as the t values are greater than the threshold level (t -values >1.96). Hence, the proposed hypotheses (H_{3a} , H_{3b} , H_{3c}) are supported. Therefore, it can be concluded that environment-friendly practices in the organisation help the firm achieve environmentally, cost and social performance in the UK food SCs (H_{3a} , H_{3b} , H_{3c}).

This is in line with the previous studies. For example, Schmidt et al. (2017) on a recent study found the positive and significant impact of different Green or environment-friendly practices on

performance (market and financial) considering cross-industry in Germany. Kuei et al. (2015) showed that green practices have a positive impact on environmental, economic and operational performance. Zhu et al. (2007b) also noted that the environmental or green supply chain practice in China resulted in improved environmental, economic, and operational performance. Graham and Potter (2015) found in UK food SC context that environmental practices enhance environmental and cost performances. However, they did not consider the social performance aspects. The extant literature supports that there is a growing number of studies that considered environment-friendly practices to improve sustainable performance. However, environmental practices to improve all three pillars of TBL performance is scarce in the literature. Hence, this study provides a novel understanding of environmental practices that lead to improving TBL performance in the UK food supply chain.

Environment-friendly and socially responsible practices should improve process innovation, and innovative actions of the personnel generate better organisational support. Social practices such as better informed and trained employees, better wages, improved working environment should enhance suppliers' product quality, reduce lead time and improve supply continuity (Holloos *et al.* 2012). Better trained employees can improve environmental performance through reducing food waste and save cost by reducing resource usages. Instead of exploitative working environment, the employees are better motivated and concentrated in balanced working hours with enough breaks, and this will enhance their attention, reduce errors and improve productivity hence boosting supply security. This suggests that socially responsible practices improve TBL performance.

Whether Socially Responsible Practices (SRPs) have impacts on all three dimensions of sustainable performance (environmental, cost and social) were tested using the following hypotheses.

- H_{4a} = Socially responsible practices positively influence the environmental performance in the SCs.
- H_{4b} = Socially responsible practices Positively influence the Cost performance in the SCs.

- H_{4c} = Socially responsible practices positively influence the social performance in the SCs.

It is reported in the results that Socially responsible practices (SRPs) have a positive and significant relationship with environmental performance ($\beta=0.233$, $t= 3.478$), and social performance ($\beta=0.262$, $t= 2.779$). However, the relationship between SRPs and cost performance (CP) was reported non-significant ($\beta= - 0.0184$, $t= 0.257$). This is, in fact, negative and non-significant as t-value is less than the minimum required level ($t\text{-value} < 1.96$). This means that the proposed hypotheses H_{4a} and H_{4c} were supported but the hypothesis H_{4b} were found non-significant, and that's why rejected. The findings suggest that Socially responsible practices positively and significantly influence environmental and social performance in the UK food SCs. However, the findings also suggest that socially responsible practices do not support cost performance. In other words, SRP may result in an increase in the cost instead of improving the cost performance (cost savings) perhaps in the short term. It could be because the socially responsible practices in the SCs is a costly endeavour for the organisation. It could also be that the socially responsible practice mechanisms are currently unstructured in UK food industry.

These findings are significant for the UK food supply chains in particular. This is because in the prior literature whether socially responsible practices improve environmentally, cost and social performance are scares and inconclusive. The extant literature demonstrates some mixed results regarding these aspects. For example, in earlier studies, it was documented that socially responsible practices have an impact on sustainable performance. Maloni and Brown (2006) noted that firms could enhance their socially responsible practices to influence their firm performance in the food industry. Pullman et al. (2009) found social and environmental practices have a positive indirect effect on firm performance suggesting the essentiality of including social practices in sustainability dimensions. However, Hollos et al. (2012) found the impact of environmental practices but not the impact of social practices on cost and operational performance.

Piacentini et al. (2000) reported that even though all companies under their investigation recognised the importance of socially responsible practices in the supply chain, they hardly do it for philanthropic purposes. Jones et al. (2005), however, reported that all leading food retailers in the UK under their research investigation have socially responsible practices as an integral part of their operations. Blome et al. (2014) noted that social sustainability practices influence sustainable performance. In this study, it is essential to note that though environment-friendly practices demonstrated the positive and significant relationship with the sustainable performance in the food SCs, socially responsible practices only have a positive and significant impact on environmental and social performance but not on the cost performance. This finding is another important contribution to this study.

6.3.4 The Mediating Role of Environment-Friendly and Socially Responsible Practices between Supplier Collaboration and Sustainable Performance in UK Food SCs- RQ4

The RV theory suggests that relation-specific assets improve the competitive advantage by extension sustainable performance. However, to capitalise the relational advantages, the firms needed to have certain internal practices (environment-friendly and socially responsible) in place that could lead to achieving improved performance (Holloos *et al.* 2012). In line with this, the current study considered environmentally friendly and socially responsible practices as the mediators of the relationship between supplier collaboration and TBL performance. To understand whether Environment-Friendly Practices (EFPs) mediate the relationships between SCOL and sustainable performance (EP, CP and SP). The following hypotheses are tested.

- H5a= Environment-friendly practices mediate the relationship between supplier collaboration and environmental performance
- H5b= Environment-friendly practices mediate the relationship between supplier collaboration and cost performance

- H5c= Environment-friendly practices mediate the relationship between supplier collaboration and Social performance

From the results presented in Table 5:11, it is found that Environment-friendly practices partially mediate the relationship between supplier collaboration and environmental performance (EP). It is noted in the table that the direct effect of SCOL and EP is significant ($\beta=0.160$, $t= 2.887$). Moreover, the effects of SCOL on EFPs ($\beta=0.240$, $t= 2.873$) and EFPs on EP ($\beta=0.416$, $t= 7.860$) also indicate significant relationship. When the direct relationship and the indirect relationships are significant, it is a partial mediation (Hair Jr et al., 2017).

Simultaneously, it is also found that the EFPs fully mediates the relationship between SCOL and CP. It is noted in the result that the direct effect of SCOL and CP ($\beta=0.067$, $t= 1.183$) is not significant. However, the indirect effects of SCOL and EFPs ($\beta=0.238$, $t= 2.896$) and EFPs and CP ($\beta=0.465$, $t= 9.063$) are significant. When the indirect effect is significant, but the direct effect is not then there is a full mediation (Hair Jr et al., 2017) which is the case for the findings in this study. So, it can be concluded that EFPs fully mediates the relationship between SCOL and CP. EFPs also partially mediate the relationship between SCOL and SP. The reason is that the direct effect between SCOL and SP ($\beta=0.322$, $t= 3.940$) and the indirect effects between SCOL and EFPs ($\beta=0.239$, $t= 2.865$) as well as EFPs and SP ($\beta=0.329$, $t= 4.234$) are significant. This means the environment-friendly practices partially mediates the relationship between SCOL and SP.

Whether SRPs mediate the relationships between SCOL and Sustainable Performance (EP, CP, and SP) were tested using the following hypotheses.

- H6a= Socially responsible practices mediate the relationship between supplier collaboration and environmental performance
- H6b= Socially responsible practices mediate the relationship between supplier collaboration and cost performance
- H6c= Socially responsible practices mediate the relationship between supplier collaboration and social performance.

It is clear from the results that the SRPs fully mediate the relationship between SCOL and EP. It is found that the direct effect between SCOL and EP ($\beta=0.103$, $t= 1.521$) is not significant while the indirect effect through the path SCOL and SRPs ($\beta=0.446$, $t= 4.730$) as well as SRPs and EP ($\beta= 0.349$, $t= 4.924$) are significant.

Therefore, the findings are- the SCOL influences the SRPs and SRPs influence EP. Simultaneously, the SRPs are also found to be the full mediator of the relationship between SCOL and CP. The direct effect between SCOL and CP ($\beta=0.105$, $t= 1.544$) were not significant however the indirect effects through SCOL to SRPs ($\beta=0.445$, $t= 4.630$) and SRPs to CP ($\beta=0.163$, $t= 2.270$) were found significant. This means that SCOL has the impact of SRPs and SRPs have an impact on CP. However, a partial mediation of SRPs was found on the relationship between SCOL and SP. As the direct effect between SCOL and SP ($\beta=0.279$, $t= 3.174$) and the indirect effects of the paths of SCOL- SRPs ($\beta=0.446$, $t= 4.701$) and SRPs- CP ($\beta=0.269$, $t= 3.189$) is significant. This implies that the direct, as well as the indirect relations, are significant. Hence the partial mediation is reported.

These findings are significant in terms of understanding how the collaboration with suppliers can improve firms' environment-friendly and socially responsible practices which will lead to achieving TBL performance. The RV supports the notion that mutual collaboration between the firms brings competitive advantage (Dyer and Singh, 1998) by extension of sustainable performance. However, it is argued that the collaboration with the suppliers will not automatically improve performance rather it will create certain practices (i.e. environment-friendly and socially responsible) which will lead to improved performance (Holloos *et al.* 2012). This research thus provides significant insight on Relational View theory and extended the theory from supplier collaboration for sustainable performance to supplier collaboration for environmentally friendly and socially responsible practices which will lead to sustainable performance.

In the extant literature, there are limited studies on supplier collaboration for sustainable performance; supplier collaboration for environment-friendly as well as socially responsible

practices; and environment-friendly as well as socially responsible practices for sustainable performance. However, EFPs or SRPs combinedly as mediators between the relationship of supplier collaboration and sustainable (environmental, cost and social) performance is scarce in the literature. So, the addition of the mediating effect of environment-friendly and socially responsible practices to supplier collaboration and sustainable performance is a unique contribution in this study. There are a handful of studies that considered socially responsible practices from CSR grounds for sustainable performance, however, they did not consider all the three aspects of sustainable performance (EP, CP, and SP). This study endeavoured to shed light on these.

6.4 Chapter Summary

This chapter started by revisiting the aim and objectives of this study that was addressed through a set of four research questions. The hypotheses generated from the extant literature and their tested results were discussed focusing on fulfilling the research objectives. The evidence from the previous studies that supports or contradicts the findings of this study were also discussed where possible and relevant. From the discussion of the findings, it can be deduced that supplier collaboration does have positive and significant influence environment-friendly and socially responsible practices in the UK food SCs. It also revealed that environmentally friendly practices could improve the environment, cost and social performance but socially responsible practices do not show the impact on cost performance. The following chapter provides the conclusion of this study highlighting the contributions and potential future research opportunities along with the limitations of this study.

7 Chapter 7: Conclusions

7.1 Summary of the Study

This study aimed to examine whether collaborating with the suppliers helps firms achieve sustainable performance in the UK food SCs. This study also seeks to determine whether environment-friendly practices and socially responsible practices can mediate the relationship between supplier collaboration and sustainable performance. Sustainable performance in this study is measured as the environmental, cost and social performance. Relational View (RV) theory is the underpinning theory for this study as it postulates that relational specific assets improve firms competitive advantage (Dyer and Singh, 1998) and by extension sustainable performance. In other words, inter-organisational relationships improve firms' sustainable performance. This study, however, extended the theory claiming that inter-organisational relationship facilitates certain operational practices (i.e. environment-friendly and socially responsible) which will lead to sustainable performance.

This is explanatory research designed to explain the relationships among the study variables drawn from the literature proposed as hypotheses. The nature of this research dictates that the positivism viewpoint as the ontology of this study. The positivist research supports the principles of objectivism, and that is independent of social actors. Positivism epistemology supports observable phenomena and enhances data reliability. It focuses on causality and generalisation. Positivism viewpoint supports the quantitative data analysis technique to prove the relationship between the variables. This is supported by the deductive approach, as the main purpose of this study is to develop an existing theory not to create a new one.

Data were collected from the operations, purchasing, supply chain directors/managers or senior executives responsible for purchasing or supply chains in the UK food industry using the survey questionnaires. Collected data were analysed using PLS-SEM (SmartPLS3). The following are the key findings while a detailed discussion of the findings was presented in Chapter 6.

- I. Supplier collaboration positively and significantly impact on environmental, cost and social performance.
- II. Supplier collaboration positively and significantly influences environment-friendly and socially responsible practices in the SCs.
- III. Environment-friendly practices have a positive and significant impact on environmental, cost and social performance.
- IV. Socially responsible practices have a positive and significant relationship with environmental performance and social performance.
- V. Socially responsible practices do not have a direct relationship with cost performance.
- VI. Environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and sustainable performance in UK food SCs.

The following sections outline the research contributions, limitations of this study and recommendations for future research.

7.2 Research Contribution

This study offers several unique contributions to the existing knowledge in the domain of supply chain collaboration, supplier collaboration, in particular, environment-friendly as well as socially responsible practices in the supply chains, sustainable performance considering TBL in the UK food SC context. This study also extends the existing RV theory from relation specific asset for sustainable performance to a relational specific asset for environment-friendly as well as socially responsible practices for sustainable performance. In other words, the addition of mediation in the RV theory to improve sustainable performance is a novel finding in the study. This study also highlighted the need for collaboration to improve environmental performance, reduce cost and improve social performance in the UK food SCs. This will encourage the companies in the food SCs to seek for collaboration to improve their environment-friendly and socially responsible practices to enhance

their environmental performance, reduce cost and improve their social performance as well. A brief explanation of the research contribution is presented below.

7.2.1 Contribution to empirical Knowledge

This study has drawn the literature from the supply chain, supply chain collaboration, food supply chains, environment-friendly or green supply chain practices and socially responsible or CSR practices domain. This study extended and put particular focus on supply-side collaboration (supplier collaboration) for sustainability which comparatively scares in the existing literature (Blome et al., 2014). This study argued that collaboration would strengthen the relationship between the partners through improved communication which will increase their sustainable performance such as environmental, cost and social. This study also argued that collaboration with suppliers does not automatically improve sustainable performance. The Collaboration with the suppliers, instead, provides a relational advantage to the firms and facilitates the firms to exploit the relation specific asset to improve their environment-friendly as well as socially responsible practices which will lead to sustainable performance. Hence, the addition of environment-friendly and socially responsible practices as mediator variables is a unique contribution to this study.

Through collaboration in the supply chain is widely studied phenomena for new product development or to improve performance. However, collaboration for sustainability is relatively less studied and not many empirical studies are found in this area too. More importantly, whether supplier collaboration improves the three pillars of sustainability namely environmental, cost and social are inadequate in the extant literature. This study endeavoured to fulfil this gap. Additionally, collaboration for sustainability giving particular attention to the food industry is rare. This study empirically tested and validated collected data from the UK food supply chain. Based on empirical data, this study found that supplier collaboration has a direct effect on TBL performance. This study also found that supplier collaboration leads to environmentally friendly and socially responsible practices which will lead to sustainable performance. So, this study empirically validated that the

environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and TBL performance. This study contributes to the literature of supplier collaboration and sustainability for food supply chains.

7.2.2 Reflecting on theoretical contributions

Relational View as the guiding theoretical lens has been used in this study. Relational view postulates that interfirm collaboration can facilitate the combination of mutual resources to develop competitive advantage, i.e. sustainable performance (Leuschner et al., 2013). In other words, firms can enhance their sustainable performance by collaborating with the partners in the chain. RV postulates that competitive advantage comes from inter-organisational resources which cannot be achieved or possessed by an individual firm alone (Lavie, 2006, Leuschner et al., 2013). So, the relational view supported that collaboration with the suppliers improves firms' sustainable performance. This study, however, extended the theory adding the environment-friendly and socially responsible practices as mediators between supplier collaboration and sustainable performance. So, this study argued that supplier collaboration would not inevitably enhance sustainable performance. Instead, collaboration with the suppliers will improve firms' environment-friendly and socially responsible practices which will improve sustainable performance. So, the addition of mediating variables in RV theory is a significant contribution to this study.

7.2.3 Contributions to practice

This study contributes to practice by highlighting the needs for collaboration with a supplier in food SCs. It is important that the managers can comprehend the necessity of collaborating with the suppliers if they would like to achieve sustainability in food SCs. Pursuing to achieve sustainability in food SCs is a reality given the factors in food supply chains such as food waste, food security, food shortages, resource scarcity and so on. The organisation in food SCs do not have a choice whether to pursue sustainability objectives rather when to pursue it. Achieving sustainability in food SCs is not only for the interest of society and environment, but it is also for the organisation's economic

benefits too. So, how efficiently an organisation can achieve sustainability in food SCs, the managers and the practitioners need to focus on that. This study highlighted that collaboration with the upstream SC partners could pave the way for sustainable performance in food SCs. This study also highlighted collaboration with the supplier, influences environment-friendly and socially responsible practices which will enhance sustainable performance. This study should also help practitioners to craft their strategies in a way that can facilitate inter-organisational collaboration. It is crucial for practitioners to understand that to improve environment-friendly and socially responsible practices, firms need to collaborate with their suppliers. It is evident from this study that, to achieve sustainability in the food supply chain, collaboration with the suppliers is essential.

7.2.4 Contribution to Policymakers

Achieving sustainability in general and in food supply chains, in particular, is a huge challenge for organisations, academics and governments as a whole. While governments and policymakers are initiating various regulations to tackle these challenges and to achieve success in achieving sustainability, issues such as food waste, CO₂ emissions, resource savings and social responsibility in food supply chains cannot be achieved by individual firms. Hence, better relationships with the upstream partners in the supply chain are crucial. This study suggests that collaboration with the suppliers facilitate firms for environmentally friendly and socially responsible practices which will lead to improved TBL performance. It is important to note that firms will initiate certain practices where they see the economic benefits for the firms. This study found that through collaboration with the supplier's firms will be able to improve their environmental performance, save costs and enhance their social performance. This study should help policymakers understand the importance of supplier collaboration to achieve sustainability in food supply chains. The policymakers could help create a collaborative environment and encourage business organisation for collaborative practices which will lead to achieve sustainable performance.

7.2.5 Summary of Key Contributions

This study makes several unique contributions. The summary is listed below.

1. This study has addressed an urging challenge - achieving sustainability in the food supply chain. It is found that through collaborating with the suppliers, firms can enhance their sustainable performance, namely, firms can improve its environmental performance, save costs and improve social performance.
2. This study has also confirmed that the supplier collaboration influences environment-friendly and socially responsible practices in the SCs. The collaboration with the suppliers through improved communication enhances the mutual relationship and facilitates them to share mutual resources. Through the strong relationships and collaboration, the firms can exert pressures and influence their partners for certain practices including environmentally friendly and socially responsible practices in the SCs.
3. This study has combined all three aspects of sustainable performance and carried an empirical validation of the extant literature which makes a unique theoretical contribution to the study of sustainability in food supply chains.
4. This study also makes a unique contribution to extending the Relational View (RV) theory. The RV theory supports the relation-specific assets or inter-firm relationship in improving competitive advantage or by extension sustainable performance. This study, however, claimed that relation-specific assets or inter-firm collaboration would influence certain practices with the partners that will lead to achieving sustainable performance. In other words, this study offered mediating constructs in the RV theory.
5. Based on the comprehensive literature review and drawing from the extant literature, this study developed a theoretical framework which was empirically validated with the data collected from the UK food industry. The framework is another important contribution of

this study as it indicates that collaboration with the supplier's influences environment-friendly and socially responsible practices in food SCs which subsequent have an impact on firms' sustainable performance.

6. This study contributed to the supply chain, collaboration and sustainability in food supply chain literature by extending the Relational View (RV) theory. For the academics and researchers, this study should pave the way for future research avenues.
7. For the practitioners, this study should guide them to form a better collaboration with their suppliers for environmentally friendly and socially responsible practices to achieve sustainable performance in their supply chains.
8. For the policymakers, this study should encourage a collaborative environment in the upstream supply chain to achieve sustainable performance in the food industry.

7.3 Research Limitations

Like every other research, this study has some limitations as well. First of all, the study has demographic limitations as the study considered the only UK as the study domain. Secondly, this study focuses particularly on the food industries in the UK. So, generalisation based on this result should be made with cautions. Thirdly, this study considered a single respondent per firm. Though the respondents were a senior figure in the company with the necessary access and knowledge about the company, however, multiple respondents from different strategic business units (SBUs) might be useful. Fourthly, the usage of non-probability sampling technique limits the generalizability to sample characteristics. However, common method bias and non-response bias were also checked that shows no significant issues to consider.

Nevertheless, this study should pave the way for more studies in this domain. This study is a cross-sectional study meaning the data are collected at a particular point in time, and hence the analysis

results are snap short of the company at a particular time. However, a longitudinal study comparing several years data may generate better results.

7.4 Recommendations and Future Research Opportunities

It is evident from the study that supplier collaboration impact on environment-friendly and socially responsible practices which lead to sustainable performance. It is also noted that socially responsible practices do not improve cost performance. As this study considered only particularly the food industry in the UK, a cross-industry or Cross-country perspective may bring different insights. This study considered a single respondent approach for data collection through the data were collected from the most informed managers in the organisation, multi respondents' approach could bring diverse insights to our understandings. Food wastes are one of the major challenges that impact society and the environment. Whether supplier collaboration can reduce food waste should thoroughly be investigated by various organisation in the food industry.

This study considered upstream collaboration in the supply chain to have an in-depth understanding of the particular aspects. However, internal collaboration with the employees who handle, safeguards and deliver the foods to the customer or other departmental collaboration can also be considered. Also, customer plays a significant part in the food supply chain including logistics, distribution and reverse logistics aspect. Investigating that could be another research area to be looked at.

Last but not least it can be noted based on the findings of this study that supplier collaboration has a positive and significant impact on a firm's sustainable performance. It is also noted that environment-friendly and socially responsible practices mediate the relationship between supplier collaboration and sustainable performance. As stated earlier, this study has generated some mixed results including some consistent but additions to the existing findings in the literature, some contradicted, and some findings provided fresh insights and unique contributions to knowledge. This study should stimulate the debate in the academia and for practitioners that through

collaboration with the suppliers' firms in the food SCs can improve their environment-friendly and socially responsible practices which will lead to the sustainable performance. This should also generate new streams of research in this domain.

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Questionnaire on Supplier Collaboration & Sustainability

Welcome

I am a PhD researcher from the University of Bedfordshire Business School, UK. As part of my research, I am exploring whether supplier collaboration has impacts on environmental, social and cost performance in the supply chain of UK food Industry. You are invited to complete this short survey. Your answers will then be combined with others to determine whether supplier collaboration enhances sustainable performance through social and environmental practices.

Benefits

You are contributing to a research that endeavors to help elucidate a real problem –sustainability in the food industry. You could use this report to develop best practice guidelines for your company on supplier collaboration for sustainability. You will receive a short summary of the report, if you wish to, please enter your email address at the end of the questionnaire.

Time Needed

The questionnaire has 4 sections (A–E). It is designed to be quick and easy to complete and takes about 10 minutes to complete. Your voluntary participation is much appreciated. You may opt out of the questionnaire at any point.

Data Handling

The university of Bedfordshire fully complies with the Data Protection act 1998, therefore, all data collected in this survey will be held anonymously and securely. Information about personal data is optional and will not be retained.

Abdul Ali | Doctoral Researcher | University of Bedfordshire |Tel: +44(0) 7964848553 |E: Abdul.ali@beds.ac.uk

Section A: Screening questions- Please tick the appropriate box in each of the questions below.

(If “No” is selected in any of the following 2 questions, then skip all questions to end of survey)

A1. We have a good relationship with our key suppliers in exchanging supply chain related information
a) Yes b) No

A2. We operate our business in the UK Food & Drink Industry..... a) Yes b) No

Section B: About your Company and Suppliers - Please check or tick only one answer per question. [You can click again to uncheck].

| | | | | | |
|-----------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------|
| B1. What is the business area of your company? | Food Manufacturing <input type="checkbox"/> | Food Processing <input type="checkbox"/> | Food Wholesaling <input type="checkbox"/> | Food Retailing <input type="checkbox"/> | Other <input type="checkbox"/> (Please specify.....) |
| B2. Number of employees in your company | Less than 25 <input type="checkbox"/> | Between 25-50 <input type="checkbox"/> | Between 51-100 <input type="checkbox"/> | Between 101-250 <input type="checkbox"/> | Over 251 <input type="checkbox"/> |
| B3. Approximately how many suppliers does your company have? | Less than 25 <input type="checkbox"/> | Between 25-50 <input type="checkbox"/> | Between 51-100 <input type="checkbox"/> | Between 101-200 <input type="checkbox"/> | Over 200 <input type="checkbox"/> |
| B4. How often do you exchange information with your key suppliers? | Daily <input type="checkbox"/> | Weekly <input type="checkbox"/> | Fortnightly <input type="checkbox"/> | Monthly <input type="checkbox"/> | |
| B5. Approximate annual turnover of your company (£)? | Less than 250000 <input type="checkbox"/> | Between 250000 and less than 500000 <input type="checkbox"/> | Between 500000 and less than 1M <input type="checkbox"/> | Between 1 M to Less than 5 M <input type="checkbox"/> | Over 5M <input type="checkbox"/> |
| B6. Your Title/Role in the Company: | <input type="checkbox"/> Supply chain Manager/Director | <input type="checkbox"/> Purchasing Manager/Director | <input type="checkbox"/> CEO/Managing Director | <input type="checkbox"/> General Manager/Operations Manager | <input type="checkbox"/> Others (Please specify) |
| B7. How many years has your company been in operation? | Less than 2 years <input type="checkbox"/> | Between 2 and less than 5 years <input type="checkbox"/> | Between 5 and less than 10 years <input type="checkbox"/> | Over 10 years | |
| B8. How long have you been engaged in this profession? | Less than 2 years <input type="checkbox"/> | Between 2 and less than 5 years <input type="checkbox"/> | Between 5 and less than 10 years <input type="checkbox"/> | Over 10 Years | |
| B9. Does your company have any environmental certification (e.g. ISO14001)? | NO <input type="checkbox"/> | | Yes <input type="checkbox"/> (Please provide the name/s)..... | | |
| B10. Does your company have any social certification (e.g. OHSAS 18001)? | No <input type="checkbox"/> | | Yes <input type="checkbox"/> (Please provide the name/s)..... | | |

Section C-E: Supplier collaboration, environmental and social practices and performance

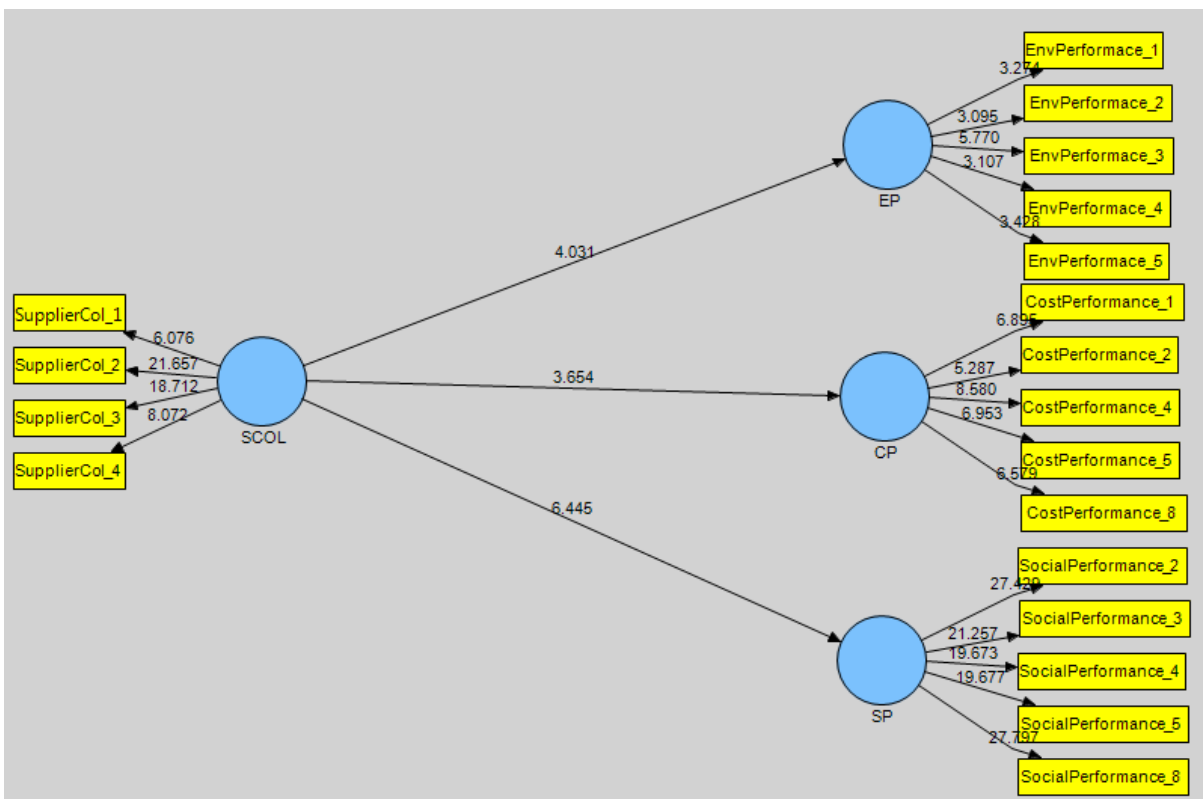
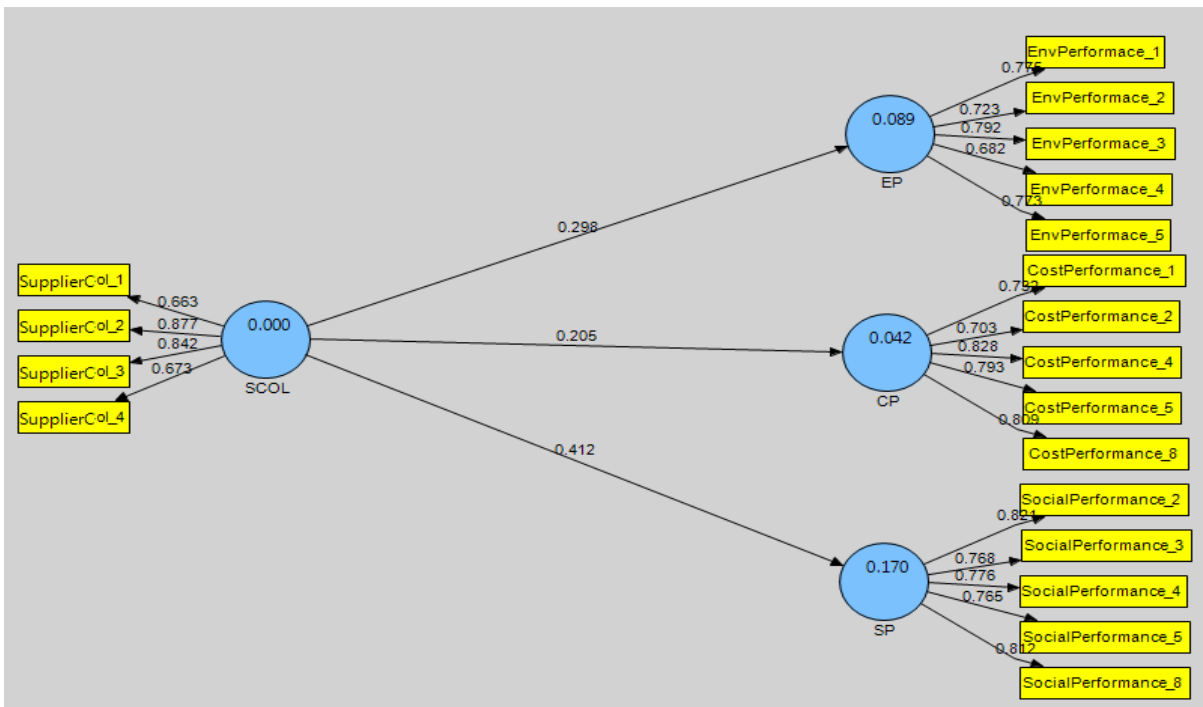
| | No | Statement | Strongly disagree | Disagree | Neutral | Agree | Strongly Agree |
|-----------------|-----------|---------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| CI – SCL | No | Collaboration with suppliers | | | | | |
| SCL1 | 1 | We exchange information frequently with our key suppliers | | | | | |
| SCL2 | 2 | We share information related to demand forecast with our key suppliers | | | | | |
| SCL3 | 3 | We share procurement plans with our key suppliers | | | | | |
| SCL4 | 4 | We share inventory level with our key suppliers | | | | | |
| SCL5 | 5 | We have joint product designs and development with our key suppliers | | | | | |
| SCL6 | 6 | We have joint process designs (e.g. transportation) with our key suppliers | | | | | |
| SCL7 | 7 | We have mutual education and training programs with our key suppliers | | | | | |
| SCL8 | 8 | We cooperate with our key suppliers for innovative practices | | | | | |
| D1- EnP | | Environment friendly Practices in our supply chain | | | | | |
| Enp1 | 9 | Environment friendly materials are used for packaging and producing foods | | | | | |
| Enp2 | 10 | Products and packaging are designed to be reusable and recyclable | | | | | |
| Enp3 | 11 | Packaging are designed to reduce food waste | | | | | |
| Enp4 | 12 | Products are sourced from environment friendly suppliers | | | | | |
| Enp5 | 13 | We design our products for consuming low materials and energy | | | | | |
| Enp6 | 14 | Environment friendly technologies are used to save the environment | | | | | |
| Enp7 | 15 | Production process is designed to reduce consumptions of resources in operations | | | | | |
| Enp8 | 16 | We use eco-friendly (e.g. fuel efficient) transportations | | | | | |
| Enp9 | 17 | Our production and delivery processes are designed to reduce carbon dioxide emissions | | | | | |
| Enp10 | 18 | We provide environmental training to the staff | | | | | |
| Enp11 | 19 | We conduct environmental audits (e.g. Sudden visits) to our suppliers | | | | | |
| D2- SocP | | Socially Responsible Practices in our supply chain | | | | | |

| | | | | | | | |
|-----------------|----|-------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| Socp1 | 20 | We source products from our local suppliers | | | | | |
| Socp2 | 21 | We source products from socially responsible (e.g. child labour free) suppliers. | | | | | |
| Socp3 | 22 | We ensure better quality life (e.g.work-life balance) for the employees | | | | | |
| Socp4 | 23 | We ensure a safe working environment for the employees | | | | | |
| Socp5 | 24 | We provide training for employees' both personal and professional development | | | | | |
| Socp6 | 25 | We ensure fair compensation for the employees | | | | | |
| Socp7 | 26 | We ensure that the employees are satisfied with their job | | | | | |
| Socp8 | 27 | We encourage and promote workplace diversity irrespective of race, gender and background of our staff | | | | | |
| Socp9 | 28 | We maintain good nutritional values of our products for consumers' health | | | | | |
| Socp10 | 29 | We contribute to local community events/activities for social and environmental awareness. | | | | | |
| E1- EnPf | | Environmental Performance in our supply chain (in the last 2 years) | | | | | |
| EnPf1 | 30 | The food waste generation has been reduced | | | | | |
| EnPf2 | 31 | Recycling practices of waste material have been increased | | | | | |
| EnPf3 | 32 | Raw material usage per unit of product has been reduced | | | | | |
| EnPf4 | 33 | Carbon dioxide emissions per unit have been reduced | | | | | |
| EnPf5 | 34 | The use of hazardous/harmful materials has been reduced | | | | | |
| EnPf6 | 35 | Water usage for per unit of product has been reduced | | | | | |
| EnPf7 | 36 | Energy usage for per unit of product has been reduced | | | | | |
| E2- CP | | Cost Performance in our supply chain (In the last 2 years) | | | | | |
| CP1 | 37 | Purchasing cost of materials per unit has been reduced | | | | | |
| CP2 | 38 | Overall cost saving has been increased through recycling and reusing | | | | | |
| CP3 | 39 | Energy usage cost per unit has been reduced | | | | | |
| CP4 | 40 | Cost of water per unit has been reduced | | | | | |
| CP5 | 41 | The cost of waste treatment and disposal has been reduced | | | | | |
| CP6 | 42 | Transportation cost per unit has been reduced | | | | | |
| CP7 | 43 | Inventory cost per unit has been reduced | | | | | |
| CP8 | 44 | Savings on labour cost per unit have been increased | | | | | |
| CP9 | 45 | New product development cost per unit has been reduced | | | | | |
| E3-SPf | | Social Performance in our supply chain (In the last 2 years) | | | | | |
| SPF1 | 46 | The Employee job satisfaction has been improved | | | | | |
| SPF2 | 47 | Our customer satisfaction has been improved | | | | | |
| SPF3 | 48 | Our employees' welfare facilities have been improved | | | | | |
| SPF4 | 49 | The health and safety training for the staff have been improved | | | | | |
| SPF5 | 50 | Our overall business reputation to suppliers, customers, and other stakeholders have been improved | | | | | |
| SPF6 | 51 | The locally sourced products have been increased | | | | | |
| SPF7 | 52 | The relationship with our key stakeholders (i.e.suppliers) has been improved | | | | | |
| SPF8 | 53 | Our community welfare services have been improved | | | | | |
| SPF9 | 54 | The working environment of our supply chain has been improved | | | | | |
| SPF10 | 55 | The socially responsible practices have been improved | | | | | |

Additional insights/ comments:

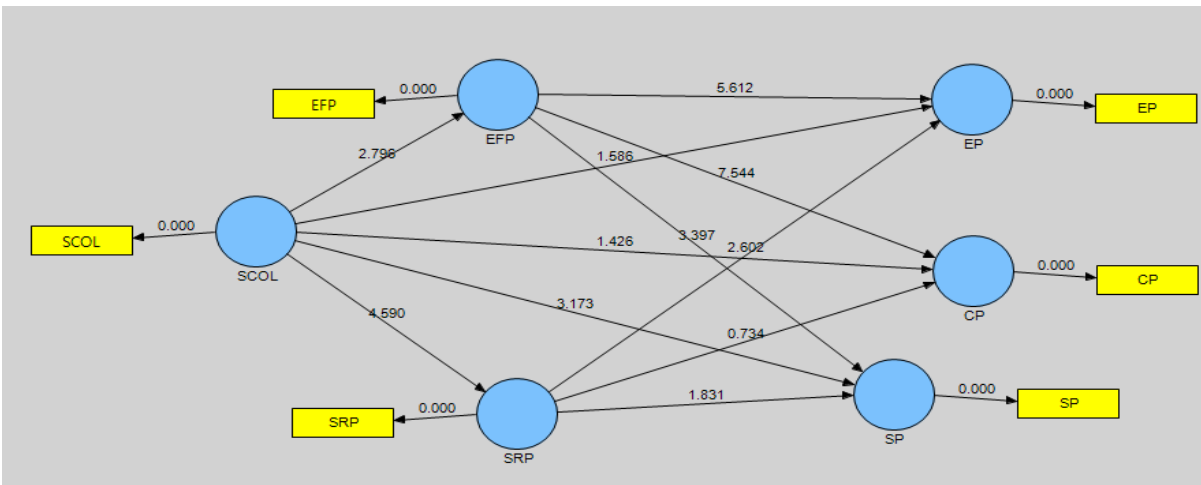
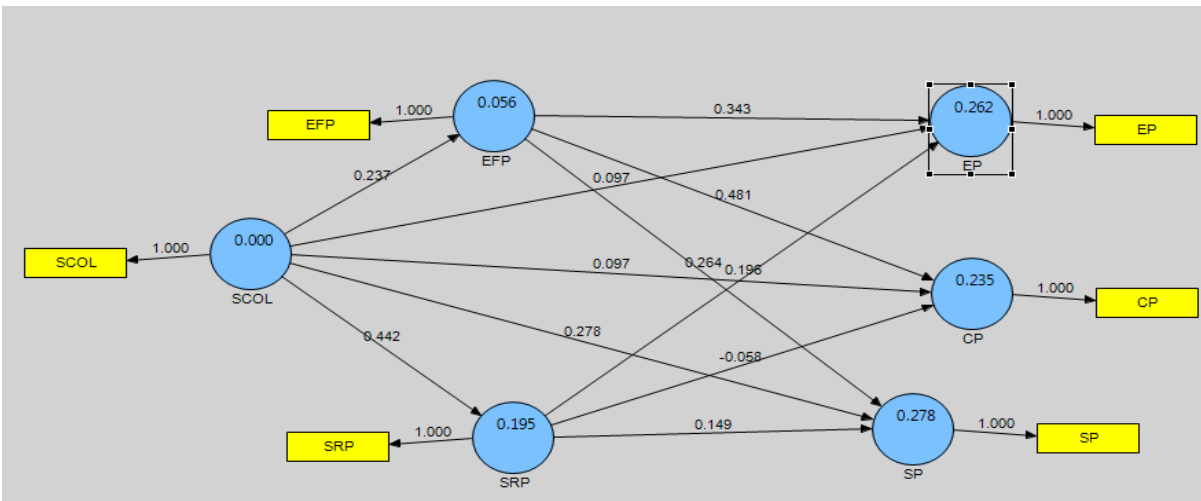
Your email address(If you wish to receive a summary of the report, please leave your email address below):

Appendix B Direct Effect and the Impact of Mediating Variables

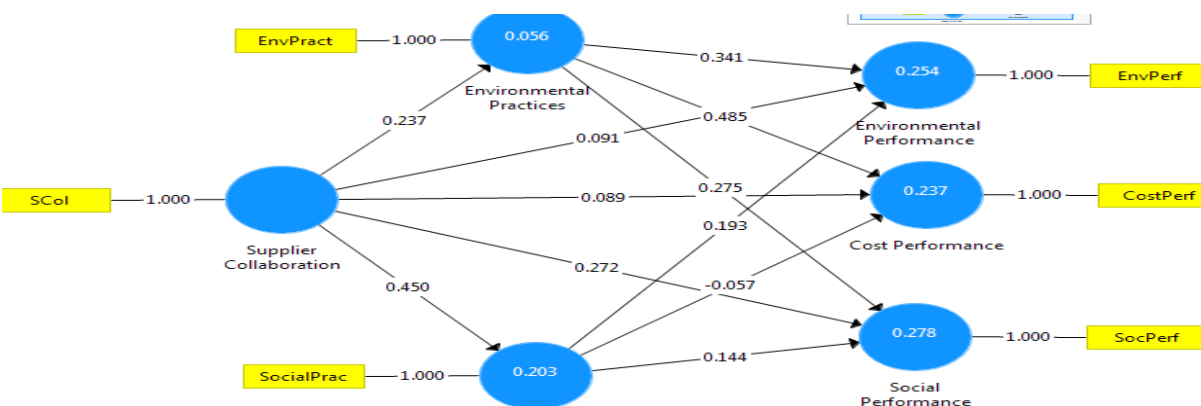


So, the direct effect is significant.

Once the Mediating effect is added (Calculating with Latent variable scores)



So, these means that supplier collaboration and environmental performance, supplier collaboration and cost performance become insignificant but supplier collaboration and social performance still significant



Appendix C Checking Univariate outliers

Descriptive Statistics

| | N | Minimum | Maximum |
|---------------------------------------------------------------------------------|-----|----------|---------|
| Zscore: What is the business area of your company? | 203 | -.95571 | 2.38927 |
| Zscore: The number of employees in your company | 203 | -.85087 | 2.06434 |
| Zscore: Approximately how many suppliers does your company have? | 203 | -1.26875 | 1.44952 |
| Zscore: How often do you exchange information with your key suppliers? | 203 | -.62161 | 2.78883 |
| Zscore: Approximate annual turnover of your company (£)? | 203 | -1.68312 | 1.32722 |
| Zscore: Your Title/Role in the company | 203 | -2.06482 | 2.11631 |
| Zscore: How many years has your company been in operation? | 203 | -3.06971 | 2.00688 |
| Zscore: How long have you been engaged in this profession? | 203 | -2.98179 | 2.06240 |
| Zscore: Does your company have any environmental certification (e.g. ISO14001)? | 203 | -.66917 | 1.48704 |
| Zscore: Does your company have any social certification (e.g. OHSAS 18001)? | 203 | -.34778 | 2.86125 |
| Valid N (listwise) | 203 | | |

Mahalanobis Check-

The screenshot shows the 'Compute Variable' dialog box in SPSS. The 'Target Variable' is 'Outlier'. The 'Numeric Expression' is '1-CDF.CHISQ(MAH_1,10)'. The 'Function group' is 'CDF & Noncentral CDF'. The 'Functions and Special Variables' list includes 'Cdf.Chisq'. The 'If...' field is empty. The 'OK' button is highlighted.

| SocialPerformance_3 | SocialPerformance_4 | SocialPerformance_5 | SocialPerformance_6 | SocialPerformance_7 | SocialPerformance_8 | SocialPerformance_9 | SocialPerformance_10 | ID | MAH_1 | Outlier1 |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|--------|----------|----------|
| 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 60.00 | 29.85924 | .00090 |
| 4 | 4 | 5 | 5 | 4 | 4 | 4 | 5 | 189.00 | 29.27751 | .00112 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 37.00 | 29.01090 | .00124 |
| 5 | 5 | 4 | 5 | 4 | 5 | 3 | 3 | 1.00 | 27.53583 | .00214 |
| 4 | 3 | 4 | 4 | 2 | 4 | 3 | 3 | 54.00 | 27.15330 | .00246 |
| 4 | 3 | 3 | 4 | 4 | 4 | 3 | 3 | 15.00 | 26.62686 | .00298 |
| 3 | 3 | 5 | 4 | 3 | 5 | 4 | 5 | 135.00 | 22.05397 | .01483 |

Or

| SocialPerformance_3 | SocialPerformance_4 | SocialPerformance_5 | SocialPerformance_6 | SocialPerformance_7 | SocialPerformance_8 | SocialPerformance_9 | SocialPerformance_10 | ID | MAH_1 | ProbabilityOutlier1 | Outlier |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|--------|----------|---------------------|---------|
| 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 60.00 | 29.85924 | .00090 | 1.00000 |
| 5 | 5 | 4 | 4 | 4 | 4 | 5 | 5 | 189.00 | 29.27751 | .00112 | .00000 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 37.00 | 29.01090 | .00124 | .00000 |
| 4 | 5 | 4 | 5 | 3 | 3 | 3 | 3 | 1.00 | 27.53583 | .00214 | .00000 |
| 4 | 4 | 2 | 4 | 3 | 3 | 3 | 3 | 54.00 | 27.15330 | .00246 | .00000 |
| 3 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 15.00 | 26.62686 | .00298 | .00000 |

We got ID 60 is a possible outlier. However, I have checked The data and it did not seems to be problematic to be flagged.

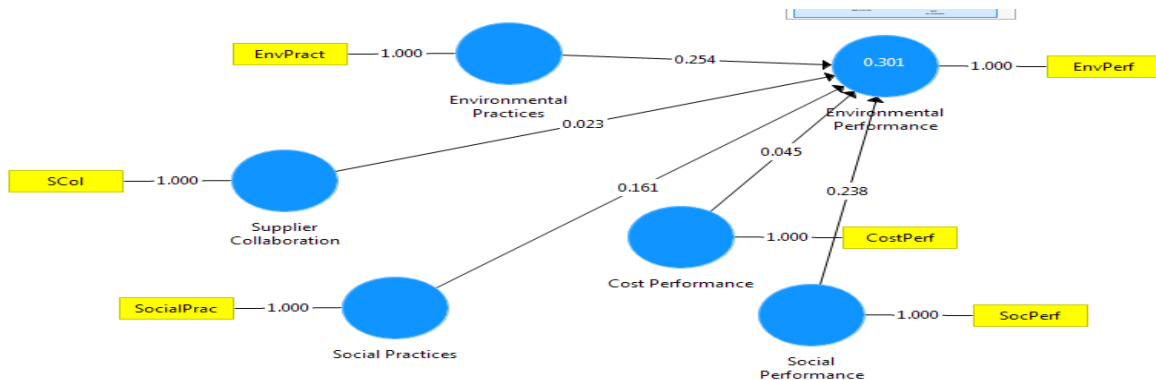
Appendix D Herman's Single Factor Test for Common Method Bias

Total Variance Explained

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 13.894 | 25.261 | 25.261 | 13.894 | 25.261 | 25.261 |
| 2 | 3.976 | 7.229 | 32.490 | | | |
| 3 | 3.502 | 6.368 | 38.857 | | | |
| 4 | 3.057 | 5.559 | 44.416 | | | |
| 5 | 2.690 | 4.891 | 49.307 | | | |
| 6 | 2.266 | 4.120 | 53.427 | | | |
| 7 | 1.973 | 3.587 | 57.014 | | | |
| 8 | 1.877 | 3.413 | 60.427 | | | |
| 9 | 1.312 | 2.385 | 62.812 | | | |
| 10 | 1.239 | 2.253 | 65.065 | | | |
| 11 | 1.201 | 2.184 | 67.249 | | | |
| 12 | 1.074 | 1.953 | 69.202 | | | |
| 13 | 1.025 | 1.864 | 71.066 | | | |
| 14 | .938 | 1.705 | 72.772 | | | |
| 15 | .924 | 1.680 | 74.452 | | | |
| 16 | .840 | 1.528 | 75.980 | | | |
| 17 | .759 | 1.380 | 77.360 | | | |
| 18 | .744 | 1.353 | 78.712 | | | |
| 19 | .720 | 1.309 | 80.021 | | | |
| 20 | .647 | 1.177 | 81.198 | | | |
| 21 | .611 | 1.112 | 82.309 | | | |
| 22 | .580 | 1.054 | 83.363 | | | |
| 23 | .566 | 1.030 | 84.393 | | | |
| 24 | .548 | .997 | 85.390 | | | |
| 25 | .511 | .930 | 86.319 | | | |
| 26 | .475 | .864 | 87.183 | | | |
| 27 | .443 | .805 | 87.988 | | | |
| 28 | .429 | .780 | 88.768 | | | |
| 29 | .424 | .770 | 89.538 | | | |
| 30 | .408 | .742 | 90.280 | | | |
| 31 | .388 | .705 | 90.985 | | | |
| 32 | .359 | .654 | 91.638 | | | |
| 33 | .347 | .631 | 92.269 | | | |
| 34 | .334 | .607 | 92.876 | | | |
| 35 | .325 | .591 | 93.467 | | | |
| 36 | .310 | .564 | 94.031 | | | |
| 37 | .300 | .545 | 94.577 | | | |
| 38 | .285 | .518 | 95.095 | | | |
| 39 | .258 | .468 | 95.563 | | | |
| 40 | .239 | .434 | 95.998 | | | |
| 41 | .230 | .419 | 96.416 | | | |
| 42 | .216 | .392 | 96.809 | | | |
| 43 | .211 | .384 | 97.193 | | | |
| 44 | .198 | .360 | 97.552 | | | |
| 45 | .183 | .333 | 97.885 | | | |
| 46 | .177 | .322 | 98.208 | | | |
| 47 | .172 | .312 | 98.520 | | | |
| 48 | .146 | .265 | 98.785 | | | |
| 49 | .142 | .258 | 99.043 | | | |
| 50 | .123 | .224 | 99.268 | | | |
| 51 | .098 | .178 | 99.446 | | | |
| 52 | .092 | .168 | 99.614 | | | |
| 53 | .084 | .154 | 99.767 | | | |
| 54 | .082 | .149 | 99.917 | | | |
| 55 | .046 | .083 | 100.000 | | | |

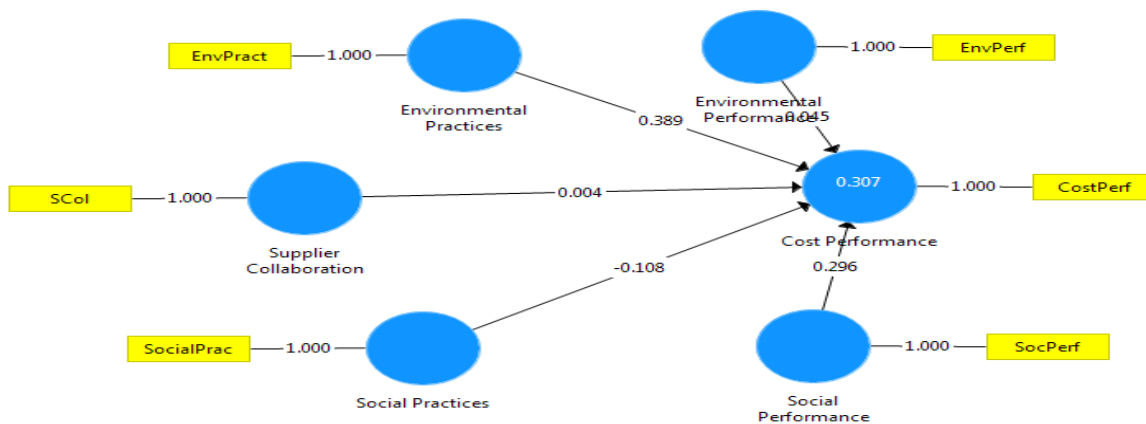
Appendix E Common Method Bias Test in PLS

If the VIF is less than 3.3 that means that there is no method bias as suggested by Kock (2015). All dependant variables were checked, and it is found that the VIF is below 3.3. That means that it should consider no method bias.



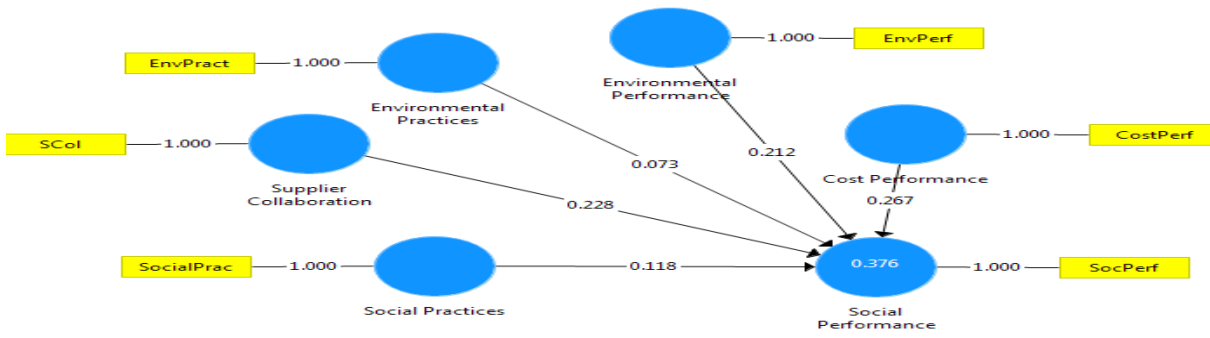
Collinearity Statistics (VIF)

| | Cost Performa... | Environmental... | Environmental... | Social Perform... | Social Practices | Supplier Colla... |
|--------------------|------------------|------------------|------------------|-------------------|------------------|-------------------|
| Cost Performa... | | | | | | |
| Environmental ... | | 1.440 | | | | |
| Environmental ... | | | 1.614 | | | |
| Social Perform... | | | | 1.521 | | |
| Social Practices | | | | | 1.555 | |
| Supplier Collab... | | | | | | 1.358 |



Collinearity Statistics (VIF)

| | Cost Performa... | Environmental... | Environmental... | Social Perform... | Social Practices | Supplier Colla... |
|--------------------|------------------|------------------|------------------|-------------------|------------------|-------------------|
| Cost Performa... | | | | | | |
| Environmental ... | | 1.428 | | | | |
| Environmental ... | | | 1.488 | | | |
| Social Perform... | | | | 1.475 | | |
| Social Practices | | | | | 1.576 | |
| Supplier Collab... | | | | | | 1.358 |



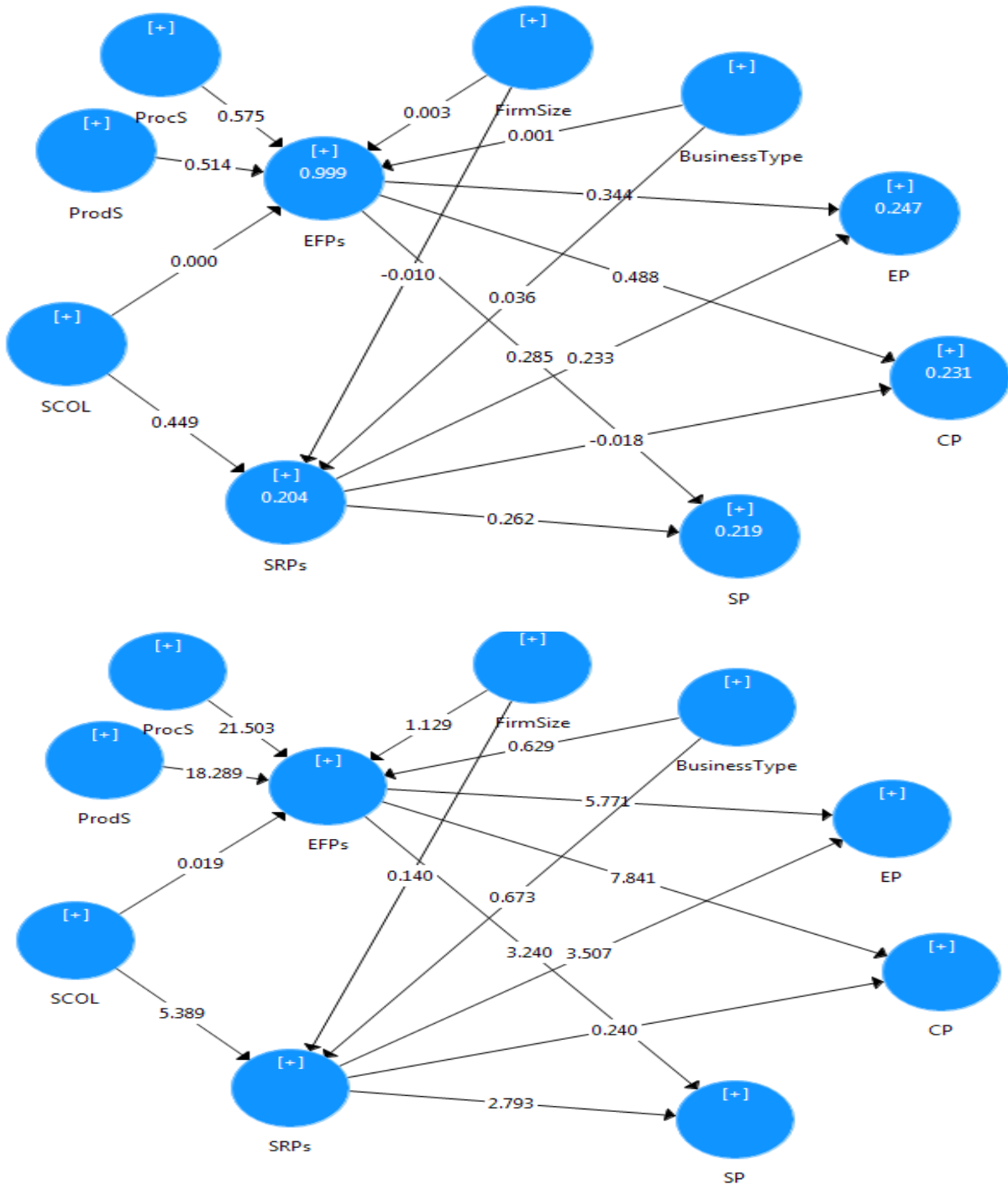
Collinearity Statistics (VIF)

Outer VIF Values Inner VIF Values Copy to Clipboard: Excel Format R Format

| | Cost Performa... | Environmental... | Environmental... | Social Perform... | Social Practices | Supplier Colla... |
|--------------------|------------------|------------------|------------------|-------------------|------------------|-------------------|
| Cost Performa... | | | | 1.329 | | |
| Environmental ... | | | | 1.358 | | |
| Environmental ... | | | | 1.698 | | |
| Social Perform... | | | | | | |
| Social Practices | | | | 1.570 | | |
| Supplier Collab... | | | | 1.275 | | |

| Final Results | Quality Criteria | Interim Results | Base Data |
|-----------------------------------|----------------------------------------------------|----------------------------------------|-----------------------------------------------|
| Path Coefficients | R Square | Stop Criterion Changes | Setting |
| Indirect Effects | f Square | | Inner Model |
| Total Effects | Construct Reliability and Validity | | Outer Model |
| Outer Loadings | Discriminant Validity | | Indicator Data (Original) |
| Outer Weights | Collinearity Statistics (VIF) | | Indicator Data (Standardized) |
| Latent Variable | Model Fit | | Indicator Data (Correlations) |
| Residuals | | | |

Appendix F Effect of Control Variables



Measurement of Control Variable: Firm size and Business type.

Firm size was divided based on the number of employees (Sebrae, 2013) as Micro (less than 25), Small (between 25-50), small to medium (between 50-100), medium to large (between 100-250) and Large (over 250) employees in the organisation. The Business types are the food manufacturer, food processor, food wholesaler, food retailer and the others (e.g. food distributors). With regards to the control variables (firm size and business type), their results found that there is no effect of the control variables.

Appendix G Ethics Approval Form

UNIVERSITY OF BEDFORDSHIRE

Research Ethics Scrutiny (Postgraduate Research Students)

When completing this form please ensure that you read and comply with the following:

Researchers must demonstrate clear understanding of an engagement with the following:

1. *Integrity* - The research has been carried out in a rigorous and professional manner and due credit has been attributed to all parties involved.
2. *Plagiarism* - Proper acknowledgement has been given to the authorship of data and ideas.
3. *Conflicts of Interest* - All financial and professional conflicts of interest have been properly identified and declared.
4. *Data Handling* - The research draws upon effective record keeping, proper storage of data in line with confidentiality, statute and University policy.
5. *Ethical Procedures* - Proper consideration has been given to all ethical issues and appropriate approval sought and received from all relevant stakeholders. In addition, the research should conform to professional codes of conduct where appropriate.
6. *Supervision* - Effective management and supervision of staff and student for whom the researcher(s) is/are responsible
7. *Health and Safety* - Proper training on health and safety issues has been received and completed by all involved parties. Health and safety issues have been identified and appropriate assessment and action have been undertaken.

The **Research Institutes** are responsible for ensuring that all researchers abide by the above. It is anticipated that ethical approval will be granted by each Research Institute. Each Research Institute will give guidance and approval on ethical procedures and ensure they conform to the requirements of relevant professional bodies. As such Research Institutes are required to provide the University Research Ethics Committee with details of their procedures for ensuring adherence to relevant ethical requirements. This applies to any research whether it be, or not, likely to raise ethical issues. Research proposals involving vulnerable groups; sensitive topics; groups requiring gatekeeper permission; deception or without full informed consent; use of personal/confidential information; subjects in stress, anxiety, humiliation or intrusive interventions must be referred to the University Research Ethics Committee

Research projects involving participants in the NHS will be submitted through the NHS National Research Ethics Service (NRES). The University Research Ethics Committee will normally accept the judgement of NRES (it will never approve a proposal that has been rejected by NRES), however NRES approval will need to be verified before research can commence and the nature of the research will need to be verified.

Where work is conducted in collaboration with other institutions ethical approval by the University and the collaborating partner(s) will be required.

The **University Research Ethics Committee** is a sub-committee of the Academic Board and is chaired by a member of the Vice Chancellor's Executive Group, appointed by the Vice-Chancellor and includes members external to the University

Research Misconduct: Allegations of Research Misconduct against staff or post graduate (non-taught) research students should be made to the Director of Research Development.

UNIVERSITY OF BEDFORDSHIRE

Research Ethics Scrutiny (Annex to RS1 form)

SECTION A To be completed by the candidate

Registration No: 1424409

Candidate: Abdul Ali

Degree of: PhD

Research Institute: BMRI

Research Topic: Influence of supplier collaboration on Green Supply Chain Management Practices and sustainable firm performance in UK food supply chain SMEs.

External Funding: N/A

The candidate is required to summarise in the box below the ethical issues involved in the research proposal and how they will be addressed. In any proposal involving human participants the following should be provided:

- clear explanation of how informed consent will be obtained,
- how will confidentiality and anonymity be observed,
- how will the nature of the research, its purpose and the means of dissemination of the outcomes be communicated to participants,
- how personal data will be stored and secured
- if participants are being placed under any form of stress (physical or mental) identify what steps are being taken to minimise risk

If protocols are being used that have already received University Research Ethics Committee (UREC) ethical approval, then please specify. Roles of any collaborating institutions should be clearly identified. Reference should be made to the appropriate professional body code of practice.

For the purpose of data collection, a list of SMEs in the UK has been obtained using FAME database. The list contains name of the companies, contact persons and contact details. Data will be collected through online survey software Qualtrics. Before sending out the link/questionnaire to the participants, an email will be sent to them detailing the purpose of the research and the research process to get their consent. Where possible, visiting the business premises and making telephone calls to the perspective participants consent will be obtained. Participants will be assured about the anonymity and the confidentiality of the provided information. Personal data will only be used for research purposes by the researcher only and will not be shared with any other parties. Collected data will be imported in excel file which will later be transferred to SPSS for analysis purposes. Name of the participants or participating organisation will be omitted. So, collected data will be anonymised. Only summative information will be presented in the thesis. Once research is completed, the outcome of the research will be informed to the participants through email. Personal data will be stored and secured with great caution in a password protected laptop where only the researcher has access. University of Bedfordshire's guidelines to maintain anonymity and security of the data will be strictly followed. Moreover, participants are free to withdraw their participation at any stage without giving any reasons. There will have no physical or mental health risk in this study as the participants are voluntarily participating and they just give their opinions based on the experiences.

Answer the following question by deleting as appropriate:

1. Does the study involve vulnerable participants or those unable to give informed consent (e.g. children, people with learning disabilities, your own students)? **No**

2. Will the study require permission of a gatekeeper for access to participants (e.g. schools, self-help groups, residential homes)? **No**

3. Will it be necessary for participants to be involved without consent (e.g. covert observation in non-public places)? **No**

4. Will the study involve sensitive topics (e.g. sexual activity, substance abuse)? **No**

5. Will blood or tissue samples be taken from participants? **No**

6. Will the research involve intrusive interventions (e.g. drugs, hypnosis, physical exercise)? **No**

7. Will financial or other inducements be offered to participants (except reasonable expenses)? **No**

8. Will the research investigate any aspect of illegal activity? **No**

9. Will participants be stressed beyond what is normal for them? **No**

10. Will the study involve participants from the NHS (e.g. patients) or participants who fall under the requirements of the Mental Capacity Act 2005?

No

If you have answered yes to any of the above questions or if you consider that there are other significant ethical issues then details should be included in your summary above. If you have answered yes to Question 1 then a clear justification for the importance of the research must be provided.

*Please note if the answer to Question 10 is yes then the proposal should be submitted through **NHS research ethics approval procedures** to the appropriate **NRES**. The UREC should be informed of the outcome.

Checklist of documents which should be included:

| | |
|--------------------------------------------------------------------|-----|
| Project proposal (with details of methodology) & source of funding | Yes |
| Documentation seeking informed consent (if appropriate) | |
| Information sheet for participants (if appropriate) | Yes |
| Questionnaire (if appropriate) | Yes |

(Tick as appropriate)

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Applicant declaration</p> <p>I understand that I cannot collect any data until the application referred to in this form has been approved by all relevant parties. I agree to carry out the research in the manner specified and comply with the statement of ethical requirements on page 1 of this form. If I make any changes to the approved method I will seek further ethical approval for any changes.</p> <p>Signature of Applicant: Abdul Ali.....Date: 21/01/2016.....</p> <p>Signature of Director of Studies: Dr. Yongmei Bentley Date: 27/04/2016.....</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

This form together with a copy of the research proposal should be submitted to the Research Institute Director for consideration by the Research Institute Ethics Committee/Panel

Note you cannot commence collection of research data until this form has been approved

SECTION B To be completed by the Research Institute Ethics Committee:

Comments:

BMRI Research Ethics Approval No. BMRI/Ethics/2015-16/012

The BMRI Research Ethics Committee has considered your application with revised documents for Ethics approval for your research project. I am providing ethics clearance for this project in my capacity as the Chair of the BMRI Ethics Committee with the following conditions:

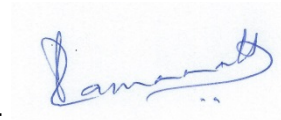
1. The confidential data should be shared with your supervisory team to ensure transparency in your research. All personal data should remain anonymous outside the researcher and supervisory team.

While executing your project, please ensure that you adhere to the ethics principles of the University (<http://www.beds.ac.uk/research-ref/rgs/research-ethics>) at all times. Please note that if there is substantial change in your research project, you may have to seek ethical approval again.

Since this project is not externally funded, this clearance is not forwarded to the University Research Ethics Committee for further approval.

The BMRI Research Ethics Committee wishes you success on your interesting research project.

Approved



Signature Chair of Research Institute Ethics Committee:

Date: 30 June 2016

This form should then be filed on the student's record

If in the judgement of the committee there are significant ethical issues for which there is not agreed practice then further ethical consideration is required before approval can be given and the proposal with the committees comments should be forwarded to the secretary of the UREC for consideration.

There are significant ethical issues which require further guidance

Signature Chair of Research Institute Ethics Committee:

Date:

This form together with the recommendation and a copy of the research proposal should then be submitted to the University Research Ethics Committee.