GREENING THE SUPPLY CHAIN: AN INVESTIGATION OF ENVIRONMENTAL PRESSURES, PRACTICES, BARRIERS, AND PERFORMANCE MEASURES IN AUSTRALIAN DAIRY BUSINESSES

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ABSTRACT

Green supply chain practices (GSC) are becoming more significant due to increased legislation to reduce emissions. While there are several benefits to pursuing environmental sustainability, the most notable are better financial returns, minimized legal risk, enhanced company image, reduced pollution, and improved quality of life. In addition, GSC research is crucial, not only to improve business processes but also, to improve business costs and protect the environment. The thesis evaluates current GSC practices, drivers, barriers, and pressures and the influence on environmental performance in Australian dairy industry, as well as the focus on GSC and the institutional theory. The general methodology features a mixed-methods design, which incorporates qualitative research in the first phase and quantitative research in the second phase, otherwise known as exploratory design. The first stage incorporated semi-structured interviews to dairy business and the second stage incorporated a survey, to generalise the findings from the first study. Thematic analysis was implemented in the first stage whilst statistical analysis was implemented in the second stage. These statistical analysis techniques incorporated descriptive statistics, hypothesis testing and a decision-making (predictive) model for GSC practices. Furthermore, the thesis also highlights an insightful viewpoint referred to as dairy industry voice. The overall provides recommendations, which can act as a guideline for future research and demonstrate practical implications, for dairy businesses seeking to improve environmental practices in their supply chain process.

CERTIFICATION OF THESIS

I Anna Tsaparas declare that the PhD thesis entitled: Greening the supply chain: an investigation of environmental pressures, practices, barriers, and performance measures in Australian dairy businesses, is not no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. The thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Date: 20 June 2022

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ABBREVIATIONS

ADF	Australian Dairy Farmers
CSR	Corporate Social Responsibility
EMS	Environmental Management System
GHG	Greenhouse Gas Emissions
GSC	Green Supply Chain Practices
GSCM	Green Supply Chain Management
IMS	Internal Environmental Management
ROI	Return on Investment
SSCM	Sustainable Supply Chain Management

CHAPTER 1: INTRODUCTION AND INDUSTRY BACKGROUND

1.0 RESEARCH BACKGROUND

Environmental sustainability has become an increasingly sensitive topic in the dairy supply chain that needs to be resolved by implementing a socially sustainable supply chain. Sustainability has become one of the major concerns for the dairy industry and its various stakeholders, especially farmers, are playing essential roles in making the dairy industry sustainable (Augustine et al. 2013). Daily demand for dairy products is increasing in Australia and agriculture contributes a significant portion of responsibility for the environment (Finnegan et al. 2018). In addition, understanding environmental business operations with dairy products is important in determining how countries are adopting green supply chain (GSC) policies and procedures (Jia et al. 2018). Company stakeholders should ensure sustainability is taken seriously and considered at each stage of the supply chain (Kumar et al. 2014; Schaltegger et al. 2014). Also, the current understanding of strategic implementation actions can boost environmental sustainability performance (Rao 2010).

The challenge is how to operate a practical business today while not compromising the natural environment in the future (Wu et al. 2011). Singh et al. (2016) established that many organisations are undertaking major initiatives to make their supply chain processes greener in response to strict government laws and to increase society's awareness of environmental protection. There are various methods for implementing sustainability, such as innovation, energy efficiency, product reliability, reducing harmful chemicals and reducing waste in manufacturing (Willard & Hitchcock 2009).

In Australia, the Australian Dairy Industry Sustainability Framework enables public reporting and measurement of sustainability commitments to support continuous improvement and change processes required throughout the whole supply chain (Milglior et al. 2017).[1] For instance, implementing solar panels to decrease the carbon footprint from the farm, fencing off waterways to increase the quality of the water and recycling the

[1] Dairy businesses, in this thesis can encompass primary production and/or processing practices. Firstly, dairy primary production is defined as the primary activity of farming, keeping, grazing, feeding, and milking of animals and the storage of milk on the premises at which the animals were milked. Secondly, dairy processing involves dairy production which inputs milk and other dairy products to produce the final product; these dairy processes may operate simultaneously.

Water management is the main method to increase sustainable initiatives (Fleming et al. 2017). Institutional theory focuses on the drivers that influence organisations and provides an alternate viewpoint in adopting strategies and practices for managing operations and supply chains. The demand for sustainable methods in the dairy supply chain, particularly in energy conservation, is growing significantly. In Australia, businesses are currently dealing with many competing demands and the new challenges of sustainable production. Customers, legislation, and competitive pressures drive enterprises to incorporate environmental safeguards. Climate change and sustainability challenges mean that dairy farm managers and manufacturing managers must keep up with market demands and sustainability changes to benefit the environment and society (Sarkis 2019).

In response to the need for environmentally sustainable practices and because of institutional pressure, Tumpa et al. (2019) suggested that companies have phased out non-recyclable plastics and continue to reduce waste, use responsibly sourced ingredients and switch to sustainable packaging. An in-depth investigation is required to examine the effect of institutional pressure on the dairy industry. The current literature, however, shows that little research has been completed in the dairy processing industry.

The dairy sector is under increasing pressure to incorporate sustainable programs and receives significant pressure scrutiny from consumers and the media (Raut et al. 2019). Wiese et al. (2013) highlighted the importance of cooperation among food manufacturers, farmer businesses and retailers to improve environmental supply chain awareness. Finally, business managers must be more transparent in raising awareness of the environment and promoting sustainability.

This thesis investigates green practices and their impact on the dairy business by focusing on key factors such as barriers, pressures and performance measures in the sector and connections between these key factors. Furthermore, this study intends to fill a gap in investigating the environmental sustainability factors mentioned above in the dairy sector. GSC literature needs to be further explored in the dairy sector for managers to improve their practices. The research provides criteria and strategic implementation that reflect the agricultural sector's situation in Australia, notably in dairy farming and processors as key dairy businesses. The thesis focuses on key companies such as dairy farmers and producers to improve practice in Australian supply chains, starting with dairy businesses, to benefit society and the environment. Therefore, this thesis will assist dairy companies in recognising current key green practices and performance measures and also in identifying

current market pressures and barriers to help them understand where they can improve and implement more environmentally friendly supply chain methods, which will benefit the industry overall. The thesis is necessary as there has been minimal investigation of Australian dairy process managers and farmers regarding the greening of the supply chain process (Duarte et al. 2012).

1.1 THESIS OVERVIEW

Chapter 1 Introduction and industry background: The main aim of this chapter is to provide an overview of the research background, motivation, and significance of the research. The research objectives and questions are also outlined for the thesis. The discussion of this chapter also outlines the introduction to the Australian dairy industry. Furthermore, the industry challenges are also discussed. Some of these key challenges, include the industry deregulation, milk price changes, climate changes and other key factors.

Chapter 2 Literature review: This chapter reviews and analyses literature in the GSCM space with key dairy business examples. The literature review incorporates an introduction to supply chain management and GSCM, green practices analysis, and barriers and drivers of GSCM practices. The literature review also outlines institutional theory and the investigation of industry pressures. In

addition, the outline includes measuring GSCM practices and performance measures in business. Finally, a key discussion of the dairy industry is provided.

Chapter 3 General research methodology: The chapter focuses on the outline of ontology, epistemology, and methodology selection. This chapter gives a critical analysis of qualitative and quantitative perspectives along with a crucial justification of the selection of mixed methods.

Chapter 4 Qualitative research methods and results: Stage one of the thesis incorporates qualitative research methods and outlines the methods used for this phase and key detail of the data analysis. This chapter focuses on an interim discussion and outlines the interview results and themes produced in the thematic analysis.

Chapter 5 Quantitative research method and results: Stage two of the thesis focuses on quantitative research methods and outlines the methods used in this phase. The procedure is outlined concerning collecting data from Australian dairy businesses. As well as an interim discussion for the second phase. This chapter focuses on the quantitative results from the survey distributed and the statistical data analysis incorporated.

Chapter 6 Overall/general discussion: This chapter discusses the key GSCM themes and findings and

compares the results from both stages of the thesis to integrate the findings. This chapter also discusses unexpected results, the significance of the results and the comparison of the results to the research.

Chapter 7 Conclusion: This chapter also concludes the research aim and summaries the main findings from the thesis, As well as the contribution of the thesis and the limitations are outlined. This chapter sums up the thesis and gives future recommendations for the thesis. Policy implications are also outlined based on the findings to assist the dairy industry in implementing GSCM practices.

1.2 RESEARCH MOTIVATION

In Australia, dairy businesses are critical to the agriculture sector. Sustainability is a significant issue for dairy enterprises, not just as a method of managing land but also to ensure that their businesses are prepared to adapt to several difficulties, such as climate, extreme weather, energy prices, and environmental impact (Yawar & Kauppi 2018). By maintaining the environment and conserving natural resources for future generations, sustainability improves the quality of life. Millions of tons of food are produced in the supply chain each year. Managers may avoid costly losses that harm corporate performance by focusing on waste reduction through improved

process management (Alston et al. 2017).The research is crucial as it provides a framework for managers to adopt sustainable practices, but it can also assist businesses in saving costs, increasing revenue and brand image, and improving product sustainability. It also helps meet the demands of society and humanity. This research is critical "to address the requirements of the present without compromising future generations' ability to meet their own needs" (WCED 1987). As a result, businesses can embrace environmental sustainability and pave the road for future generations.

Furthermore, in an industry that incorporates major challenges and as product demand grows, this research can assist dairy firms in taking an in-depth look at their businesses' health and offering tools and guidance on how to improve their current practices. Making eco-friendly practices as a part of supply chain management is not just ethical; it is also smart business. Importantly, these strategies are typically much easier to apply than managers imagine (Caldera et al. 2019).

Transitioning to product material, lowering manufacturing energy, and implementing better recycling processes are all environmental strategies that help to improve supply chains from start to end. As a result, more research is required in the Australian dairy sector for farmers and dairy processes. It is limited in terms of the industry's voice on this topic and what may impact green

supply chain practices, such as barriers or drivers and institutional pressures. GSCM is a relatively new concept, a more sustainable supply chain is also a less wasteful supply chain and reducing waste can lower a company's overall operating costs while improving the industry's reputation (Vijay et al. 2017). Finally, GSCM is important as it also seeks to eliminate or reduce waste (energy, hazardous glasshouse gas/chemical emissions, and solid waste) (Wongthongchai et al. 2019). The motivation for completing this thesis, is that it can positively impact the environment and society by focusing on the supply chain - which not only incorporates individual businesses but also shows how environmental supply chains can add value to all businesses. In addition, the dairy industry is struggling after deregulation, and this research can assist both larger companies and family- owned businesses to improve sustainable practices, as well as minimise cost to run a profitable business.

1.3 SIGNIFICANCE OF THE RESEARCH

According to Augustin et al. (2013), supply chain studies of the dairy industry show that further investigation is needed in the space of GSC. Modern dairy businesses are continually looking to reduce environmental impacts and organisational costs from farms to processes. Therefore, it is crucial to identify the significant pressures that influence the decisions of a dairy organisation's processors and farmers to implement green practices in Australia

(Emamisaleh et al. 2017). The research framework focuses on institutional theory and constructs in environmental research (Lee et al. 2013), investigating the influence of institutional pressure on GSC practices, with key barriers that impact environmental practices (Chu et al. 2017). Also, it explores how green practices in dairy businesses lead to greater environmental performance outcomes (Zhu, Sarkis & Lai 2007). Based on the study, institutional theory provides a deeper analysis of current pressure and drivers in the dairy sector and this perspective can support managers in implementing better practices in their business.

This thesis contributes to both literature and practice. Firstly, it analyses current institutional pressures which impact dairy businesses and how firms should adopt a culture of GSC practices through leadership within the dairy industry to overcome the misperception of green practices. Secondly, the findings can assist dairy businesses in understanding current best practices surrounding environmental performance. Finally, they can overcome the pressure and barriers that companies may face concerning GSC initiatives. The thesis also contributes to the literature in the field by focusing on the institutional theory and investigating the theory using constructs such as environmental performance and various GSC practices. Mixed-methods research adds insightful findings to understand the connection between institutional pressure and GSC construction and the

decision-making perspectives of managers. Furthermore, in the GSC literature more focused research is required on the impact of institutional theory in the dairy sector. Dairy businesses also require greater investigation, on adopting GSC practices, as well as managerial perspectives are needed on the current barriers that may impede a business in adopting GSC practices as monitoring and adopting GSC practices play important roles in dairy business management in Australia. This thesis provides a significant guidance to the dairy sector on analysing the key drivers and barriers. Also, the current research makes several noteworthy contributions, which include that Australian dairy businesses should increase collaboration in their supply chains, information sharing and implementation of GSC initiatives, along with measuring both internal and external practices. Finally, the thesis provides guidelines and recommendations, such as a greater adoption of GSC practices, as well as greater government support is also required.

1.4 RESEARCH AIMS/OBJECTIVES

The focus of the research is to investigate green practices and their impact on GSC implementation, environmental performance and the influence of institutional pressure and barriers to environmental performance in dairy businesses in Australia. To analyse further environmental activities in dairy businesses and the connections in the research

model, The thesis outlines four research aims:

- The first aim of the research is to investigate current GSC practices by focusing on the implementation and measurement of GSC practices in dairy businesses.
- The second aim is to investigate the roles of institutional pressure and drivers towards GSC practices and implementation.
- The third aim is to investigate to what extent Australian dairy businesses face barriers to adopting GSC practices.
- The fourth aim is to investigate the correlation relationship between the key factors that may impact GSC practices.

1.4.1 RESEARCH QUESTIONS

The following research questions guide the study:

RQ1: To what extent are Australian dairy businesses implementing environmental GSC practices?

RQ2: To what extent are Australian dairy businesses measuring and monitoring GSC practices?

RQ3: To what extent are there drivers towards GSCM practices in Australian dairy businesses?

RQ4: To what extent are Australian dairy businesses facing institutional pressure to implement GSC practices?

RQ5: To what extent are the barriers faced in the Australian dairy business to implementing GSC practices?

RQ6: What are the correlation relationships between the key factors in the dairy sector that may impact GSC practices?

RQ1 and *RQ2* focuses on the first aim of the research is to investigate current GSC practices by focusing on the implementation and measurement of GSC practices in dairy businesses. *RQ3* and *RQ4* focuses the second aim is to investigate the roles of institutional pressure and drivers towards GSC practices and implementation. *RQ5* focuses on the third aim is to investigate to what extent Australian dairy businesses face barriers to adopting GSC practices. *RQ6* focuses on the fourth aim is to investigate the correlation relationship between the key factors that may impact GSC practices.

1.4.2 RESEARCH CONTRIBUTION

The study builds on current green supply chain literature. It adds more current, in-depth analysis of one industry through the investigation of institutional theory. The institutional theory helps solve business problems. In particular, the institutional theory assists in investigating the pressures in the dairy sector regarding environmental practices. However, the research adds to the institutional theory with three additional factors (such as food security drivers, community

pressure and environmental pressure), these can help businesses be more resilient to GSCM changes. The thesis also adds key factors to the overall green supply chain space of government influence, technology barriers, cost barriers, business pressures and overseas drivers. Furthermore, the thesis outlines a framework which can help understand the role of government support and environmental barriers in the dairy supply chain. The majority of literatures on GSCM have relied on quantitative data. For example, mainly questionnaire data collection. As a result, a new method is needed to understand GSCM business problems more clearly. The transformative design allows for a more comprehensive research study through the lens of both methodologies while connecting with business through interviews, surveys, and open- ended questions. This research also suggests managerial implications for dairy farmers and processors to understand the environmental practices more visibly and the factors which impact their environmental strategies. The policy implications outlined in the discussion chapter assist the dairy in improving their current business challenges.

1.5 THE AUSTRALIAN DAIRY INDUSTRY BACKGROUND

The dairy industry in Australia continues to grow and contributes three billion dollars to the country's economy each year (Burden et al. 2021). At present, there are 5,800 registered dairy farms in

Australia, with a herd size of 261 cows per dairy farm (Hutchinson 2016). The current number of dairy cows in Australia is 1.5 million, which can produce nine billion liters of milk. Australia's dairy industry employs a vast number of people. There are 46,200 personnel employed in Australia's dairy industry (Dairy Australia 2020). Dairy production in Australia is concentrated in Victoria, New South Wales, Tasmania, and South Australia. Figure 1. Below shows the location of dairy businesses that produce milk and dairy products in Australia.

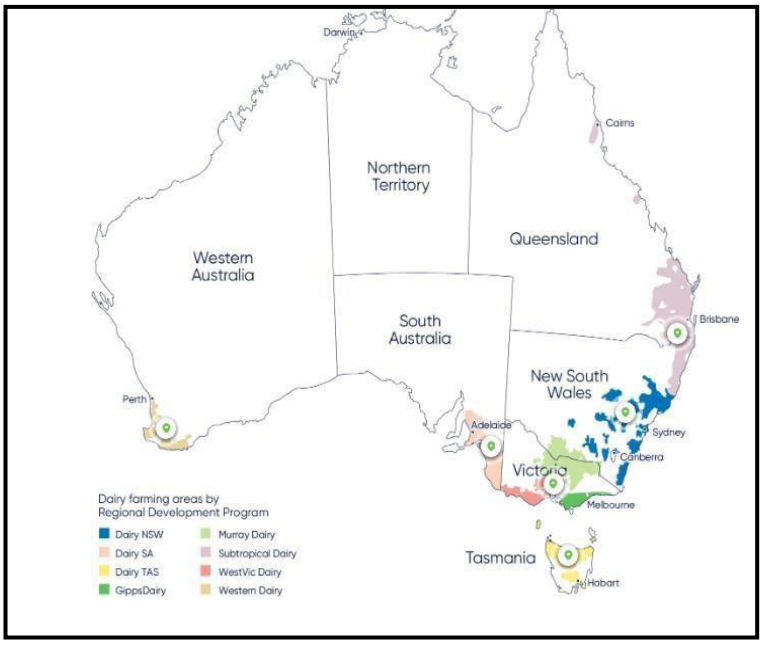

Figure 1. Dairy farming and processing areas in Australia. Source: Overview of the Australian Dairy Industry (2020).

Australia is a major supplier of dairy products nationally and globally. A total of 35% of the produced milk is exported as various products. The dairy industry produces milk, cheese,

yoghurt, ice cream, butter, milk powder, and dairy and pharmaceutical ingredients at over 70 production plants. In the Australian dairy industry Businesses consist of farmer-owned cooperatives, public and private corporations, and multinational companies such as Fonterra, Sanilac Foods, San Miguel (National Foods), Parmalat, Kraft, Snow Brand and Bega (Dairy Australia 2020).

1.5.1 DEREGULATION OF THE DAIRY INDUSTRY

There are several challenges that influence Australia's dairy industry with one of them being deregulation. Deregulation refers to decreasing or eliminating government restrictions over an industry, which is usually done to stimulate economic growth (Edwards 2003). The Australian dairy industry was regulated before 2000 by the federal government and the states (Anderson 2004). Different forms of subsidies, price controls and quotas were applied to the dairy industry before de-regulation. The income level of dairy farmers was protected because the government regulated market milk prices. However, after 2000, as the dairy industry was deregulated at the federal level, protections were lifted, and farming operations became unfeasible (Sheng et al. 2020). Since its deregulation in 1999, the Australian dairy sector has transformed from one based on many small farms, to one based on fewer but larger farms competing both domestically and internationally (Eggleston 2010).

1.5.2 PRICE CHALLENGES AND DEREGULATION

Deregulation of the dairy industry influenced pricing, and one of the most pressing challenges in the dairy industry is the lack of transparency in milk prices. Farmers in Australia have little bargaining power when selling milk to producers because of the perishable nature of milk and the market's many competitors (Richards et al. 2012). After deregulation, dairy farmers were ill-informed about price changes; some sold their farms because they did not understand the effect of these changes. Dairy producers influenced the price offered to farmers, leading to price revisions (Deloitte 2020). The government established the milk price index to help dairy businesses manage their operations more effectively. Prices have marginally increased, but price fluctuations continue to be a barrier for dairy goods, resulting in negative consequences for enterprises and revenue (Eggleston 2010).

1.5.3 BUSINESSES EXITING THE INDUSTRY

As a consequence of deregulation, the dairy industry became increasingly centralised, and producers in different regions became more concentrated. Many dairy farms had to exit the market, and consequently the overall milk production in Australia decreased. A total of 1.73 billion dollars was provided to farmers, from the federal government for restructuring; this caused the number of dairy farms to decrease from 12,500

to 7,500 (Australian Parliament House 2016). After deregulation, the free market governed the prices received by farmers (Cocklin & Dibden 2002; Newsome & Sheridan 2018). Currently, only 5,800 dairy farms are operating in Australia. Deregulation of the dairy industry caused challenges for many businesses.

1.5.2 THE IMPACT OF AUSTRALIAN WEATHER AND THE PANDEMIC

In most recent times, dairy-producing regions of Australia were severely impacted by drought or flooding, resulting in problems such as high feed prices, limited pasture growth, and restricted water allocation. A combination of these issues and changes in the seasons was another factor that led to the decrease in milk output (Deloitte 2020). These problems provide significant obstacles for the dairy business and cause destocking when farmers lower the number of cows, they may choose to keep or leave the market altogether (Barkema et al. 2015). Dairy farms and processors are efficient, but variable weather conditions affect their capacity to regulate production expenses. Milk production is highly seasonal peaking in October and tapering off the cooler months in April (Eggleston 2010).

International supply chains and businesses faced major changes in their strategies and processes during the pandemic (Hoque et al. 2020). As businesses considered supply chain resilience, organizations juggled a variety of system goals and

challenges, including business continuity risks, abrupt volumetric fluctuations, real-time decision-making, and employee efficiency. Firms experienced a change in production due to a pandemic. Supplier and procurement disruptions were impacted due to the pandemic, as many premises were closed, which led to problems with other business practices, such as less production, because of lack of product supply and uncertainty. In addition, the new trend showed a change in distribution channels for firms. Businesses had to consider re- evaluating their business model for disruption changes, such as moving to an online business model (Queiroz et al. 2020). As a result, the dairy industry noticed a great deal of difficulty regarding the food supply chains.

Dairy businesses in Australia were confronted with high product input prices, high animal feed costs, and higher overall expenses (Liu et al. 2021). As a consequence of this, the pandemic had an impact on the productiveness of enterprises. As well as the quantity of revenue those firms produced (Karwasra et al. 2021).

On the other hand, because dairy products are perishable items, the difficulty of the issue was compounded by the fact that there were limited storage and transit facilities for dairy commodities, which disrupted the supply chains (Acosta et al. 2021).

1.5.3 TECHNOLOGY IN THE DAIRY INDUSTRY

Technology is still developing in the dairy industry, existing literature shows that technology adoption is a key driver of dairy production, profitability, and economic sustainability of dairy farms (Benjamin & Yik 2019). Technology has modernised dairy sites and processing facilities. However, further investigation is required from a dairy supply perspective into the contribution of technology, especially regarding environmental performance systems. For example, Richards et al. (2012) found several efficiency levels that improve farm profitability and reduce GHG emissions from dairy products. A farms and producer's environment will be better if these technologies are used (Burns et al. 2022).

One example of environmental technology can include a technology referred to as 'varcor' technology, which produce clean water and fertilizer separated form business waste (onsite). Another example includes the use of environmental drones, where they are used to detect and measure methane concentrations at various distances downwind from emission sources of the farm and processor.

To measure emission sources, it is essential to recognize how methane concentrations fluctuate at different downwind locations (Zhu et al. 2021).

Further, Abdul-Rahaman et al. (2018) demonstrated that advancement, as evaluated by an index that combines technology acceptance, knowledge acquisition and continuous innovation, improves the sustainable growth of dairy farms. Sustainable growth is measured by profitability and market orientation (Buller et al. 2018).

1.5.4 EXPORTS OF DAIRY AND COMPETITION

Australia exports a large quantity of milk and due to its dependency for revenue generation, the dairy industry strongly depends on revenue generated by exports, the success of Australia's dairy industry strongly depends on the worldwide market. Compared to Australia, New Zealand and the United States produced and exported more commodities in 2018– 19, which caused downward pressure on commodity prices (Brown & Stone 2007). Australian dairy exports face many hurdles, for example, while demand for milk powder surged in China, other factors, such as sanctions and increased market instability, reduced demand for Australian dairy products worldwide. These challenges lead to dairy processors passing the risk of product selection onto farmers via farm-gate pricing (Edwards 2003). The farm gate value of an agricultural or aquacultural product is the net worth of the commodity after it leaves the farm, after marketing expenses have been deducted (Anderson 2004).

1.5.5 ENVIRONMENTAL RESPONSIBILITIES IN VARIOUS COUNTRIES

Companies throughout the world are trying to improve their supply chain's sustainability and efficiency (Rao 2008). Different countries apply varying approaches to develop their dairy industries and attain economic growth (Bond et al. 2012). For example, Dairy New Zealand focuses on six commitments to change the dairy industry. Industry leaders, farmers and stakeholders collaborated in New Zealand to support their dairy producers. They provided a framework to make the New Zealand dairy industry more responsible and sustainable. Further, Asian countries such as China have collaborated and developed a sustainability framework to improve the sustainability and responsibility of their dairy industries, which play an essential part in the region’s economic development (Dairy Global 2020). National governments and stakeholders also developed different guidelines for the dairy businesses and suppliers to achieve long-term sustainable performance. The Australian government and states focus on environmental sustainability by positively influencing organisations to measure emissions, manage land and effluent use and optimise water usage. Producers are also focusing to produce more products using recyclable plastic and materials (Henchion et al. 2022).

1.6 CHAPTER CONCLUSION

The research key aim was to investigate current dairy practices, performance measures, barriers, drivers, and pressures in the dairy industry. As well as creates a model between the GSC factors. GSCM may be impacted by several challenges such as, price challenges, businesses exiting the industry, the impact of COVID-19 and Australian weather conditions, as well as the increase in technology needs, exports, and international influence from different markets. In addition, the industry's deregulation has played a major role to dairy businesses. The next chapter reviews the literature.

CHAPTER 2: LITERATURE REVIEW

2.0 CHAPTER AIMS

This chapter critically examines previous studies and research related to the current study. The goal of reviewing the previous literature is to develop the study's theoretical framework and comprehend the various concepts related to this study (Sekaran et al. 2019). The structure of this literature review is as follows: supply chain management, green supply chain management, pressures and drivers, and measurement techniques. Additionally, data and information related to Australia's dairy industry are collected and reviewed throughout the literature review.

2.1 EVALUATION OF THE GREEN SUPPLY CHAIN LITERATURE

2.1.1 THE CONCEPT OF GREEN SUPPLY CHAIN

This thesis focuses on the dairy farmer/producer side of the supply chain perspective; therefore, it is crucial to define this perspective. SCM refers to managing the transfer of information and materials during the manufacturing processes, including logistics and storage processes (Stadtler 2008). *Supply* refers to the dispatch of articles and services for factories and warehouses at one end of the chain and for customers at the other end (Christopher 2016).

A *supply chain* is a set of businesses that move materials forward. Usually, several independent firms are involved in manufacturing a product and placing it in customers' hands at the end of a supply chain (Bashir et al. 2012). Material producers, product assemblers, distributors, wholesalers, logistics practitioners and retail merchants are all part of a supply chain (La Londe & Masters 1994). Therefore, SCM is a systematic approach, and the philosophy of SCM should view a supply chain as a single entity rather than separate parts, each performing their processors interdependently. The company culture and the management techniques of each firm in a supply chain should also be compatible for successful SCM (Cote et al. 2008).

Mentzer et al. (2001) suggest supply chain organisational combability should be a priority to achieve benefits in the supply chain such as profitability and sustainable outcomes. Organisational combability includes mutual goals and objectives and similar operating philosophies, which also incorporates supply chain members' mutual commitment and dependencies (Green et al. 2012). Therefore, all companies must incorporate collaboration and commitment. Another important aspect when analysing supply chains is the supply chain structure (Dangelico et al. 2015). Supply chain structure decisions refer to the location of factories and distribution centers or warehouses, the quantity and capacity of facilities,

the ability for subcontractor expansion and the means of transport to use (Mahata et al. 2013). The result of structure decisions is known as supply chain setup. The supply chain configuration is a critical decision variable since the decisions it implies, such as the location of distribution centers, the connection policies between them and the inventory levels, are of utmost importance for companies' supply systems and distribution (Moghaddam 2015).

2.1.2 DAIRY SUPPLY CHAIN MANAGEMENT

This section discusses the key components of a dairy supply chain, such as inputs, costs, and information. Dairy supply chains consist of numerous components, including production, transportation, and packaging. Adding value and transporting dairy products to customers necessitates inputs such as funding and raw supplies (Rozhkova et al. 2020). The value of dairy products rises as the chain of actors and activities associated with providing them to the final customer grows. Therefore, all chain actors must minimise costs while adding value to products. However, establishing an efficient, and cost-effective dairy supply chain is a significant challenge (Verge et al. 2007). The start of the supply chain, such as dairy farmers and operations, needs further investigation (Clarke et al. 2007). Key issues at the start of the supply chain include difficulties transporting large volumes, insufficient

transportation, a lack of milk collection and processing technology and knowledge, environmental impacts, and poor- quality raw dairy from the production site (Barkema et al. 2015; Broman et al. 2017).

Dairy supply chain contracts are binding agreements made between companies and suppliers. They are one way that information flows through the supply chain (Song et al. 2018). Manufacturers and retailers in a supply chain usually request information regarding green production, design and other environmental criteria and the more traditional factors such as cost, quantity, quality, and delivery (Chen et al. 2017). Even organisations in the Australian dairy industry have started asking suppliers about their environmental criteria. Environmental information and pressure from customers improve products and services. Environmental management information from suppliers is also required regularly (Susanty et al. 2017). Therefore, in the dairy supply chain, supply contracts are a common method to include price and volume and requirements for environmental sustainability initiatives. A summary of environmental criteria in supply chain contracts can help companies decide whether their supply chain partners incorporate green criteria (Jorgenson et al. 2006). The final input for dairy supply chains can be business costs. Cost estimate incorporates several factors, all of which must be considered before making a decision. Costing a

dairy farm or firm requires information:

about milk products, the quantity and makeup of the herd, cattle feeding, housing and the milking method. The number of dairy cows, hectares of grassland and employees all contribute to the gross margin of milk production (Santarossa et al. 2014). Dairy revenue does not equal available money, so planning for the coming fiscal year is essential (Mostert et al. 2018). Dairy farms face excessive costs for seeds, fertiliser and other resources needed for future harvests. Agricultural supplies and developments are also costed. Farmers frequently stockpile harvest items in bulk at current market prices. The feed unit value will be compared to the value of marketable crops like silage (Munawwar 2006). As a result, dairy industry expenditures are significant in the supply chain.

2.1.3 ENVIRONMENTAL SUSTAINABILITY (IN THE DAIRY INDUSTRY)

Environmental sustainability avoids the pollution of environmental resources and ensures long-term environmental quality by engaging in sustainable practices. Environmental sustainability is critical to ensure that current and future generations can meet their own needs. Natural environments have a remarkable ability to regenerate themselves and maintain their viability (Wijethilake et al. 2020). The dairy industry in Australia is committed to sustainability by ensuring that farmers are protecting their animals, decreasing their impact on

the environment, providing nutritious and safe products, and re-creating a livelihood that is rewarding for all those working within the industry (Augustine 2013). Buys et al. (2014) show that climate change has a significant impact on the Australian dairy industry, which is a crucial risk to sustainability. Milani et al. (2011) studied the environmental impacts of dairy processing and products. They found that a dairy farm or processing site can be broken into a number of unit processes during the inventory analysis step. Raw milk, water, energy, gasoline, cleaning chemicals and packaging are all major inputs that must be measured. Other environmental hazards include CO_2 and other upstream fossil fuel pollutants used to generate electricity, CO_2 from natural gas used to manufacture steam and emissions from cleaning chemicals and packaging materials (Ekval et al. 2001). Dairy farmers in Australia show a high commitment to responsibly managing the water and land. The farmers and factories in Australia reduce their water usage and recycle their water (Shine et al. 2020). Further, the Australian dairy industry has created a framework to make investments in renewable energy, avoid tail docking and stop deforestation by reducing and controlling Greenhouse gas emissions (GHG). However, farmers need to use advanced and efficient techniques to raise animals, like rational grazing, to reduce GHG emissions. More work is also needed to further reduce water usage and the usage of antibiotics for animals (Wang et al. 2016).

Higgins et al. (2015) suggest that using recyclable materials to package and store milk would enable dairy farmers to cut down on their GHGs. This can also reduce landfill waste and control the level of GHG emissions. Farmers and businesses in the dairy industry can try to use reusable packaging materials to reduce waste in the industry. Other than this, it is equally essential that the farmers and food-producing factories in Australia reduce emissions in the form of methane gas. Key players in the Australian farming industry are focusing on advanced technologies to minimise the loss of nutrients from farms (Moore et al. 2013). Dairy farmers use technologies to measure the nutrients and productivity status of pastures and soils. However, every farmer involved in the dairy industry should focus on individual actions and approaches to make the overall industry sustainable. The farmers should take care of the animals included in the dairy industry because animals with good health can give healthier milk. Also, excellent health in farming animals indicates less usage of medicines or antibiotics, leading to less discharge of gases, especially methane gas.

Black et al. (2021) indicate that sustainability in dairy farming can occur through the combined efforts of farmers and different businesses related to the dairy industry. In addition, the cooperatives and the dairy product distributors should make the dairy business more sustainable. Dairy farms and

processors in Australia should take initiative-taking measures to lower their carbon footprints and contribute to environmental sustainability. Doing so enables dairy businesses to transform and improve the environment by implementing eco- friendly and beneficial activities for their herds, such as shade stables, solar panels, soil cultivation, improved grazing practices and reduced water usage (Rakesh et al. 2019). Sustainable agriculture often offers win–win solutions as what is beneficial for the environment and addressing climate change also improves efficiency and cost savings for dairy businesses (Gargiulo et al. 2018).

2.1.4 BUSINESS SIZE AND DAIRY SUPPLY CHAIN MANAGEMENT

Understanding individual business roles in supply chains helps comprehend SSC implementation (Jia et al. 2018). Dairy farms tend to be more careful about their activities concerning their global strategy and the expectations of stakeholders (Stekelorum et al. 2019). This study focuses on both small- and medium-sized enterprises (SMEs) and large firms. However, it is important to distinguish between both types of business to understand the implementation of green practices.

Touboulic & Walker (2015) states that the prevalent focus on large firms is that larger firms often incorporate buying power, greater revenue power and more resources to implement sustainability.

Larger firms in the Australian dairy market incorporate large-scale producers with more than two hundred employees. However, many Australian dairy companies are smaller businesses (Graafland & Smid 2016). For example, dairy farming, processing, and manufacturing in Australia are characterised by SMEs that are often family-owned enterprises. Moreover, due to the restricted resources that characterise dairy businesses (Stekelorum 2020), strategic adoption of sustainability measures is vital (Porter & Kramer 2006). Eltayeb et al. (2011) observed that SMEs prefer to incorporate defensive compliance—that is, they are reactive in terms of environmental legislation, waste minimisation and eco-efficiency—into their operations (e.g., using products designed to reduce environmental impact). Therefore, SMEs are more reactive than proactive in incorporating sustainable practices.

Customer pressure drives reactive environmental activities in business to business relationships with large firms; this pressure can be significant enough to encourage environmental initiatives in SMEs' business strategies (Ciliberti et al. 2008). Yu et al.'s (2018) study focuses on customer drivers related to external and internal green practices and explored these across different firm sizes. They found that external green practices were more significant for large companies (although they were still significant for SMEs) and that large companies treated green supply chain management (GSCM)

differently. However, the study could have been more insightful by incorporating green supply chain (GSC) SME literature.

Environmental sustainability is an increasingly sensitive topic in the dairy supply chain that can be solved by implementing a socially sustainable (environmental) supply chain. Many stakeholders recognise the necessity for supply chain managers to successfully implement sustainability initiatives in the supply chain. Although firms have started entering the worldwide market during the previous decade, supply chain managers will continue to increase customers' confidence.

Sustainable development in SMEs has been studied in–depth in academic literature to determine the major facilitators and difficulties associated with adopting sustainable development. They appear to be either a driver or a hindrance to the organisation's progress, depending on how the organisation is moving (positive or negative) (Powell et el. 2009). Numerous researchers have claimed that small enterprises' ability to adopt sustainable growth ideas depends on their manager's or owners' individual beliefs. As a result, commercial sustainability hurdles are seen as personal difficulties. Concerning the hurdles, Biswas (2017) discussed the "attitude–behaviour gap," which is evident in the absence of lifestyle adjustments despite consumers' desire to choose greener options. According to Gupta et al. (2020),

a global study of sustainable consumption suggests that the four primary reasons for non- adoption of sustainable behaviours are a lack of awareness, surrendered lifestyles and associated expenses and taxes. In contrast, Colovic et al. (2019) highlighted that SMEs' unique characteristics could drive sustainability. SMEs may readily discover specialised business possibilities that conglomerates shun and develop novel solutions to societal problems and apply them more quickly than corporations because of their less complicated organisational structure (Ghadge et al. 2017). Additionally, being part of local communities can facilitate sustainability initiatives because it fosters an emotional connection to the community. Locally based small businesses cannot afford to have their reputations tarnished by substandard products or unsustainable social practices. Local engagement also enables the development of deep, personal ties with community members, which may improve product and service quality. The authors' literature analysis on the barriers and drivers of SSCM in firms of diverse sizes found several elements of incorporating sustainable practices. However, a study gap was identified in terms of the correlations between these variables and their relationship to the characteristics of organisations and managers.

SMEs may also face more environmental barriers and more significant challenges in the supply chain than larger companies. One challenge is environmental requirements applied by larger firms

that set out specific social and environmental standards. These standards function as a prerequisite for SMEs to do business with companies, and these are usually in the form of certification schemes and even voluntary acts (Santos 2011). Other obstacles to executing sustainable activities include finances, technology, a lack of expertise and psychological motivations (Natarajan & Wyrick 2011). The absence of alignment between business strategy and long-term activity is also a problem. Other reasons that may limit SMEs' environmental involvement include their inability to influence suppliers' sustainable behaviour or because some consumers may not base their purchasing decisions on sustainable criteria (Santos 2011).

2.1.5 THE GREEN SUPPLY CHAIN (GSC) PERSPECTIVE

This study examines sustainable supply chain management (SSCM) through an environmental lens, otherwise known as GSCM or the GSC[2]. The main aim of including environmental activities in a supply chain is to reduce water and air pollution and reduce, reuse and recycle the products. GSC helps a firm's efficiency by reducing water use, reducing the cost of products and manufacturing, image

[2] Green supply chain management (GSCM): integration of green practices in the supply chain. Green practices (GSC): integration of practices to achieve environmental initiatives in firms. GSCM and GSC are terms used inter-changeably within the thesis.

building and improving customer satisfaction (Sezen & Çankaya 2017).

Therefore, GSC adds value and reduces a business's harmful effect on the environment of the whole supply chain's operation (Rao 2011). Tachizawa et al. (2015) added that companies' GSC and other green initiatives are not due to the companies' concern for the environment but occur because of the market and the economic performance outcome. Despite many multinational corporations' efforts to address environmental issues in their supply chains, a gap exists between the desirability of supply chain sustainability in theory and its implementation in practice (Sancha et al. 2015).

GSCs in agriculture are a collection of manufacturing activities transferring quality agricultural products to meet market needs best. In each line, for each type of product, one or more supply chains can be applied simultaneously, depending on the manufacturing and consumer market characteristics. Wognum et al. (2011) suggests the importance of traceability in supply chains to gain customers' trust since milk, fish and poultry case studies showed that customers wish to be informed about material flows. Pham and Pham (2017) found that firms should improve their knowledge and experience by creating environmental policies and improving interpersonal

relationships among their suppliers. Existing research is limited about the Australian dairy industry's current best practices and how these are influenced by external sources such as institutional pressures. A greater investigation is needed with a strong theoretical pathway to investigate current methods and monitor practices for environmental performance (Wang et al. 2016). Examining the dairy industry is essential because it is a core industry embedded in everyday society. This industry can branch out too many other industries that will connect to sustainability. For example, this industry requires excellent research on environmental practices such as eco-design packaging due to the nature of the products, internal environmental management (IEM) due to the quantities being produced and green purchasing due to buyer– supplier relationships with product suppliers (Rao 2011).

Frameworks have proposed improving the collaborative relationship between suppliers and manufacturers to explore the gaps between these frameworks to aid the managerial decision-making process and develop general processes to attain and maintain a GSC (Yu et al. 2014). Different sets of performance measures are used for determining the effectiveness or efficiency of the prevailing system and comparing the competing alternative systems, as well as for designing proposed systems using the determination of the values of the

decision variables that yield the most desirable performance levels (Guo et al. 2017). Chin et al. (2015) proposes a conceptual model that linked green procurement, green manufacturing, green distribution and green logistics to sustainability performance and environmental collaboration. Srivastava (2007) suggests that eco-design must be implemented, which means designing green products while considering process development and environmental factors crucial to the supply chain. Holt et al. (2009) added that environmental management, supplier assessment, green procurement, supplier education and mentoring are essential concepts. GSC needs further investigation in the Australian dairy industry to assist firms in adopting greener initiatives and realising their advantages for environmental performance. This thesis investigates current green practices as critical constructs, incorporating cleaner production, IEM, eco-design, green purchasing, and green supplier development (Lee et al. 2013; Zhu & Sarkis 2007).

Powell et al. (2009) further describe drivers such as managerial commitment, reputational business, employees and implications as underlying motivations for firms to implement sustainable practices. However, Powell et al.'s research was limited to a small number of firms (5) and did not deeply explore sustainability factors. Further, this study did not indicate practical implications. Research using the GSCM lens to focus on many

industries and different countries suggests that Australia needs further research into the dairy industry to assist companies in adopting greener initiatives (Petljak et al. 2018; Quayle 2003; Shang, Lu & Li 2010). Current green practices investigated as key constructs in this research include cleaner production, internal environmental management, eco- design, and supplier development (Lee et al. 2013; Zhu & Sarkis 2007; Udin 2021).

Many countries are starting to recognise environmental issues under the directives from customers, and legislation, particularly in the UK, China, Japan, and the European Union, has become a significant concern for businesses. Therefore, GSCM was developed as an efficient, integrated, and systematic strategy. It is a crucial innovation that helps companies in developing a win–win strategy that can attain profit as well as market share objectives, decreasing their environmental risks and influences while raising their ecological efficiency (Li et al. 2020; Pressey, Winklhofer & Tzokas, 2009; Yook, Choi & Suresh 2018; Zhu, Sarkis & Lai 2013).

2.1.6 BENEFITS OF IMPLEMENTING GSC PRACTICES

Mirhedayatian et al. (2014) found certain benefits of GSCM, including financial, social, and environmental benefits. GSCM helps increase revenue, reduce costs, increase utilisation of assets, and enhance customer service in terms of

financial benefits (Jaggernath & Khan 2015). In terms of social benefits, it is worth noting that GSCM helps reduce the levels of community impacts, noise and traffic congestion while improving humans' safety, health, and security. In this context, Jabbour et al. (2016) suggests that GSCM helps improve companies' operations by employing environmental solutions and aids in improving agility.

Mumtaz et al. (2018) suggests that managers can reduce pollution and operating costs by implementing GSC practices. Surveys also show that green practices make it possible to improve organisational performance. Mumtaz et al. (2018) conducted their investigation on several industries. It is common for research to be conducted across a wide range of industries. However, since this type of investigation is common, no specific framework has been developed in detail for one main industry (i.e., the dairy industry). Moreover, in many other cases, there is no specific focus on one industry (Govindan et al. 2016; Huang et al. 2012; Jabbour et al. 2016; Rao 2007; Rekik & Begeron 2017; Vijargy et al. 2017; Zhang & Yang 2016).

Green supply chain management is a new field, thus research in one industry is limited (Sarkis et al. 2011). Greater detailed application is required in individual industry to boost the research practices and share common knowledge and practices (Malviya & Kant 2015). GSCM Scholars

should consider targeting individual business and managers in a specific industry for a more successful application, to individual operations. Not only will this be beneficial for warehouse-level operations but will also be more efficient to monitor and progress (Rao 2011).

Xu et al. (2013) finds that environmental management helps mitigate the risks and brings speed- related innovations. Further, environmental management helps increase adaptability (Joshi & Rahman 2015). GSC practices often help in the process of innovation, which leads to continuous improvements. Seuring (2013) also claimed that implementing environmental activities helps promote alignment while involving negotiating policies with customers and suppliers, leading to better alignment of business principles and processes.

2.1.7 INVESTING GSC PRACTICES FROM THE LITERATURE

One of the main focuses of the literature is on the GSC practice of cleaner processing, otherwise known as cleaner production, which is a company-specific environmental sustainability program that is proactive (Diab et al. 2015). It aims to reduce waste and pollution while increasing production. Source reduction techniques are used to analyse the flows of materials and resources within an organisation to find options for reducing waste and pollution from manufacturing processes (Dou et al.

2018). Improvements in organisation and technology assist in reducing or recommending better options in the use of materials and resources and the avoidance of waste and wastewater generation (Laari et al. 2018). Managers and CEOs can impose internally legislated emission limits in specific countries, and corporations can adopt measures that satisfy those specific goals for reporting to shareholders (Miexell et al. 2015).

Other authors, such as Jama et al. (2018), suggest companies want suppliers to develop internal systems for management and provide specific accreditation, for example, the ISO 14001[3]. Such systems supply information that leads to more or assists with environmental cooperation. Environmental protection is a service or product throughout the product's lifecycle, which protects people, animals, land, and resources even after manufacturing is complete (Wang et al. 2012).

Ecological design is an approach in which attempts to create products with smaller ecological footprints and avoid detrimental environmental impacts (Zhu

[3] ISO 14001 is a voluntary international environmental standard that is expected to be adopted by the substantial majority of businesses. It focuses primarily on the design, implementation, and maintenance of a formal environmental management system, the corporation must state what it will accomplish, how it will do it, who will do it, and by when it will be completed.

et al. 2012). It is necessary to analyse each of the phases that comprise it, such as supply, and ensure sustainability for a positive impact on society and the environment to preserve a GSC (Huang et al. 2021). Although companies would like to invest in GSCs, change and resilience are required to adapt the chain to external factors that may affect its potential to manufacture or deliver services (Huang et al. 2016).

Companies must understand and mitigate the economic, social and environmental risks connected to products and services' lifecycles (Govindan et al. 2015). SMEs have adopted various GSC practices to improve environmental performance to supply international markets effectively.

Huang et al. (2012) and Zhu et al. (2005) investigated IEM, eco-design, investment recovery and consumer cooperation, focusing on manufacturing firms rather than retailers. These studies also examined green production processes and design classifications of environmental activities. Sarkis & Geng (2005) suggests that enterprises have increased environmental awareness due to competition, regulation and marketing drivers and pressures.

Kumar (2014) finds that collaboratively viewing different practices are essential for GSCM. The main factors that Kumar (2014) found were environmentally oriented management and

customer cooperation. Further, for a company to be successful, it needs to ensure environmental management and customer collaboration. It also needs to have the quality of being conscious of the environment around it. Despite interesting findings, Kumar's (2014) paper required more analysis of interviews with supply chain managers. For example, managers are motivated by the potential benefits of environmental SCM. The benefits include increased efficiency, effectiveness, differentiation in the market and revenue growth (Vijay al. 2017).

Sellitto et al. (2019) state that GSC practices should be categorised into four categories: collaboration, innovation, operations, and mitigation. Collaboration involves cooperation with suppliers and customers. Innovation may include adopting eco-design, green products, and green processes. Operations include environmental technology, green purchasing, manufacturing, warehousing, and distribution. Mitigation involves pollution prevention and investment recovery. Sellitto et al. (2019) interviewed four managers from large firms, of which two firms observed green practices. The study's strength was filling a gap in categorising GSC practices and interviewing managers to obtain professional opinions. However, it is unlikely that all the investigated green practices are equally important, and further study should consider each activity's priority.

According to Bourlakis (2014), it is critical to explain three key indicators to ensure successfully adopt of GSC practices. The first is efficiency indicators, such as the proper use of resources concerning cost and profit; on the other hand, flexibility indicators imply that businesses should provide customers with flexible products and services to reflect environmental changes. The second is external indicators, which include organisations receiving things to the right place at the right time and providing the right type and number of products. The third is internal indicators, which are critical in the dairy industry because raw material quality is a shared duty of all supply chain participants. Product quality indicators are the most important component of an SSC (Bourlakis 2014).

Li et al. (2019) investigated companies' environmental behaviours concerning their business performance. They investigated relevant, insightful constructs such as company board size, education level of business owners and proportion of females on the board related to businesses' performance and choice of suppliers. They found that managers with greater training were more willing to adopt GSC practices. This study was conducted through hypothesis development; further research using primary in-depth qualitative data would provide valuable insight.

Many GSC studies focus on several industries that would each benefit from a specific study of issues.

Zhu & Sarkis (2004) provided a model that compared GSC categories to external and internal company practices, linking GSC to performance. Their research was uniquely underpinned by coordination theory (Channel coordination (or supply chain coordination) tries to enhance the performance of the supply chain by coordinating the strategies and objectives of separate businesses. It focuses mostly on inventory management and ordering choices in remote inter-company environments). Ahi and Searcy (2015) further highlighted metrics linked to both GSC and sustainable SCM. A total of 2252 GSC matrices were identified and discussed. However, both studies failed to ascertain how companies should measure the identified performance factors.

Fahimnia et al. (2015) analysed the concept of GSCM regarding the integration of environmental awareness into SCM, outlining how GSCM can enhance sustainability performance. The main strength of their study was its emphasis on the importance of environmental collaboration, which is an essential element of the relationships that facilitate strategy formulation. However, the research would benefit from an additional focus on manufacturing companies' involvement in developing collaboration with suppliers to achieve sustainable performance (e.g., Choudhary & Sangwan 2018; Huang, Tan & Ding 2012; Lee, Kim & Choi 2012).

Many researchers have attempted to categorise

GSC practices. For example, Rao & Holt (2005) and Rao (2007) suggests inbound functions, outbound functions and cleaner production. Al- Sheyadi et al. (2019) identified external GSC practices such as external EMSs and internal GSC practices such as eco- design, source reduction and EMSs. Zhu et al. (2007) identified similar categories.

Testa & Iraldo (2010) argued that GSC practices should be divided into the following three broad categories: reputation led (practices that promote a positive business image), efficiency led (practices that cut costs and reduce materials in products) and services and innovation led (practices that establish businesses as industry leaders and promote a solid competitive advantage) (Huang et al. 2012). Other research has investigated GSC practices such as green procurement, green logistics, eco–friendly packaging, IEM and investment recovery (Zhu et al. 2007; Lee et al. 2012; Saeed et al. 2018).

Lee et al. (2012), in their study of SMEs in the South Korean electronics industry, argued that large manufacturers need solid IEM and external cooperation and coordination with suppliers and customers in their supply chains to implement GSC practices. This study was unique in incorporating business performance measures such as employee satisfaction and other human resource management variables.

2.2 THE GOVERNMENT/INSTITUTIONAL FRAMEWORK OF GSC

The Australian Government and the territory and state governments have implemented legislation to protect the environment, the community and consumers and promote fair competition and trading. The legislation helps in the governance of businesses while they interact or communicate with their customers, suppliers, and competition. In addition, the legislation helps outline the business's and the business owners' rights whenever any conflict arises (Australian Parliament House 2021). Likewise, the government needs to focus on the strategies that lead toward sustainability in the dairy industry. Usually, farmers or businesses processing dairy products face fines if they do not comply with the sustainability framework. However, the government can also provide farmers and milk suppliers funding and finances to implement greater environmental initiatives. For instance, farmers can have enough funds to purchase and use recyclable or reusable material for packing and distributing the milk to factories or other distributors. Unfortunately, the lack of finance creates hurdles in making Australian dairy businesses sustainable. In response, for business environment sustainability, central, state and territory governments and the local and jointly administered offices combined to check on the administration of the environmental protection aspect. Local governments particularly play a

significant role in accessing recycling and waste collection services, operating landfill sites, conducting awareness programs and providing the infrastructure for litter (Lokuwaduge & Heenetigala 2017).

Several businesses have undertaken government resource sustainability methods for reducing waste. One example is Australia's national waste policy. Businesses must follow the national waste policy (Less Waste, More Resources), which agreed to the following six directives: taking responsibility, improving the market, improving sustainability, reducing risks and hazards, tailoring solutions, and providing evidence. Conducting environmental audits is a method that sets a benchmark for business activity improvement and assesses the extent and nature of harm the business activities are having on the environment (Caldera, Desha & Dawes 2019).

Businesses can also set up an environmental management system (EMS) that supports their management plan, improves resource utilization, and ensures the issuing of licenses and permits and meeting environmental objectives. Energy use can be minimized by adopting cogeneration or trigeneration technology and by following the business Energy Advice Program. Businesses have started using water-efficient products registered under the Water Efficiency and Labelling Standards Scheme and using the protected matters search

tool and national waste policy for waste and resource management (Knight et al. 2019).

Panchasara et al. (2021) show that Australia is highly committed to decreasing GHG emissions from dairy operations. The dairy industry exports its products to the Asian (China) region, where consumption patterns increasingly shift to those of Western diets. Australia has exported its dairy products to Japan, China, Singapore, Malaysia, and Indonesia for many decades. However, the total emissions from the dairy industry are reported to be 12.5%, that is, 1.63% of the entire country's emissions (Eckard & Clark 2018). The dairy industry has set a goal of reducing GHG emissions intensity by 30% by the end of 2030.

2.3 THEORIES THAT CONCEPTUALIZE GSC

2.3.1 COMPARISON OF GSCM THEORIES

Numerous GSCM theories can be applied to organisations, including stakeholder theory, knowledge-based theory, and resource-based theory, which will be discussed further. The stakeholder theory attempts to find a balance between ethics and economics while achieving the company's goals (Sezen et al. 2017). This means that a company should be run in a way that benefits its stakeholders, and directors should answer them. Companies are beginning to dismiss shareholder primacy in favour of stakeholder theory (Bowen et al. 2006). This theory does not come without flaws.

This theory produces the best results when it is applied continuously in organisations, and the evaluation of the analysis of this theory can be subjective at times (Yawar et al. 2018). It is also impossible to fulfill all stakeholder interests at the same time, and businesses may, prioritise stakeholders such as shareholders over employees and customers (Roehrich et al. 2017). Based on the reasons stated above, It was concluded that stakeholder theory has some drawbacks. Thus, focusing solely on shareholders demonstrates a bias towards shareholders, which may harm stakeholders and violate ethical codes.

The knowledge-based theory is another well-known GSCM theory (Saeed et al. 2018). According to the knowledge-based theory, knowledge is the firm's most valuable strategic asset. Because knowledge-based resources are frequently difficult to duplicate and socially complex, proponents argue that the diverse knowledge bases and abilities among organisations are the primary determinants of long-term competitive advantage and superior corporate performance (Duarte et al. 2012). Due to information asymmetry, the knowledge-based theory would not apply to sustainable supply chain contexts in Australia (Fayezi et al. 2012). Because of information asymmetry, the knowledge-based theory was not considered to be the best fit for this study that conceptualizes green supply chain in Australia.

The resource-based theory has an impact on strategic management. It is widely used as a managerial framework to identify critical resources required by a company to establish and maintain a competitive advantage (Dubey et al. 2015). The resource-based firm is a modern theory that provides viewpoints on organisational and strategic issues. A common criticism of the Resource based View (RBV) central logic is flawed logic. It arose as a result of economists' desire and the assumptions of firm diversity (Shibin et al. 2020). Because of the focus on resources and firm diversity, this theory was not considered to be most suitable for the study. Institutional theory will be reviewed in more detail below.

Finally, institutional theory which focused on institutional pressures that impact businesses, has improved our understanding of the incentives for institutions to converge and maintain their institutional diversity (Glover et al. 2014). Organizations strive to adhere to widely recognised and accepted norms within the organisational sector, which contributes to the organization's legitimacy (Lia et al. 2020). Many business activities and their outcomes can be explained using institutional theory. According to Altayar (2018) a number of institutional decisions and actions can be explained using institutional theory, which is why this research incorporates institutional theory. The central focus of the study aligns with elements of institutional theory which impact both

dairy business and environmental practices in the supply chain, and thus this theory was considered most appropriate for the study.

Institutional theory, otherwise known as institutional pressure, can explain how changes in social values, competition and regulations affect green sustainable activities and environmental management decisions (Kuappi 2013). Institutional theory describes three forms of pressure that create business isomorphism: Organisational customer pressure, regulation pressure and competitors pressure (Glover et al. 2014).

Institutional theory occurs from influences exerted by those in powerful positions such as governments, this is referred to as (regulation) government pressure below (Zsidisin et al. 2005). Another form of institutional pressure is competitor pressure, this occurs when companies feel pressure to match rival businesses (competition). Furthermore, firms are embedded in social networks and receive influential pressure to conform to institutional expectations, this is known as organisational customer pressure (Lin & Sheu 2012). Finally, institutional theory outlines how best practices, procedures and processes are implemented (Dragu et al. 2013).

2.3.2 INSTITUTIONAL THEORY FRAMEWORK

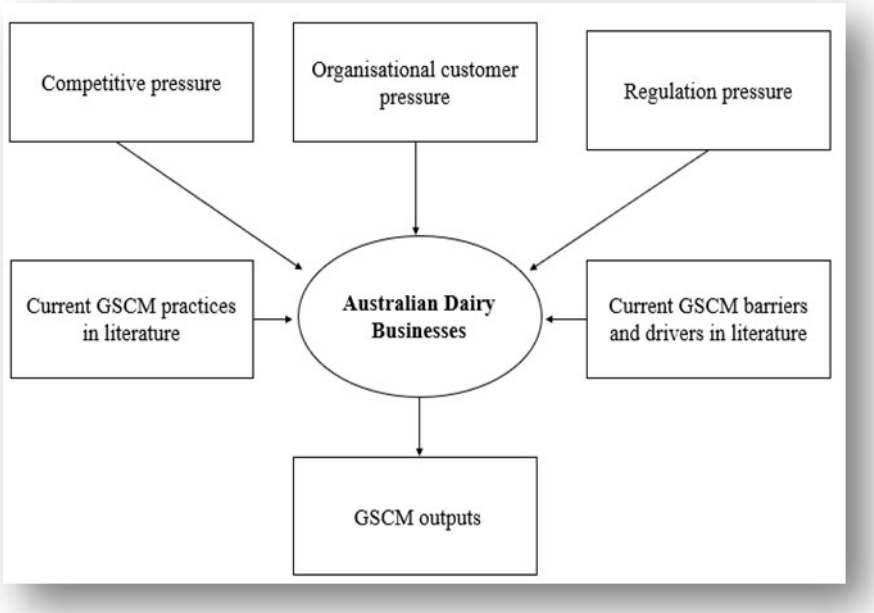

Figure. 2 Institutional theory diagram

The framework developed from a review of the literature to guide the subsequent empirical investigation. An institutional theory-based diagram is provided, illustrating the role of institutional pressures and drivers, as well as potential barriers to GSC.

2.3.3 ORGANISATIONAL CUSTOMER PRESSURE

Organisational customer pressure has a strong presence on environmental performance. In addition, direct customers of the firm exert customer pressure. Therefore, organisational customer pressure significantly influences environmental performance metrics (Dubey et al.

2017). Customer pressure forces firms to adopt GSC initiatives, but these impositions take the form of customer demands and directives to set environmental standards (Eltayeb et al. 2011). Business buyers' disapproval of products containing hazardous chemicals or insufficient recyclable content creates incentive and encouragement for businesses to adopt GSC practices (Rezali et al. 2021). Due to the end consumer, business customers are becoming more concerned about products' origin and the inputs used during production. For example, farmers must be concerned about animal welfare and the environmental impact of production (Beske et al. 2014). Milk processors and farmers may experience organisational customer pressure provided by supermarkets. Branded and generic milk have varied supermarket pricing and processor profitability. Supermarkets hold tenders to select generic milk processors, which create greater customer pressure (Eggleston 2010). These customer pressure can also be influence by GSCM practices, to select environmentally friendly suppliers.

2.3.4 REGULATION PRESSURE

Dubey et al. (2014) found that dairy businesses face significant regulation pressures to implement green activities. However, Eltayeb et al. (2011) found that regulation also impacts the drivers of eco- design which was found to be the most

beneficial in improving environmental performance. Therefore, environmental regulations and the pressure to join green initiatives can also be active catalysts for firms to improve their environmental performance (Rao 2004).

Kershaw & Gaffe (2008) suggested examples of regulation pressure in Australia, including environmental protection policy and the Environment Protection Act of 1970. In Australia, environmental management is crucial to business management (Balcombe et al. 2007). Regulations influence businesses to reduce energy consumption and emissions, use water more efficiently and manage raw materials in the different stages of production processes. Environmental legislation influences business owners, impacting the stages of waste material and product lifecycles (EPA 2020). A much more systematic approach in the literature could identify how a company interacts with regulation pressure. Regulation pressure also involves the use of government schemes. The government's proposed Carbon Pollution Reduction Scheme poses some unique challenges for the dairy industry as this scheme results in progressively higher costs being imposed on activities that produce GHGs (Ford et al. 2019). Dairy manufacturers also participate in other national programs, including energy efficiency opportunities and Greenhouse Challenge Plus, which can assist companies in focusing on reducing energy consumption (Kershaw & Gaffe 2008).

2.3.3 COMPETITIVE PRESSURE

According to institutional theory, competitive pressure encourages firms to follow the actions of successful competitors. Firms are influenced to imitate environmental and green practices to stay ahead of the competition (Sancha et al. 2015). Zhu et al. (2013) suggested that institutional pressure from competitors influences companies to reconsider their internal eco-design activities and re-examine regulatory pressures. Sancha et al. (2015) found that pressure from competitors would most likely force a business to imitate its competitors' business models and strategies. Wu, et al. (2012) suggested that companies use their organisational resources to improve environmental performance due to competitive pressure.

Min et al. (2001) suggested businesses pursue eco-design practices and environmentally friendly programs when challenged by competitive pressure, primarily when the companies are operating in a competitive and uncertain market. In the Australian dairy industry growing market concentration among businesses has been a significant cause of increased market concentration among processors and farms, and this trend is expected to continue across the sector (Eggleston 2010).

2.3.4 INSTITUTIONAL PRESSURES AS DRIVERS FOR SUSTAINABILITY

Institutional pressures in supply chain focus can also be drivers for sustainability. Thus, the institutional forces can potentially affect companies' decisions about whether or not to implement sustainability measures (Vanalle et al. 2017). However, the three institutional forces shown in institutional theory are conceptually distinct, although they have not always been shown to be practically distinct (Dubey et al. 2017). Silva et al. (2021) showed that the owner of the firm's ideology benefits the community. Other noted causes include legislative constraints or rules about the environment and social issues, the activities of a few mid- level workers towards sustainability and the commitment to protect human capital by providing more than a mere wage to human resources. Additionally, researchers have emphasised the necessity of setting a positive example by contributing to society's welfare and wellbeing. These factors can create a positive loop of sustainability; small enterprises' relatively low-cost efforts and activities can result in GSCM success (Ali et al. 2018).

Shibin et al. (2017) suggest that coercive pressure significantly affects the supply chain and resource allocation. Existing literature shows that normative pressure in the market has an insignificant effect on the top management of the business. This research is fundamental as it helps show the

importance of market pressure and its relationship to management. However, one limitation is that the findings are inadequate in exploring the influence of government on the supply of products.

Saeed et al. (2018) examined different types of pressures and how these affect sustainability practices. Their study also categorised GSC practices as either external or internal practices, examining the concepts through the lenses of institutional theory and resource-based theory. Further, based on a survey and structural model analysis, Al-Sheyadi et al. (2019) suggested the GSC categories of EMSs, eco- design, source and external environmental management. All were found to be most effective when implemented together. Further, positive environmental performance was essential for achieving higher cost savings within a firm.

2.3.5 PREVIOUS STUDIES AND CONTRIBUTIONS TO GSC DISCUSSION

It is crucial to analyse literature on environmental practices, as well as the drivers and impediments that suggest an indicator of current strategies. Meager et al. (2020) investigated the drivers and barriers in the restaurant industry in the UK. The research used quantitative interviewing to collect raw data. This research was significant because it shed light on the drivers and barriers in restaurants, for which there is limited literature. It also highlighted that logistics and cooperation are

also barriers. Some of these barriers included sceptics and employer financial responsibility. The study contributes to practice by showing that the organisation's ethics and media are significant drivers of sustainable management. On the other hand, Handayani et al. (2019) studied the construction industry to find the barriers and drivers that stakeholders face in this industry. The research involved a literature study and interviews. Participants were asked about GSCM. The study mainly focused on the environmental aspects that affect the operations of a business. The research contributed to practice as some of the drivers found include sustainable resource utilisation, green maintenance and operations. The research contributed to practice by showing the effects of environmental factors on the operation and success of a business. The findings were not explicit about the influence of climate change on the operation of a business. Furthermore, another study acknowledged the importance of barriers and drivers in implementing GSCM (Dashore & Sohani 2019). The research identified 20 drivers and 16 barriers in the implementation of GSCM. Some of the barriers were poor technology and poor organisational structure. The drivers included high consumer disposable income, availability of proper transport, communication and warehousing infrastructure. It contributed to the literature by analysing the influence of infrastructure on implementing GSCM. The study failed to adequately show the influence of external factors on the

business environment.

Research on the business environment and its effects in implementing GSCM help shed light on the barriers and drivers. One study provided a literature review of the subject. It showed the environmental aspects and how they could positively and negatively affect a business (Dhull et al. 2016). The research contributed to practice because it showed that if the environment is healthy and research is used well, the likelihood of success of a business is increased. However, severe environmental degradation could be a significant barrier to a business's logistical operations. Finally, it contributed to the field by shedding light on the importance of carrying out sustainable business activities that help in conserving and bettering the business environment.

Emamisaleh et al. (2019) determined internal and external drivers that affect the production and supply of food products. It contributed to practice as the research found a deep connection between the external and internal drivers of a business. The external factors affect the internal factors. Factors such as management were some of the most significant internal influencers of a food industry supply chain. It contributed to the literature as the study brought out the profound relationship between internal and external economies of scale while it was noted that the study failed to mention some very vital influences, such as the impact on

the environment. On the other hand, A 2019 study carried out by the University of Nairobi determined how GSCM in the food industry was used in Kenya. Primary data was collected from 46 food companies in Kenya (Nderitu 2019). The study concluded a robust correlation between GSCM and internal operational logistics. There was a positive impact on green supply and the food industry's success. It contributed to practice as it is recommended that businesses adopt a greener supply chain. This study explored the importance of having a green supply in the food industry. A further improvement for this study would be to explore the factors that hinder the development of the GSC. Yontar et al. (2020) suggested that increasing food production, demand and customer satisfaction is essential. The study showed 86% customer satisfaction when a GSC was used. Also, clients needed to respond to sustainable food production and supply. A further study can examine which sustainability features customers are most responsive to in the GSC. Furthermore,

Maaz et al. (2021) investigated the implementation of the GSC in the food industry in 150 food production plants. This study contributed to practice because it concluded that green intellectual capital and a GSC positively affect GSCM. This study also showed that a GSC positively affected the economic aspects of a business. It also contributed to the literature by showing the relationship between green energy and supply and

how they are connected to sustainability. A further study can analyse the different adverse effects of environmental awareness in dairy businesses, in more detail.

Diab et al. (2021) found that food production is important in a company's business structure. The research involved interviewing top management and operational experts in a firm. The study showed that there was a connection between sustainability and the success of the company. This research shows the importance of nutrition industries when it comes to the success of any organisation, although the study had limitations as it was limited to one firm; therefore, some of the data collected could be biased. The implications of the dairy industry would be insightful to incorporate with this viewpoint on current drivers and barriers in the food business, and many of these studies may be enhanced by focusing on the crucial businesses such as dairy farms and producers.

2.3.6 INVESTIGATION OF INSTITUTIONAL THEORY IN GSC PRACTICES

Many scholars use institutional theory as a framework to investigate the structure of SCM, sustainable development and how these factors affect organisational styles and operations. According to Altayar (2018), institutional theory is a symbolic and compartmental framework of rules, laws, regulations and regulatory structures that

establish common sense and produce separate actors and action routines. While only a few research studies examine SCM theory, Glover et al. (2014) claimed that institution theory provides a solid foundation for explaining why some operations with no apparent economic return are chosen.

Delmas et al. (2004) drew on institutional theory to examine how different business strategies led to green practices. Key drivers in instigating green changes in rules included being a core company within a supply chain and government regulation. On the other hand, there was a strong association between competition from the industry (i.e., competitor pressure) and sustainable supplier adoption of green practices. Lee (2008) suggests that firms must have buyer influence, government involvement and supply chain readiness to drive green practices. Studies based on institutional theory call on organisations to identify relevant organisational, regulation and competitor pressures based on GSC practices and then strategically allocate resources to achieve the targets. However, other studies, such as Huang et al. (2015), suggested that government regulation and legislation are significant drivers. According to evidence about organisational and regulation pressures, the manufacturing industry follows a reactive approach. It adopts specific GSC practices only in response to individual demands to avoid penalties or loss of business. Another reason could be that it is cost-focused and attributes less

importance to long-term relationships with suppliers and customers (Shafique et al. 2017).

Businesses are usually driven by regulations to adopt GSC practices and ensure a continuous supply of green inputs to produce environmentally friendly products. Wong et al. (2015) suggested that many firms are forced to adopt proactive GSC because of institutional pressure. Government regulations and customer pressure also improve green production capabilities (Foo et al. 2019). Government and customer pressures impact internal practices and influence green supplier development (Foo et al. 2019). Lin & Sheu (2012) found that organisational pressure and competitor pressure impact green practices and certification, while organisational pressure also impacts green direct investment. Environmental pressures act as critical incentives for successful GSC practices. Regulatory, customer and societal pressures help firms to improve green practices (Dubey & Gunasekaran 2014; Glover et al. 2014).

Wong et al. (2015) suggested that many firms were forced to adopt proactive GSCM because of institutional pressure. One of the limitations of this explanation is that it does not explain why this could be a maximum pressure in the industry or give critical examples. Huang et al. (2015) suggested that government regulation and legislation are significant drivers and impact industries differently. Government regulations and customer pressure also improve green production

capabilities. Choudhary & Sangwan (2018) found that the impact of competitive and regulative pressures was high on large and medium enterprises in GSC. SME manufacturers are also crucial for implementing traceability, leading the whole chain in that implementation and putting pressure on other members to follow (Bourlakis et al. 2014).

According to Rekik & Bergeron (2017), motivations for adopting environmental actions are still poorly explained in the literature. While many researchers have conducted theoretical organisational reviews of GSC, there is still a more critical requirement for new and innovative theories in the GSC field that should be explored further. First, organisational theory provides a valuable source of theoretical underpinnings for investigating and furthering research in GSC. Second, there are ample opportunities for future research and investigation with already applied theories. Significant questions still exist that require investigation. Third, there is a room for new theories examining GSC management, introduction and diffusion, which have not observed significant investigation (Ghoushchi et al. 2018).

Wijethilake & Upadhaya's (2020) showed that the positive effect of learning systems on sustainability in realistic strategic responses to drivers of the sustainable marketplace is essential. Tay et al.'s (2017) study focused on identifying the

main drivers of sustainability and concluded that governance is one of the main factors that have a relatively high effect on implementing SSCM. They also stated that this driver could set quality standards to produce environmentally friendly goods. Many studies of the SSC have been carried out because of the need to address environmental concerns worldwide. However, only a few of these studies offered a concrete basis for environmental regulation. Also, most research concentrated on energy use and a few on processes for waste management Therefore, more research, particularly in the dairy industry in Australia should be carried out because on the current environmental regulations and GSC practices. The impact of government pressures on GSC by large and medium-sized companies was found by Choudhary & Sangwan (2018). Lin & Shue (2012) found that customer pressure and competition influence green practices and certification, while organisational stress harms green direct investment. Therefore, these different research perspectives build on more critical analysis. Further research is required into the environmental impact on GSC structures in the dairy industry and how environmental initiatives for various dairy enterprises can be improved by external institutional pressure and internal managers. Advanced research is needed in institutional theory, as findings from institutional theory are diverse since the research has been done in different countries. A more significant investigation

is required into GSC practices in the dairy industry in Australia. Further analysis is also needed regarding the critical constructs of GSC, including the moderating variables of institutional pressure and managerial commitment. However, there is a gap in applying it to specific industries, such as the Australian dairy industry.

2.3.7 FOCUSING ON ESSENTIAL GSC PRACTICES IN DAIRY BUSINESSES

This research focuses on GSC practices and green external integration. The following section discusses green internal integration, such as IEM, cleaner production, and eco-design and practices (e.g., supplier cooperation in dairy businesses).

2.3.7.1 INTERNAL ENVIRONMENTAL MANAGEMENT (IEM) AND ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS)

IEM is a crucial GSC practice; it incorporates developing GSCM as a strategic organisational imperative through commitment and support from senior and mid-level managers (Green et al. 2012). IEM is one of the fundamental practices for improving enterprise performance. Management support is a key driver for successfully implementing green activities and IEM. Management must be wholly committed to environmental management to ensure complete environmental excellence. Dairy farms and processors need to be active in IEM and external

cooperation and coordination with suppliers and customers in their supply chain (Lee et al. 2012). This practice often includes EMSs and implements firms' environmental policies, procedures, or regulatory compliance. One example of these systems is codes of conduct, which are popular in the literature (Geng et al. 2010; Ciliberti et al. 2011). Internal GSC practice links to the environmental performance of manufacturing companies. The prime target of all environment-related strategies is to minimise the negative environmental impacts of production by reducing the usage of environmentally unfriendly energy and materials and reducing waste (Saeed et al. 2018).

To achieve environmental practices, dairy manufacturers should follow specific IEM systems, such as ISO9000 (quality management) and ISO14001-certified (environmental management) systems. Companies have internally developed environmental policies that include environmental operating procedures and contingency plans, environmental risk assessments and environmental awareness training. Additionally, EMSs aid businesses looking to enhance their environmental performance by enhancing resource efficiency, reducing wasteful spending, bettering regulatory compliance, and enhancing brand perception (Kershaw & Gaffe 2008).

Companies should register with ISO 14001 and apply related protocols. Business managers should

ensure to follow imposed environmental laws and acts, ensuring the company is up to par with the global regulations. Another way is to ensure that a company uses green energy, such as solar energy, since it does not pollute the environment. Emission-free machines should reduce the number of gases released into the atmosphere. Businesses should also aim at making biodegradable products. Treatment of wastewater before releasing it into rivers is another way to divert the environmental crisis and recycling of water should be improved (Bour 2019).

Some dairy companies also incorporate an environmental system into their operations. For example, many Australian dairy farms use an environmental management process and EMS standards to develop integrated plans for farm management that achieve environmental sustainability. The sustainable scorecard of the dairy industry and a company's environmental performance are measured based on key performance indicators (KPIs). KPIs provide insights into how efficiently farms use their resources and can assess the sustainability management skills of individual farmers (Burden et al. 2021). Since the contribution of the Australian dairy industry is significant, the government is making it compulsory for a few businesses to implement performance systems such as balanced scorecards and EMSs (Martín-de Castro et al. 2016). With EMS and support from the knowledge

and skills of mentors, these many dairy businesses are devising customised solutions to manage natural resources that also improve the productivity of the farm and the company (Dubey et al. 2017). The enhanced adoption of a management process through EMS leads to integrated farm management of quality, the environment, safety, occupational health and prevailing social challenges.

2.3.7.2 CLEANER PRODUCTION

Cleaner production involves processes such as pollution control, reduction of waste, the capability to minimise or remove harmful material and even resource consumption (e.g., suppliers' use of resources) (Wang et al. 2016; Zhu et al. 2010). Cleaner production also involves improving methods to reduce solid waste, water use and air emissions and using cleaner technology (Dou, et al. 2018). These green initiatives incorporate improvements in the production process that reduce the generation of waste and increase compliance with emission standards (Rao et al. 2010). Companies also increasingly consider using environmentally friendly raw materials to incorporate eco-design for their production or process. Cleaner production is crucial in dairy businesses. Some sources include cleaner production as a construct (Rao 2004; Rao & Holt 2005; Rao et al. 2010). However, this construct needs more emphasis in the literature because cleaner production is a critical strategy in enabling environmental responsibility in manufacturing

firms. Therefore, a more significant investigation of cleaner production practices is needed. In addition, firms must follow green production standards to demonstrate their commitment to improving the recyclability of their brand packaging, their contribution to the circular economy and their sourcing of environmentally sustainable commodities from suppliers (Zhao et al. 2017). For dairy businesses, green production includes direct energy use during processing, indirect energy use during storage, reducing GHG emissions with pesticides, reducing toxic effects of chemical agents, water use, land use and packaging waste (Augustin et al. 2013; Raut et al. 2019). Dairy businesses must consider the ways they use water and energy resources. Dairy production affects the air by releasing CO_2 emissions associated with energy consumption. Milk production also affects the environment in various ways, and the scale of these impacts depends on the practices of dairy farmers and feed growers (Augustin et al. 2013).

Dairy farming and processors use a large amount of water. Water management is critical in agriculture because water is utilised in a variety of ways and originates from a variety of sources (Finnigan et al. 2018). The growing concern is water quality and quantity loss, which poses considerable threats to the Australian dairy industry. The entrepreneurial capabilities of farming are related to water consumption. (Meena

et al. 2019). For example, producers have to produce more while using less water. Water supplies for dairy farms must be consistent. Clean and sanitised equipment is required for animal farming, milk cooling, crop irrigation, value-added commodities manufacturing, manure transportation and shed cleaning (Vourch et al. 2008). Water management in the dairy industry is a growing concern because water is required in dairy farming and every farming and agriculture industry.

Dairy managers have to evaluate processes for distributing water (Akhtar et al. 2018). In a supply chain, management is important for setting environmental policies and goals and providing resources and training to help people improve their green practices (Dubey et al. 2014). Farmers and processors need to use and protect all water resources because water is essential for farming and making raw materials. Eory et al. (2018) led researchers to look for more innovative solutions and new ways to improve water management. Everyone who works in industrial and agricultural plants should choose the best machinery and processes for their industry. The total amount of water used by these plants affects how much water they use, so everyone in these industries should choose viable sources of water and unit processes so that water consumption is as low and efficient as possible. The machines used to make products need a lot of water to clean them or cool them down and make and process the product (Boguniewicz-

Zablocka et al. 2019). Farmers also need efficient irrigation systems to reuse every drop of water. They need to take the right steps and follow the law to protect water resources and the environment (Boguniewicz- Zablocka et al. 2019).

Due to climate change concerns are increasing dairy businesses are concerned about rising energy-gas emissions and are working hard to manage and reduce carbon emissions and their carbon footprints (McKinnon 2012). Companies also recognise the critical importance of carbon management in the supply chain. Companies work collaboratively with their supplier networks to reduce carbon and other GHG emissions to improve production. Communication is essential to solve the growing emission problems because companies can express their intention and commitment to sustainability. Setting proper targets is also essential so that suppliers and companies distinguish between absolute emission reduction targets based on the annual decline and management of sustainable initiatives to focus on performance improvement. Emissions must be controlled to protect the environment, and legal policies must be developed to prevent carbon footprints from exceeding limits because this is highly harmful to the environment. The environment is already deteriorating because of industrialisation. Isotopic techniques, inhibitors in nitrogen fertilisers to reduce N2O emissions and experimenting with different climate systems to see

the effect of the different technologies are some of the different methods that can be used to reduce carbon emissions. One main innovation that could reduce carbon emissions is nuclear power generation, which produces no carbon emissions but must be harnessed cost-effectively (Flysko et al. 2014).

Alternative modes of transportation that use battery power and electric vehicles are also essential to reduce carbon emissions in the dairy industry supply chain. The strong growth and demand for logistics make it challenging to reduce energy consumption and emissions in various industries. Still, there are several ways suppliers and companies can control it (McKinnon 2012).

Large-scale production emits high levels of pollutant gases which are hazardous to the environment, necessitating the development of new technologies to mitigate the effects of carbon footprints. Suppliers and the various individual companies that collaborate with those suppliers and aid in production are responsible for reducing carbon emissions (Adom et al. 2013). These stakeholders must be mindful of the amount of carbon emissions produced by their plants and transportation. They must devise novel ways to reduce the impact of GHG on the environment. Suppliers and businesses must reduce their carbon footprints in a variety of ways such as eco- design.

2.3.7.3 ECO-DESIGN

Eco-design is the third GSC practice in the research model. It comprises activities that reduce the environmental impacts of products during their entire product lifecycle and is classified as one of the most important activities because it incorporates green design during product development to minimise a product's environmental impact. It is integrated into the product design process and the entire supply chain of production, consumption and disposal (Namagembe et al. 2019). Eco- design begins with the packaging. Primary packaging includes sales packaging such as plastic or glass bottles. Secondary packaging includes packaging discarded after a product is used, such as the container that holds a product. Transportation packaging, such as parcels, boxes and crates, helps with storage, identification and relocation (Sezen & Çankaya 2017).

Eco-design involves essential environmental strategies and classifies power sources into external and internal sources. This can lead to happier consumers, more efficient production, higher quality products and fewer emissions. The three most critical internal incentives are innovation opportunities, increased product quality and new market opportunities for firms that improve their eco-design strategy (Van Hemel & Cramer 2002).Many researchers focusing on institutional pressure incorporate eco-design as a

critical construct (Wu et al. 2012; Zhu & Sarkis 2007). However, eco-design also indirectly connects environmental activities to external green practices, such as supplier cooperation, because these activities enhance environmental collaboration for greener product design or process mediation. Further, waste reduction is crucial for supply chain partners and must be done jointly (Walker & Preuss 2008).

The dairy industry continues to develop sustainable packing to positively impact the environment. Packing no longer refers only to a crate or a carton but is now considered an integrated approach to equip materials for safe and adequate mobility across the entire supply system that maximises value for consumer sales and profitability. It preserves items from harm, enables their reliable delivery, interacts with the consumer and is one of the primary product advocates in a competitive market (Edwards 2003). However, dairy processors and farmers usually generate several different forms of packaging waste, including plastic, cardboard, cartons and plastic, organic waste such as sediment and garbage, and workplace waste. In addition, silage cover is a significant issue on the farm due to a shortage of recycling options available in regional areas. At the production level, the frequency of waste grew to 1.5 tonnes of waste going to landfills per Ml of milk produced in 2018–19, up from 1.35 in the previous year (Australian Dairy 2020). However, these

strategies require greater investigation as current Australian dairy industry challenges and may impede such packaging practices.

Recycling is a three-step process. Recyclables can be collected in a variety of methods, including drop-off locations and deposit or refund programs. After collecting recycled materials, a recovery factory classifies, cleans and processes them to create raw materials (Dolman et al. 2014). These raw materials are suitable for manufacturing. Then, recyclables are traded like raw commodities, and their prices fluctuate globally in response to variations in supply and demand (Gupta et al. 2020).

Consumers prefer to purchase products which are produced from recycled materials. For example, recycled glass can be used with bitumen to create roadways, and carpet plastic can be used to create park benches. Additionally, purchasing recycled products helps shut the loop on reuse material (Xu et al. 2013). In the dairy business, packaging can be re-used and redesign for future use from both processors and farmers. Sustainable packaging especially eco-design leads the way to a more environmentally sustainable future in the dairy industry, specifically since dairy products incorporate key packaging as their part of their material (Zailani et al. 2012).

2.3.7.4 SUPPLIER MANAGEMENT IN THE DAIRY BUSINESS

Supplier engagement and collaboration are major buzzwords in current SCCM literature. Supplier development and integration should be a focus of proactive companies since the reactive approach to supplier non- conformance could cause adverse impacts on supply chains (Foerstl et al. 2014). On the one hand, companies may implement codes of conduct to regulate supplier performance in areas of health, safety and labour rights. Alternatively, firms check environmental supplier performance by audits, on- site inspection at supplier premises and documentation. There are particular strategies to improve supplier management, according to (Nakandala & Lau 2019). The company must take the following steps: conduct supplier research and screening, mitigate risks and centralise supply agreements (Ghadimi et al. 2018). The company can effectively improve its supply chain contracts by focusing on these areas.

Information is crucial at each stage of the GSC process, from green supplier selection to monitoring and collaboration. Supply chain contracting and information utilisation plays essential roles in today's supply chain system, and both are critical industries (Huo et al. 2013). However, selecting suitable environmental suppliers is particularly problematic as many firms lack information on suppliers, especially on their

environmental performance (Zhu et al. 2005). On the other hand, Ciliberti et al. (2011) states that Corporate Social Responsibility (CSR) codes of conduct could improve intangible aspects between supply chain partners and reduce information asymmetries in supplier relationships, whether indirectly or indirectly.

From the supplier's perspective, there are a few obstacles to overcome, but they are legally obligated to handle all issues that arise during the supply chain process. When a supplier attempts to contract with multiple manufacturers or companies, they are obligated to deliver the goods to all partners. When parties become legally tied, it serves both of their interests (Deshmukh et al. 2013). However, Ahmad et al. (2017) suggested collaboration among supply chain partners is significant to the overall performance of the supply chain. Touboulic et al. (2014) also state that adopting a collaborative approach is advantageous and incorporates a willingness to collaborate on sustainable practices. Alternatively, Neumuller et al. (2016) suggested that the key to sustainable management is to consider corporate sustainability goals and specifications from supplier selection. One primary purpose of the vendor selection stage is to discover suppliers with the greatest potential to promote corporate sustainability and align with business objectives. However, this research lacks clarity on business relationship management and there is a limited focus on supplier relationship

management (Singh & Travedi 2016).

Green supplier management includes various processes such as distribution, selection of suppliers, manufacturing of products, purchasing of materials, designing of products, assembling of products, recycling and disposal management (Hasan 2013). Companies are increasingly managing their suppliers' environmental performance to ensure that the materials and equipment are environmentally friendly and produced using environmentally friendly processes (Rao & Holt 2005). Improving the green capabilities of suppliers are termed *green supplier development*, which encourages suppliers to be more environmentally friendly rather than terminating suppliers on the basis of improvable green performance (Blome et al. 2014). Green supplier development ultimately incorporates sharing knowledge and informing suppliers about the benefits of cleaner production (Rao & Holt 2005).

Green supplier development also involves pressuring suppliers to undertake environmental activities and choosing suppliers by environmental criteria, known as green supplier selection. Lee (2015) found that GSC practices and providing suppliers with environmental information had significant positive impacts. The results provided the important implication that firms need to focus more on support and collaboration when enhancing social capital with suppliers. Therefore, firms should

work with suppliers to reduce emissions, monitor the waste practices of suppliers, extend technical support and conserve natural resources (Rao & Holt 2005). Ellegaard and Koch (2012) suggested supplier development programs such as supplier seminars and workshops, visits to supplier locations and guided support for suppliers when they face technical difficulties (Ellegaard & Koch 2012). The knowledge transfer from the buyer to the supplier is critical and signifies that all parties take green performance seriously. Hence, the supplier can achieve greener development by sharing knowledge and goals, which Blome et al. (2014) confirmed, as solely employing the strategy of buying green products will not succeed.

The dairy supply chain incorporates manufacturers investing in green supplier development programs for farms to ensure animal safety and well-being and pollution control on-site (Sharma, Chandana & Bhardwaj 2015). Sharing joint initiatives, knowledge and assets through supplier development can positively affect GSC (Blome, Hollos & Paulraj 2014). One example of green supplier development within the dairy industry is the large company Danone. Danone collaborates directly with farms that supply dairy for its yoghurt products to increase transparency to customers, improve land use and reduce environmental footprints in its supply chain process (Murfield & Tate 2017). Therefore, companies have recognised the need to implement strategies that extend their

sustainable methods beyond the firm's boundaries to their supply chain partnerships. The most common extension of sustainable purchasing strategies is the standards that suppliers must meet to secure business.

Thakker & Rane (2018), who developed a model to help green suppliers achieve success, found that green supplier development is crucial to GSC and requires coordination from employees, top management and upstream suppliers. In addition, developing links with external influences such as suppliers and even competitors may improve overall environmental supply chain performance (Choudhary & Sangwan 2018). One key challenge business may encounter when managing sustainability is recognising that a company is no more sustainable than its supply chain. Therefore, purchasing businesses must review and collaborate directly with their suppliers to build a greener supply chain (Sancha et al. 2015).

Despite many efforts by multinational corporations to implement environmental and social issues in their supply chains, a challenge for business remains (Tachizawa Giménez & Sierra 2015). Roehrich et al. (2017) conducted research based on manufacturer collaboration and supplier development to improve supplier capabilities and performance. Roehrich et al. (2017) suggested that supplier performance efforts can be targeted at various areas such as product development and quality measurement. Therefore, since supplier

development requires investment on the manufacturer's part, it is essential to share investment revenue to reduce risk in the supply chain.

Firms often stop purchasing from suppliers that fail to meet green criteria and undertake training programs to share best practices with their suppliers (de Giovanni 2012; Schöggl, Fritz & Baumgartner 2016). Sharing information is essential in a supply chain and can improve supply chain relationships, perceptions, communication and behaviour of supply chain members (Thomas & Esper 2010). Additionally, information-sharing in a supply chain can improve traceability and visibility (Green et al. 2012). Information-sharing can also reduce supply chain risks—risks may come from mistaken decision-making, excessive inventory and even environmental neglect (Li et al. 2014). Manufacturers and retailers in a supply chain usually request information regarding green production, design and other environmental criteria and the more traditional factors such as cost, quantity, quality and delivery (Wang et al. 2017).

Ahmed et al. (2018) suggested institutional pressure had a significant impact on external green collaboration (supplier development), although the study examined the adoption of GSC practices for organisations of different sizes drawn from various industry segments. An industry-specific investigation may help provide additional

information on industry practices and differences (Ahmad & Najmi 2018). However, more investigation is needed into the impact of institutional pressure on GSC practices such as green purchasing and green supplier development.

Even large-scale organisations in the Australian dairy industry have started asking suppliers about their environmental criteria. Environmental information and pressure from customers are used to improve products and services. Environmental management information from suppliers is also required regularly (Susanty et al. 2017). However, environmental information needs to be integrated because it provides sources of information to facilitate the innovation of new eco–products and green practices (Zsidisin & Ellram 2001). Kim et al. (2015) found that suppliers with higher information-sharing capabilities improved their environmental collaboration, contributed to green cost reduction and achieved competitive advantage. The results also showed that green alignment in the degree of consistency in evaluating suppliers' environmental capabilities made by buyers and suppliers positively influenced suppliers' competitiveness. When it comes to information- sharing, several aspects are significant, such as information accuracy, timeliness, frequency and credibility (Wang, Ye & Tan 2014). Incomplete information, or information asymmetry, is a challenge (Fayezi, O'Loughlin & Zutshi 2012). Therefore, managers who can understand the buyer–supplier relationship and the

necessity for environmental management in supplier firms need to consider information- sharing and external green integration as critical factors in implementing an effective GSC system. Supplier managers should also improve information systems to establish stronger buyer– supplier relationships and maintain their contracts.

2.4 THE GSC PRACTICES AND MEASUREMENTS

Measuring green practices is one of the most important aspects of the GSC described in the literature. The information must always pave the way towards a more environmentally friendly future, which may be accomplished by assessing green supply chain activities and entering performance systems. This section discusses recent literature in this regard as it relates to the thesis. Reefke & Trochhi (2013) suggested that a dairy performance management system must be designed to transform plans into actions and turn feedback into knowledge. Therefore, dairy businesses can use sustainable scorecard approaches to establish performance systems to track environmental developments. The customised scorecard can potentially move misaligned sustainability management towards an integrated sustainable approach (Reefke & Trochhi 2013). Tajbakhsh & Hassini (2015) showed that different members in the supply chain require performance measurement systems that align with sustainable development. They developed an insightful sustainability framework of seven

performance dimensions.

However, one major drawback of the sustainability framework is that it is too holistic and complex for both theory and practice. McLellan et al. (2018) states that a company should make changes in its compliance policies to create norms for safeguarding the environment effectively in supply chain functions. For example, a company can change its supply chain compliance by engaging with manufacturers that have efficient plants and have applied sustainability initiatives. Using practices demonstrated in the sustainability framework will help a company effectively provide support to safeguard the environment. Most companies (irrespective of their nature, size and operations) must adopt environmental practices in their supply chain unit and operations. However, the environmental benefits of adopting sustainable practices for large and multinational companies are often more significant than those for small- scale companies due to the relative scale of their operations.

According to Seman et al. (2019), companies have analysed the changing perceptions of consumers towards the environment. The companies have also started using different strategies adopted in all their departments to promote environmental sustainability. They also suggested that companies develop KPIs to measure their environmental performance. KPIs are used to measure how well a company adopts sustainable practices.

Evaluation of KPIs can ensure that management decisions minimise the company's harm to the environment. This is also known as measuring environmental performance. Environmental performance refers to the quantifiable outcomes of an organisation's environmental management (Fang et al. 2018).

Feng et al. (2018) states that companies must develop environmental performance indicators in their supply chain functions. Developing environmental performance indicators will help companies gain a competitive advantage, promote environmental practices and analyse which areas their departments fail to promote environmental practices. However, there are drawbacks. Tajbakhsh & Hassini (2015) suggested that performance systems are not designed to account for the complexities involved in measuring performance across supply chain interfaces; this is further complicated because different parties within the supply chain may have different perspectives on sustainability. Previous research proposed a balanced scorecard approach customised for SSCM (Reefke & Trochhi 2013).

The majority of research in this area is quantitative and based on factors that link environmental performance to key business factors. Zailani et al. (2012) found a significant relationship between environmental performance and regulatory

pressure, although they did not find a link between customer pressure and environmental performance.

Furthermore, Reen et al. (2012) found that environmental performance positively affects operational performance in the manufacturing process. Huang et al. (2012) investigated GSCM practiced in the food and beverage, textile, electronics and furniture industries and discovered that business owners must develop appropriate measurement tools to support desirable environmental performance. However, the study failed to identify different industrial industries based on their GSCM practices and did not examine the differences between industries. Huang et al. (2012) also did not concentrate on a single industry.

Although many studies examined a variety of businesses, the study below concentrated on just one—the automobile industry. Zhu et al. (2007) assessed environmental sustainability in the automobile industry relative to car production and critical environmental pollution in China. They recognised that different pressures influenced different green practices; for example, regulatory pressure from emission laws shaped eco-design and investment. Market pressure, on the other hand, affected collaboration and green purchasing. However, the study failed to carry out in-depth analysis of the relationship between pressures and GSCM practice adoption.

Other authors suggest environmental performance is not only about key business factors but also about how suppliers are managed. Dubey et al. (2015) investigated the effects of environmental performance, supplier relationship management and total quality management under the leadership and moderating effects on the organisation. The study's main strength is that the authors thoroughly investigated the effects using a pre-tested and structured questionnaire, and they collected data using various survey methods. Alternatively, Tajbakhsh and Hassini (2015) outlined a guideline for sustainable performance measures linking supplier partners. However, these studies would have been much more helpful if the authors had considered an internal business perspective and managerial decision-making and made a firm commitment to interviews.

Existing research also shows that business customers can influence a company's environmental performance and GSCM. Laari et al. (2016) suggested a relationship between customer-driven GSCM and environmental practices in manufacturing and development. They tested their hypothesis on a sample of 119 manufacturing firms from all over the world in the study. The authors proposed that GSC practices were prerequisites. The study's strengths are that it confirmed that upstream environmental requirements are met by monitoring suppliers,

which the authors referred to as environmental collaboration. They noted the public's growing environmental awareness and the implementation of regulations imposed by government bodies and organisations.

Further, Seman et al. (2019) argued that GSC practices are critical for achieving professional improvements in the environmental performance of private organisations. The study's main strength is that the authors conducted extensive research on the relationships between GSCM, green innovations and environmental performance, which is uncommon in other studies (Seman et al. 2019). Evaluation of the purchasing component of the supply chain shows a different element of the supplier relationship where corporations agree to terms and conditions in their supply contracts. Yu et al. (2019) found that green purchasing was positively related to environmental performance. Further, Zailani et al. (2012) claimed that green purchasing was related to operational, social and economic performance, with the relationship to operational indicators being the most significant. More study is needed to properly understand and develop additional connections between green practices and performance aspects despite these findings.

Shareholders can also impact environmental performance. Schaltegger et al. (2017) investigated the impact of shareholder-focused business strategy on the relationship between a

firm’s economic and environmental performance. The study advanced an argument favouring business strategy, concluding that business strategies implemented to benefit shareholders improve firms’ ability to balance economic and environmental performance. As a result, firms with a strategy to manage their stakeholder relationships will more effectively strike a balance between their economic and environmental performance than other firms.

The measurement of a company's environmental cost and revenue outcomes is known as economic performance. Economic performance is another major pillar in the literature about measuring green practices in a business. Gandh & Vasudevan (2019) successfully proposed a GSC and economic performance model, which assumed that government initiatives vary in increasing GSCM practices in small and medium-sized industries. A survey questionnaire was also proposed to develop and capture GSCM practices and other implications for environmental, economic and other types of organisational performance. The study’s main strength is that it used descriptive statistics to help other researchers adopt better practices and encourage better business practices (Zhu et al. 2017). From a supply chain perspective, economic and environmental performance measurement can assist organisations in adopting GSC practices. These can be through external or internal factors. As a result, supply chain measurements can be

incorporated into business models (Rao 2011). Despite these findings, more research is required to fully understand and establish additional links between green practices and these performance dimensions. It is necessary to conduct further research on one industry, such as the dairy industry.

2.4.1 METRICS AND BENCHMARKS TO MEASURE GREEN PRACTICES

Key metrics measure performance and green practices (Cote et al. 2008). However, managers have noted that green concerns are treated separately in business supply chain practices, and joint commitment is often overlooked (Rao 2004). Khan et al. (2018) identified GSCM and economic performance metrics. They used over 20 measures on GHG emissions from diverse businesses, giving one of the first in-depth analyses of the use of metrics in GSCM and economic performance. Environmental performance would have made the study more intriguing. Setting benchmarks and KPIs in a GSC is essential because this is associated with determining the quality and effectiveness of a company's supply chain. Benchmarking enables the company to establish specific environmental standards throughout its supply chain network. Every company sets its standards based on its processes and the nature of its business (Mani et al. 2018). Companies in the dairy industry, for example, generally set their benchmarks as current

energy and emission results. As a result, it is entirely up to the company to establish benchmark standards that meet its needs. However, from a legal standpoint, companies should set benchmarks in their supply chain lower than the government guidelines (Dubey et al. 2017).

There are four stages to successful benchmarking in the supply chain. The first is current state assessment; the second is benchmarking participant identification; the third is comparative analysis; the fourth is the strategic prognosis. Further, a company must establish a specific benchmark for its entire operation. Setting a benchmark helps employees understand the basic quality expectations management has for them. A company can also gain a competitive advantage by raising consumer awareness that it adheres to a specific quality standard to ensure customers receive the highest quality products (Lee et al. 2012). Further, to set particular market standards, a company must have basic performance standards that can guide the supply chain unit to specifically produce products up to certain marks (Tseng et al. 2019).

2.4.2 TRACEABILITY IN THE SUPPLY CHAIN FOR SUSTAINABILITY

Traceability is critical to GSCM, and it needs to be discussed in greater depth. Traceability is the ability to track anything in a supply chain. It is the capacity to use documented recorded identification

to validate an item's history, location, or application. Traceability for sustainability incorporates regenerating skills and knowledge that allow for more complex strategic planning, administrative control and monitoring, and risk management across the supply chain. This entails updating (inter)organisational practices and learning methods better suited to complex supply chains to regenerate and manage competencies and knowledge across the entire supply chain and ensure that sustainability objectives are met, and their implementation is assessed (Garcia-Torres et al. 2019).

Traceability can improve product quality; tracing dairy products from production to consumption can benefit GSCM practices. The dairy farmer, collecting facility, milk storage, processing plant and market or end customer are stages in the process. The dairy farmer and other stakeholders join a blockchain network. The system may also be updated with quality and compliance certificates and certifying agencies and regulators can join as digital entities to oversee firms' and farmers' quality and milk-processing standards. On the other hand, inputs such as feed, chemicals and animal health can be traced from dairy businesses. From a supplier perspective, a lack of traceability is the primary barrier that hampers the operation of the supply chain. A traceability system can show the reduction of chemicals, business waste and product materials used to create the product. As

with technology, it is also suggested that employee management and organisational culture are key barriers to GSCM adoption (Van et al. 2019).

Many authors examine the different perspectives of sustainable supply chain traceability. Kumar et al. (2020) created a methodology for implementing traceability in the retail supply chain. Identifying the vital information to record or retain is critical for an organisation's better functioning, management and record-keeping (such as complying with legislation) and for the other supply chain stakeholders. Traceability, a technology-driven notion that relies on adopting relevant technologies and sustaining the system at each level of the supply chain, is one of the limits. The absence of competent labour to build and maintain a traceability system is one of the key difficulties businesses experiences.

According to Agrawal et al. (2019), a traceability system records and follows the trails as goods, components, materials and services are delivered from suppliers, processed and then disseminated as finished products and services. Key issues include the lack of dedicated and inexpensive technologies that account for the complexities of supply chain structure and product features, a lack of awareness and consensus among stakeholders about the potential benefits of a single traceability system, and the lack of traceability rules and regulations. While these challenges still need to be overcome, a

traceability system helps identify how businesses measure and track SSCM products in the dairy industry.

2.4.3 BLOCKCHAIN FOR TRACEABILITY IN THE DAIRY INDUSTRY

Blockchain is a crucial technology for traceability. Blockchain-based traceability systems are supplemented rather than replaced by transparency solutions. Blockchain technology has opened new opportunities to allow smart contracts to perform and record transactions in decentralised multi-peer systems with no central authority players to manage the workflow (Agrawal et al. 2018). According to Hastig et al. (2020), using blockchain for supply chain traceability improves operational efficiency and supply chain coordination. However, as more nodes are added to reflect the network, transaction performance can quickly deteriorate. By assessing the full lifecycle consequences, all stakeholders can make more strategic procurement decisions that are proactive rather than reactive. A proactive logistical control that recognises products within and outside the supply chain minimises product damage.

Saberi et al. (2018) provided a framework for defining the principles and functions of a traceability system. A fundamental barrier to blockchain adoption in sustainable supply chain traceability is unfamiliarity. Blockchain can help dairy farmers by increasing transparency, reframing pricing, and assisting farms in selling

milk and dairy products. Supply chain managers are also concerned about blockchain technology's ability to keep track of transactions. Based on the needs of the business and the factors that lead to success, technology needs to be assessed, and business case building procedures need to be followed. There must also be a way to keep track of SME suppliers in remote areas (Hastig et al. 2020).

The Australian Government has given Australian dairy farmers the contract to build a blockchain-based real-time payment and supply chain information-sharing system. When a farmer sells milk, the transaction is recorded in the ledger and linked to the contract, providing immediate access to all authorised participants. Contracts, orders, deliveries, test quality findings and payments are all stored in the ledger, and smart contracts can be used to speed up payment. Overall, this can be used to develop environmental activities and measurements that will benefit dairy companies. As a result of the increased demand for unique products as tailored outcomes and the shortening product lifecycles, organisational structures are evolving (Rogerson 2020). In the dairy industry, traceability is crucial, especially in multi-party supply chains where demanding requirements must be followed to assure success (Salah et al. 2019). In this context, many ideas are being considered to make traceability a competitive and dependable element for end-users. Wireless sensors, specific tags, electronic product codes, radio frequency

identification devices and near- field communication can be used to track dairy products and environmental data.

2.5 DRIVERS AND BARRIERS IN THE IMPLEMENTATION OF GSCS

Environmentally sustainable drivers influence green practice adoption and implementation within the supply chain (Agi & Nishant 2017). Therefore, decision-makers must be aware of the importance of the many drivers and techniques for implementing practices to create a competitive supply chain (Wang et al. 2016). Pressures, triggers, facilitators and drivers are all terms that have been used interchangeably in the literature to describe these impacting elements (Brun et al. 2020). Drivers that influence GSC practices are usually categorised as external and internal. External factors like the government, the local community, investors, consumers, suppliers and internal factors such as workers and management all impact GSC strategy (Munawwar 2016). Therefore, this classification helps researchers identify drivers more effectively (Saeed et al. 2019).

Caniato et al. (2012) characterised drivers of GSC as forces that persuade firms to execute specific sustainability measures in response to external constraints. Drivers of GSC are external forces that launch and inspire focus organisations in the implementation of supply chain processes

(Sánchez-Flores et al. 2020). As a result, drivers for GSC may be characterised as motivators or influencers that encourage or push firms to embrace sustainability activities all through the supply chain (Saeed & Kersten 2019). On the other hand, various drivers have varying degrees of influence on supply chain choices (Koberg & Longoni 2019). For example, the media can affect buying decisions and investors affect logistics-related supply network decisions. In contrast, regulatory agencies have a greater effect on decisions about the environmental aspects (Meixell & Luoma 2015). Many authors have looked at many factors that drive GSC practices. However, it is also essential to investigate the most important practices and how they affect integrating the internal and external parts of a popular industry, such as dairy (Holt & Ghobadian 2009; Rao & Holt 2005; Rao, Holt & Rao 2010).

Company reputation was a critical reason for implementing sustainable initiatives. For example, a firm's image and status influence business decisions and establish the firm as a role model for other companies (Saeed & Kersten 2019). Further, cost, organisational obligations and economic performance were crucial drivers of sustainability (Saeed & Kersten 2019). Moktadir et al. (2018) evaluated the drivers of sustainable organisations on three levels: institutional (pressure of shareholders such as customers and their reviews and product buying, affecting the firm's resources

and potential revenues, as well as its reputation); laws and regulations; and standards and certification, which may have the unintended consequence of reducing the firm's focus on GSC as it may become preoccupied with symbolic concerns. The same authors divided GSC predictors into reactive (why the corporation feels compelled to engage in GSC, which is typically unintentional) and proactive categories. The effects of sustainable policies might be external or internal (reputation). Additionally, this study defines mediator factors, such as relationships and values (explaining why particular sustainable activities result in inevitable results), and moderators (the four Ps: people, pricing, place [location] and corporate profile).

Ortas et al. (2017) identified a correlation between GSC and a company's financial performance. Sustainability solutions are also associated with non-financial outcomes, such as competitive advantage (Yu, Kuo & Kao 2017), fostering positive consumer reputations and positive employee attitudes (Chang 2015), fostering corporate goodwill (Orlitzky et al. 2011) and improving firm abilities (effective management, product quality and operational practices, including for women and minorities and improved demographic diversity). Dhull et al. (2016) also outlined the primary economic, environmental and social advantages associated with sustainability initiatives. Income can be enhanced by implementing sustainable policies

through improved advertising and establishing distinct marketing tricks. Sustainable policies also benefit income by increasing consumer awareness, providing unique goods and services, increasing market share, sales and other competitive benefits, and selling renewables to companies or municipal councils (Dhull & Narwal 2016). Another advantage of sustainability is cost savings for energy, materials, packaging costs and waste reduction. Therefore, pollution taxes and social benefits (lower employee turnover results in lower training costs). Additionally, sustainable practices can result in intangible benefits such as improving the firm's brand and earning the community's respect, recruiting competent and committed personnel, and lowering the chances of non-compliance in the socio - environmental fields (Khan et al. 2021).

To be sustainable, the firm must have a proactive entrepreneurial attitude, actively seeking new commercial prospects while applying social innovation. Studies found that sustainability initiatives can be driven by agreements with shareholders within the same business community and by setting an example for other companies to follow and communicate the social impact of the firm's policies (Lüdeke-Freund 2020; Vuorio et al. 2018). Ghazilla et al. (2015) conducted a comprehensive analysis and found that the primary drivers of sustainability are, among other things, a better brand image, improved competitive position and increased product quality. On the other hand,

Powell, Davies and Shearer (2009) claimed that organisations should include more credible internal drives, including organisational commitment, employee support, strong motives and a willingness to implement sustainable practices. However, they only interviewed five companies, and they did not detail their sustainability practices. As a result, their conclusions were overly broad. Therefore, more qualitative interview data might have enhanced the findings.

Zhu et al. (2005) addressed GSC adoption drivers, specifically pressures and drivers from governments, customers, suppliers and employees that influenced firms to adopt various environmental initiatives. Their comprehensive survey identified that large-scale enterprises face challenges from regulatory bodies, competition and market pressures. The study also found that GSC is still in its infancy in China and that cultivating GSC practices is a significant trend in developing countries (Zhu, Sarkis & Geng 2005).

Through a two-theory view, Saeed et al. (2018) linked internal and external GSC practices to different types of institutional pressure. They found that certain types of institutional pressure affected GSC practices more than others. Among both internal and external environmental practices, regulation pressures were found to be the most significant, while organisational and competitor pressures were the least significant. The study reached practical conclusions and employed an

effective pre- testing questionnaire technique, but in-depth data was scarce.

Xiao et al. (2018) looked at GSC practices in first- and second-tier suppliers in the automotive industry. They found that the most significant pressures on companies were strategies, supplier advances in eco-design products, environmental partnerships with suppliers and the cost of eco-design. There was no evidence of a relationship between GSC practices and operational performance, but there was a relationship between GSC practices and environmental and economic performance. However, the research lacked certain diversity factors. Diversity factors such as focusing on environmental practices and various costs would enhance the study.

Ismael (2021) suggested that to achieve strategic goals, a company must balance efficiency and responsiveness in its supply chain functions. The following are the supply chain drivers in the dairy industry: Production unit (facilities), transportation (deciding routes and modes), information (related to consumer perceptions and demands) and inventory management. The company's facilities, transportation, inventory and information are the supply chain's drivers. However, the company, such as those in the dairy industry, must maintain balance among the supply chain drivers to maintain balance in the supply chain functions.

There are many barriers for businesses trying to adopt environmental practices. Alshamsi et al. (2017) state the lack of innovative technologies can hinder the implementation of environmental practices. Further, Ozceylan & Paksoy (2013) suggested there are also psychological barriers, including a lack of systematic thinking among the leadership and management. These hinder companies from seeing benefits from sustainability initiatives and lead to the concentration of business efforts on the optimisation of traditional linear models (Bulmus, et al. 2014).

Zhang & Yang (2016) focused on the Chinese manufacturing industry to assess how to apply green practices. The study looked at how green practices affect the environment, finances and operations of manufacturing organisations. Government and competition motivation considerations did not encourage the adoption of GSC practices. The authors found that government regulatory restrictions and increased competition had the least impact on enterprises when developing a grounded supply chain. The key challenges to GSCM implementation were identified as employees, customers and management. The most significant obstacle to implementing green initiatives in a firm is a lack of environmental understanding on the part of the company's employees and management (Imtiaz Subhani et al. 2013). Management and employees who are aware

of the GSC can better implement sustainable environmental practices and are more likely to do so in the future (Walker & Preuss 2008).

Several other studies have used a similar approach to the one used in this work. Min et al. (2001) found several barriers to implementing GSC. They were the perception of having a limited individual impact on the environment, a lack of knowledge/information and expertise, and the idea that minimal financial benefit comes from engaging in environmental activities and joint supplier development. This adds to existing literature showing that external barriers prevent businesses from implementing sustainability initiatives, including a lack of buyer and supplier awareness of GP activities (Min & Galle 2001). Some authors (e.g., Diabat et al. 2013; Lee 2008) referred to this situation as a lack of GSC readiness. (Dou, Zhu & Sarkis 2018; Stekelorum, Laguir & Elbaz 2019; Z. Wang et al. 2018).

Existing research shows that firms lack knowledge, joint supplier relationships and goal- sharing in their green partnerships. Luthra et al. (2018) stated a lack of organisational encouragement, innovative green practices and supplier reluctance to change as other parts of the sustainability challenge. Barriers to information- sharing and the lack of cooperation among supply chain members to achieve GSC goals are evident in business

practices (Govindan et al. 2014; Li & Lin 2019). Various parties in the chain have little or no knowledge of each other's actions. Lack of communication is responsible for inefficiency, waste and sometimes mistrust among suppliers and customers. Small-scale businesses may be able to deal with the issue of poor communication, but this issue can be exacerbated if an organisation operates globally. Companies can improve communication with relevant parties using cloud-based networks (Asaad 2018).

Legal and investment barriers can also affect GSCM implementation. Legal barriers and voids mainly relate to managing waste products and waste at the end of their lifecycle. The lack of a labelling and certification system with the necessary legal status also creates difficulties in converting linear supply chains into SSC (Nenes & Nikolaidis 2012). The low investment related to implementing supply chain principles does not attract domestic sources of financing from international companies that are already actively using environmental circular business models (Brandenburg et al. 2014).

Academic writers have identified other impediments to the development of sustainable measures in organisations in addition to those connected to the management. Björklund (2018) identified three types of sustainability obstacles: Organisational, structural and operational. Yanto et al. (2019) demonstrated in a research study of a credit union in the United States that opposition to

change relating to green practices, whether from staff or consumers, may make or break a business's dedication to sustainable ideals. Their reluctance may stem from their concerns about the increased expenses associated with going green. The diversity of employee behaviour around sustainable development may make it challenging to execute eco–friendly initiatives across all levels or divisions of the business, resulting in inconsistencies within the organisation. Narimissa et al. (2020) argued that sustainability's industry-specific and country- specific hurdles and drivers differs in countries and must be focus on in more detail. SMEs have a negative impression of their sustainability. Another barrier noted by Al Zaabi et al. (2013), particularly for SMEs, is the lack of a defined person or department responsible for sustainability. According to Ghadge et al. (2017), large enterprises report these difficulties four times more frequently than SMEs. Moreover, a third of large businesses reported minimising their carbon footprints, compared to less than 1% of SMEs. This situation may create additional challenges to incorporating sustainable development in SMEs, such as lower market or social pressures or expectations, lack of monitoring or scrutiny by environmental and economic activists or NGOs, and their reputation and area of action are primarily local. Castka et al. (2014) attributed these conclusions to a distrust of bureaucracy and time and expense constraints in SMEs, saying that these constraints are often based on beliefs rather than

facts. Historically, SMEs have emphasised internal concerns like personnel, skill development, team building, morale and motivation. As a result, many of their social, civic and environmental efforts are driven by or designed to benefit employees (Álvarez Jaramillo et al. 2019).

According to Govindan & Hasanagic (2018), companies also pressure their manufacturers and suppliers to produce and distribute high–quality products and follow safety precautions. However, some of the common barriers in the supply chain process related to the safety and quality of products are poor storage, delay in transportation and inclement weather. Therefore, these barriers hamper the performance of the supply chain. Companies should follow suitable production methods, standards of international overview, and testing and proving methods because these will help the company maintain adequate food quality. Apart from this, it is also essential to understand that packaging plays a vital role in dairy product quality standards, as packaging materials and processes ensure the freshness and safety of products (Asaad 2018). Therefore, following the methods suggested in this review can result in an organisation saving costs and ensuring the safety of its goods.

2.6 SUMMARY OF RESEARCH QUESTIONS

Environmental practices and measurement techniques still need to be further focused in the Australian dairy industry. The first two research

questions indicate: RQ1: To what extent are Australian dairy businesses implementing environmental GSC practices? RQ2: To what extent are Australian dairy businesses measuring and monitoring GSC practices? Institutional pressures vary from country-to-country managers still need greater adoption of drivers and pressures in the Australian economy for GSCM practice.

The third and fourth questions indicate: RQ3: To what extent are there drivers towards GSCM practices in Australian dairy businesses? RQ4: To what extent are Australian dairy businesses facing institutional pressure to implement GSC practices?

Finally, there are still challenges and barriers to adopt GSCM practices, such as managerial commitment, cost, and technology barriers. The fifth question indicates: RQ5: To what extent are the barriers faced in the Australian dairy business to implementing GSC practices? Finally, after the initial findings, correlation relationships will be made between the key factors found in the interview the last question indicates: RQ6: What are the correlation relationships between the key factors in the dairy sector that may impact GSC practices?

2.7 CHAPTER CONCLUSION

The dairy industry has significant impacts on the national carbon footprint, animals' health and productivity. The industry is starting to integrate

green practices and address challenges related to distribution, storage, logistics and production (Emamisaleh & Rahmani 2017). This is, therefore, an essential area of focus as the dairy industry continues to expand (Raut et al. 2019). Because dairy supply chains often have agricultural components related to the use of water, recycling, employment of labour and impacts on soil, management's efforts to go green are complicated. This requires extensive review, research and planning for business owners and executives to remain true to their efforts to reach consumers through reliable, transparent and sustainable practices (Sharma Chandana & Bhardwaj 2015). Issues of cleaner dairy production are often related to the disposal of business waste (Macleod 2011). Measurement techniques and traceability technologies can assist the dairy industry in incorporating more transparency in its business. In this thesis the perspective has been narrowed down to focus GSC practices within dairy businesses. A gap in this research area in investigating GSC using a mixed-methods approach and allowing triangulation of results to provide a deeper insight into GSC practices and institutional pressure and performance measures. Firstly, dairy companies are shaped by the systems within which they operate (Laosirihongthong et al. 2013). Regulation, competitive and customer pressures can encourage companies to adopt GSC practices. Overall, the field needs further investigation and connection to

Australian firms that address environmental measurements, which only a few studies have addressed so far (Chu et al. 2017; Dubey et al. 2017). Further investigation with individual businesses in Australia is required to understand the implications of GSCM for each supply chain member. Studies in GSCM outline findings for institutional pressures in diverse countries with varying results (Saeed et al. 2018; Zhu & Sarkis 2007). However, further investigation is needed in Australia. It is also important to analyse how managers respond to external business pressures and how environmental performance outcomes are measured (Kazancoglu et al. 2018). The literature connects the constructs of environmental measurements and GSC practices. However, there is no detail about how managers address environmental performance and current practices being implemented in GSC for the dairy industry. Pham & Pham (2017) confirmed that firms have had to be confronted with pressure to influence environmental issues in their supply chains, reduce the environmental impact of their goods and services, and create environmental policies that improve relationships in GSCs. As dairy businesses incorporate major GHG emissions, there remains a significant challenge to become more environmentally friendly. To help with this challenge, managers are implementing green initiatives within their companies and upstream and downstream of the companies.

CHAPTER 3: GENERAL RESEARCH METHODOLOGY

3.0 CHAPTER AIM

This chapter aims to evaluate the various research methodologies and methods regarding their strengths and weaknesses in the GSC research field. The main analysis of the chapter is based on mixed-methods research. An evaluation of pragmatism and transformative research is critiqued. In conclusion, the transformative paradigm is selected to investigate the research question in depth to generate adequate thesis results. Before discussing the main mixed- research methodologies, an overview of the research paradigms is provided below. Finally, the qualitative data collection resulted in the design of survey questionnaire for the thesis.

3.1 ONTOLOGY AND EPISTEMOLOGY

Scholars implement the concept of ontology to enable them to determine reality. The term, in other words, means "what is reality?" Ontology approaches are based on the need-to-know reality. Ontology is concerned with the kinds of things that exist in the social world, as well as assumptions about the form and nature of that social reality (Goertz et al. 2012). It is concerned with the question of whether social reality exists independently of human understanding and interpretation; for example, whether there is a

shared social reality or whether there are "multiple context-specific realities" (Biesta 2010). A decision about ontology and epistemology creates a complete assessment of how knowledge is gained and how scholars can acquire knowledge and use the correct methodological strategies to discover it. Three distinct ontological positions have been identified: realism, idealism and materialism (Snape & Spencer 2003). In contrast to idealism, which maintains that reality can only be understood through the human mind and socially constructed meanings, realism asserts that there is an external reality that is independent of what people may believe or understand it to be. The materialist school of thought, like realism, holds that there is a real world, but only the material or physical world is considered to be real. The material world is the source of other phenomena such as beliefs, values and experiences, which emerge from the material world but do not form it (Zukauskas et al. 2018). The ontological concept of critical realism encompasses the transformative paradigm between positivism and constructivism/relativism (Given 2008).

The first part of this chapter outlines various epistemologies regarding research and selection of the epistemology for the thesis. Epistemology can be defined as the different thoughts and beliefs among scholars; they have distinguished between the capacity to understand of research from different perspectives. Epistemology is how researchers find reality, and the methodology and methods are the approach to and procedure for

getting the knowledge and also the tools to be used in acquiring the knowledge and the type of data to be collected (Johnson et al. 2000). It is essential to follow these steps since they must follow an order in acquiring knowledge, confirming reliable findings, and validating findings.

3.2 RESEARCH PARADIGMS

The research paradigms is a set of beliefs and agreements shared between researchers about how research problems should be understood and addressed (Jackson et al. 2018). The business research field is usually concerned with five paradigms. (1) Positivism considers that only one truth can be measured and determined in a study. As a result, scientists are more likely to estimate certainty using a quantitative methodology. Researchers using this study style set aside their preconceptions and values to seek objective, empirical and knowable truth (Whewell 2017). (2) A post-positivist theory includes empirical indicators that link the theory to observable phenomena and hypotheses that can be tested using the scientific method. Post-positivism recognises capabilities such as surveys, sociological or psychological studies, and experiential human behaviour (Johnson et al. 2020). (3) Constructivism holds that there is no distinct truth and therefore researchers construct knowledge. Researchers are particularly interested in participants' social views (Ekpenyong 2018). (4) Pragmatism claims that certainty is regularly debated and broadly

understood by researchers. This is a type of research study based on a more practical philosophy than idealism (Walliman 2010). Finally, (5) the transformative paradigm guides researchers in the understanding of combined worldviews.

3.2.1 EVALUATION OF POSITIVISM, POST-POSITIVISM, AND CONSTRUCTIVISM PARADIGMS

The positivist epistemology holds that the world is external, and any research phenomenon or situation has a single objective reality regardless of the researcher's perspective or belief. Positivism considers visible evidence to be the only type of acceptable scientific discovery. As a result, positivist epistemology assumes that only "facts" are generated through the scientific method, and it can be used to generate valid knowledge claims. In this paradigm, researchers validate descriptions by selecting concentration variables and then comparing the variables with this assumption. The approach utilised is more quantitative in nature, with sample measurements and scaling statistical analysis. For example, Sancha et al. (2014) used a positivism perspective by using a statistical test and hypothesis statements to find a connection between GSC variables. The variables were incorporated from primary data collection, investigating institutional pressures amongst various firms.

A more recent focus of positivism is the view of post-positivism, which does not concur with the

positivist worldview that a researcher can be a totally independent observer of the world around them. Post-positivism suggests that the ideas and even the identity of a researcher can affect what they see and how they think about the world, which in turn affects their conclusions. Post- positivism tries to find objective answers by trying to recognise and work with the biases that people have when they come up with theories and information. Even though post-positivism is primarily concerned with quantitative approaches, it encourages methodological diversity and thinks that the method employed in a given study should be chosen based on the research issue being addressed (Panhwar et al. 2017).

The constructivist focus holds that there is no single reality. Instead, individuals determine the truth. The truth needs to be deduced. This paradigm is used mainly to ascertain the essential meaning of procedures and events. It comprises a partnership between researchers and participants. First researchers become familiar with the context after which they scrutinise it to generate participant meanings. This paradigm usually uses qualitative methodology, comprising qualitative interviews, focus groups and observation. Powell et al. (2009) focused on constructing their research based on interviews about management perceptions and beliefs on sustainability. The researchers asked what are the main motives in implementing corporate social responsibility in the supply chain. Therefore, this allowed for individual interviews

with managerial staff to outline current motivations.

3.2.2 MIXED-METHODS EPISTEMOLOGIES AND PARADIGMS

In business research mixed methods is based on these two epistemologies/paradigms pragmatism and transformative. This section covers an analysis of pragmatism and transformative mixed methods and choosing the most suitable epistemology for the thesis. The pragmatism paradigm incorporates practical approaches, techniques, and strategies in research. Pragmatism solves research problems and questions. In other words, this problem-oriented approach chooses the best and most suitable research methods to solve the research questions (Russill 2016). Pragmatism is open to all viable options and does not limit itself to the positivist approach of ultimate truth or absolute reality.

The pragmatist epistemology holds that as individuals act in the world, reality is actively created and is ever-changing, based on human experience and oriented towards solving practical problems. Pragmatism can serve as a philosophical program for social research, regardless of whether that research uses qualitative, quantitative or mixed methods by using both qualitative and quantitative. The pragmatism view comprises the collection of both qualitative and quantitative information. First, there is the development of reasoning for mixing approaches. Then there follows the incorporation of this information at

different phases of the investigation. The pragmatic approach may incorporate many stages of both qualitative and quantitative analysis such as interviews, focus groups and surveys. This reality, on the other hand, is neither revealed nor grounded and can only be discovered by human experience. The primary difficulty is that it is dependent on the researcher and their opinions; hence, there is a possibility of biased impact on how the researcher thinks about concepts. Generally, it may influence the thesis (Kaushik & Walsh 2019).

Pragmatism research is the notion that reality can never be definitively known. Pragmatism is predicated on the concept that theories may be relevant and comprehensive by examining them for their "transferability" to another context (Ruwhiu et al. 2010). Similarly, pragmatic researchers can preserve both subjectivity in their thoughts on the research and impartiality in the data collection and analysis process. It is important to note that it has been alluded to as an "approach" instead of a "paradigm" (Morgan, 2014). Mitchell (2018) explained the contextual problem- oriented nature of pragmatism and how it limited her ability to analyse and identify social issues. Pragmatism disregards disputed philosophical concepts such as reality and truth. Rather, it believes that either a single or numerous empirical techniques may exist (Creswell & Clark 2017).

Biesta (2010) argued that "knowledge" can only supply us with facts about our acts and their

consequences, not even about the "once-and-for-all truths" that exist in the universe. As an alternative, pragmatism dismantles the boundaries between positivism and constructivist methods of knowledge to examine what is valuable from both perspectives (Biesta 2010). "Abduction," as it is known in pragmatism, is used to address the links between theory and evidence. Abduction is defined as a "move back and forth between inductive and deductive reasoning converting observations into hypotheses and then judging those hypotheses via action".

Feilzer's (2010) research study is an example that openly uses pragmatism's abduction. The consequences of pragmatism for her research thesis, which measured the influence on the general population of obtaining accurate information about crime through newspapers, are discussed in this article. While assessing qualitative data, the author "abductively" determined that it possessed "qualities of consistency and repetition," prompting her to convert it to quantitative data. The author described the use of abduction as "checking data sets," which she combined with triangulation processes to obtain the conclusions.

The transformative approach refers to an emerging research methodology that promotes the systematic integration, or "mixing," of quantitative and qualitative data within a single investigation or long-term program of enquiry. When researchers employ the transformational paradigm, the focus is

on suggesting a solution to recognised problems. This paradigm is best suited for the thesis study as there are many obstacles to overcome in an industry like the Australian dairy industry, an industry that has many challenges, particularly with GSC practices and key industry problems like deregulation, revenue challenges and government support. In conclusion, the transformative view advocates for the adoption of an explicit research purpose to serve the end goal of establishing a more equitable and democratic society, and this pervades the whole research process from issue conceptualisation to drawing conclusions and using data. The paradigm mixes several forms of data, such as participant perspectives, with descriptive or inferential statistics and metrics (Creswell 2010). Furthermore, the transformative view is more structured and much more suitable for the industry and research questions selected in this study. Similar to the pragmatism worldview, the transformative view allows for rich data sources from qualitative and quantitative methodologies. Trevors et al. (2012) suggested this type of research starts with understanding and expanding thoughts, visualising difficulties, and investigating problem-solving strategies. According to individual and group requirements, a transformative philosophical worldview makes efforts that can be excluded or downgraded. It provides a central position in research on the experience of diverse groups that are traditionally marginalised (Mertens 2017). The transformative worldview refers to sharing the researchers' viewpoints from diverse

investigation fields requiring essential societal changes or modifications towards sustainability and is also used in mixed-methods studies. A transformative philosophical worldview offers several benefits for this thesis, where it focuses on society's political and social aspects (Canales 2013).

When compared to pragmatism, the transformative mixed methodology recommends the adoption of an explicit goal for research to serve the ends of creating a more just and democratic society. This goal should permeate the entire research process from the formulation of the problem to the drawing of conclusions and the use of the results. Pragmatism does not recommend the adoption of an explicit goal for research (Sweetman et al. 2010). The transformative design to choose mixed methods is crucial as the transformative design helps in solving a problem for the industry. From a transformative viewpoint, it is critical to situate all choices, data collecting, analysis and publishing within the social and historical circumstances of the community in question. This necessitates paying close attention to problems of power, authority and voice. Based on the information presented above, this perspective proposes a mixed-methods overall objective to lead the research process, specific considerations for using qualitative data and findings of the research design and advice for the emphasis on integration o f analyses (Shannon-Baker 2016). In conclusion, the use of a transformative worldview in conducting

mixed- methods research is highly recommended by many researchers and used in their investigations. The use of a transformative worldview results in creating appraisal standards for analysing, evaluating and estimating a mixed-methods study. A transformative philosophical worldview is established to identify accurate and reliable results or to justify an appropriate research problem. This philosophical worldview is change-oriented as well as justice-oriented. It involves a collaborative process, as researchers often require government, local, national or global support (Canales 2013). The main justification is due to the research seeking to make a change to the Australian dairy sector and focusing on change orientation. The application of GSCM practices to the industry in focus will assist greater outlook in the sector for business.

3.3 TRANSFORMATIVE MIXED METHODS

Mixed methods incorporate quantitative and qualitative research methodologies and there are four designs that a researcher can apply. According to Biesta (2010), these include triangulation, exploratory, embedded as well as explanatory research design. These research designs are different from each other and are used by researchers in different contexts. These research designs are discussed one by one below and this discussion clarifies how one research design is different from another. It was mentioned by Creswell & Plano Clark (2017) that in triangulation, multiple data sources and methods are used in

carrying out the qualitative and quantitative studies so that the phenomenon can be understood in a comprehensive manner. Moreover, various theories, investigation methods and multiple data sources are used in the triangulation to investigate a single phenomenon. Mitchell (2018) mentioned that triangulation is used for minimising the possible biases that occur due to the usage of a single methodology. Furthermore, triangulation allows for the convergence of results leading towards the same conclusions; for when the results are related to different phenomena or objects but are complementary to each other; and for when the results and outcomes are expected to be contradictory or complementary. In an embedded research design, a secondary and supportive role is played by one dataset that is mainly based on another type of data (Creswell & Clark 2017). Also, this research design is important because one type of dataset is not enough for answering different types of questions and each question can be answered based on different data. The embedded research design is highly useful for researchers when they incorporate both qualitative along with quantitative types of data for answering their questions. Triangulation design allows for a more comprehensive analysis, while embedded design interpretation is centered on a specific methodology as a basis. Furthermore, this research design is highly useful for the researcher when they focus on a qualitative research design but also want to embed a quantitative component or vice versa.

In contrast, the explanatory design, you collect quantitative data and then qualitative data to explain. For instance, such type of design is highly useful when the researcher requires qualitative data for explaining nonsignificant or significant results, surprising results or results obtained from outliers. Also, this design is also helpful when the researcher has obtained quantitative results and needs to follow up through qualitative study (Biesta 2010). For the exploratory design, not much is known, thus qualitative data is collected first and then quantitative data to generalise the finding (Greene et al. 2007).

3.3.1 THE EXPLORATIVE DESIGN

The transformative design in this thesis is executed using exploratory research design processes beginning with qualitative, while the second one is quantitative to generalise the findings (Mitchell 2018). Exploratory design has been used due to a number of benefits for this thesis. Firstly, exploratory research is useful when there is limited or no data available for a chosen topic. Secondly, the exploratory research design is initiated qualitatively and is highly significant when the researcher needs to test or develop any instrument. Finally, exploration is required when instruments or measures are not available, when there are unknown variables and when guiding the theory. The qualitative data collection informed the design of survey questionnaire for the later chapters.

Figure 3. illustrates the exploratory research design used in this study.

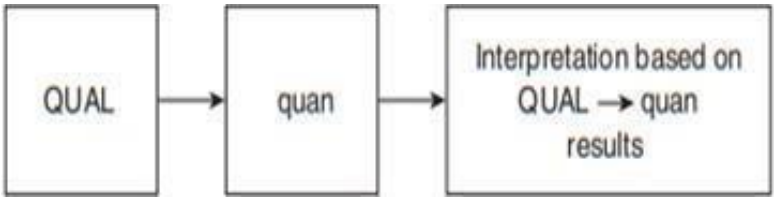

Figure 3.. Exploratory research design

(Source: Creswell et al. 2006)

3.4 THE FIRST PHASE OF THE THESIS (CHAPTER 4)

The first phase of the thesis explores GSCM practices, and measurements of dairy businesses. The impact of institutional pressure in dairy business, and impact of barriers to GSC practices in the dairy industry. This phase explored the literature concepts in the current Australian dairy industry, gathering valuable insights from management and businesses around Australia. The qualitative research method emphasises obtaining data through interviews. It addresses the thinking of people and the reasoning behind their ideas. The qualitative research method puts a focus on gathering information through open- ended and social contact. It covers people's views and the reasons behind their views. One-on-one interviews, focus groups, ethnographic research, observation procedures, record-keeping and case study research are examples of qualitative methods. These methods are employed in a way that reveals the targeted population's behaviour, practices and

perceptions on a specific topic. Qualitative research is often used in business literature. Scholars have employed qualitative analysis in a variety of areas, including management, finance and supply chain management (Creswell 2010). Qualitative research is essential for practical purposes to investigate with a more in-depth discussion of a topic. Denzin (2018) suggested that qualitative research is better at interpreting social processes and investigating complex problems that include contextual variables (Gill et al. 2008). The main benefit of adopting qualitative research is that it allows the researcher's primary research stance as it incorporates the freedom of using open-ended questions.

Qualitative methods can also be performed on secondary data; this is referred to as document analysis. This can be investigated using company policies and secondary data as a main method. In business literature, it is common to read research that tackles one or more questions that begin with the words "Why", "How" and "To what extent" (Shannon-Baker 2016). In the current thesis, qualitative research is the first stage as it outlines the research questions, which ask "to what extent" are businesses facing environmental pressure, barriers and applying GSC practices. It is also asked "how" businesses are adhering to these factors for the environment. Greater qualitative methods used in the dairy sector would be insightful for the research as it constructs real-world views.

A drawback of qualitative research, however, is that data collection for the research background can be costly to a thesis (Davies et al. 2014). In addition, this research viewpoint is often criticised for lacking scientific rigor, with insufficient explanation of methods used, lack of transparency in methodological procedures and results merely a set of personal opinions subject to researcher bias (Creswell 2014). Moreover, one of the limitations of qualitative study explained by Mitchell (2018) is that it is a lengthy and time-taking process compared with quantitative study. One of the reasons behind the time-taking process of qualitative study is that personal interactions are involved in data collection that can lead towards deviation from the main problem under study. The introduction of some significant GSC papers that define qualitative approaches, which will be covered further below, is also essential. In the GSC literature, qualitative analysis is widely used and further investigation in the qualitative field is needed (Sarkis 2007).

Perotti et al. (2012) also focused on qualitative research on the motivation for management of green practices to uncover new sustainable motivations through the organisation's culture, as well as how managers impact on sustainability and how this can be beneficial, and how analysis of behavioural backgrounds can be beneficial. However, there is a broad need for further theory development and testing, including a deeper

understanding of the factors influencing how far organisations participate in sustainable (green) supply management and the relationship between these factors and organisational success (Toboulic et al. 2015). GSCM practices start within an organisation and industry, and are implemented based on managers' views and practices, and this is a crucial first stage of the findings for the dairy industry in this thesis.

Qualitative research is emphasised in the first stage of the research thesis. The execution of GSCM activities as well as interactions among participants in the chains generated a large amount of information which could be analysed using qualitative methods. The first stage of the thesis required qualitative analysis, which formed part of the mixed-methods research due to current practices, beliefs and values needing to be analysed through the dairy industry and managers were the key participants for investigating dairy businesses and current GSCM practices, therefore adding more human value, as management is a key driver in enabling GSCM practices. Secondly, there is little data that makes the connection between current GSCM factors and the Australian dairy industry; hence exploration is needed of the current environmental activities.

3.5 THE SECOND PHASE OF THE THESIS (CHAPTER 5)

The second phase of the research uses surveys and

quantitative data to generalise the findings from interview findings, as well as investigating the relationship between the key factors and themes. A major benefit of using quantitative data is its objectivity. It relies on concrete numbers and fewer variables. This can help to remove biases from the research and make the findings more accurate. Another benefit is that it is often easier to obtain large sample sizes. Hence, quantitative methodology as the second stage of the thesis also allowed generalising the findings from the interviews to suggest data outputs that represent the dairy industry. The interviews produced seven themes which are further explored in chapter 5. A quantitative approach

collects data and applies statistical techniques to a systematic examination of events. This approach collects numerical data and generalises it across people or phenomena. Because it is data-driven, it incorporates both primary and secondary quantitative research. Common research methods include probability surveys and questionnaires. To assess descriptive statistics and causes between variables, the quantitative framework uses deductive methods such as hypothesis testing (Apuke 2017). This quantitative research paradigm emphasises reasonable judgement as a foundation for theory generation.

The strength of quantitative methods is the large volume of data obtained. The collection and analysis of data are done using mathematically based methodologies, which is a feature of this

research approach. Quantitative research focuses on a clear path and data collection (Frels et al. 2013). A weakness of quantitative research is the lack of understanding of the social dynamics in the research context (Raddon 2016). Another disadvantage, according to Creswell et al. (2014), is that these methods do not prove a hypothesis; rather, they imply a failure to reject the hypothesis.

The following are some examples of quantitative research that have been published in the GSCM literature. Green et al. (2019) conducted a study to empirically assess the complementary influence of total quality management in GSCM and the just-in-time approach on environmental performance. The study collected data from 225 manufacturing managers to evaluate the complex cause-and-effect relationships between environmental performance and total quality management, GSCM and just-in-time practices. Tumpa et al. (2019) performed a study to investigate the different barriers to implementing GSCM in various emerging economies. Çankaya & Sezen (2019) explored the eight dimensions of GSCM in social, environmental and economic performance, including three aspects of corporate sustainability. The relationship between GSCM and sustainability performance was examined using a plant-level survey. Song & Gao (2018) developed a GSC game model under a shared revenue contract. Quantitative methodology is used to make connections and analyse causes– effects in the GSCM literature.

3.6 ETHICS REVIEW

Research ethics is essential as it encompasses norms established to assist researchers in researching with honesty and integrity. In practice, ethical research principles must be followed, such as obtaining informed consent from potential research participants, minimising the risk of harm to participants, protecting their anonymity and confidentiality, avoiding deceptive practices and giving participants the right to withdraw from the thesis. It is critical to pay close attention to the defined processes while analysing in order to establish the validity of the research. Research ethics are required and some of them are explained here. In addition, research ethics maintains the morals required for collaborative work such as mutual respect and extending the principle of research integrity to others (Israel & Hay 2006). In this thesis, primary data was collected at two stages. Ethics applications were completed at the two stages of the research. The first stage, which was interviews, was approved as low-risk ethics research and the second stage of the research, which was surveys, was also approved as low-risk ethics research.

Ethical considerations were made as the data was managed with strict confidentiality and integrity; specifically, participant business names and individual names were not disclosed, while research data storage following the University of Southern

Queensland Guidelines. USQ ethics approval was obtained before starting the research from the Human Research Ethics Committee. There were two instances of ethics approval, one approval for the interview stage (Ethics Approval number H20REA247) and the other amendment approval for the survey stage (Ethics Approval number H20REA247 V1). Hence, data collection started after ethics approval was obtained.

3.7 CHAPTER CONCLUSION

The thesis incorporated a transformative worldview of dairy businesses due to the industry problem of greening the supply chain. To begin with, this thesis incorporated the strengths of both qualitative and quantitative methods. Furthermore, it was not constrained by the tenets of a single study method and using a mixed method allowed this study to find key industry answers to a detailed set of research questions. It is more beneficial when both quantitative and qualitative method approaches are employed together. The thesis followed the specific framework in the research design shown in Figure 4 below.

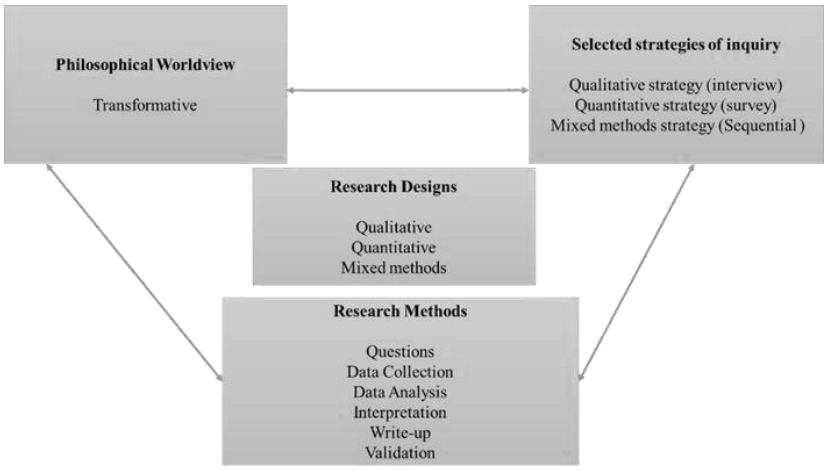

Figure 4. Framework for research design.

Source: Interconnection of worldviews, strategies of inquiry and research methods (adapted from Creswell 2009).

In conclusion, an individual method could not have assisted the research process due to the minimal data in the sector and Australia. Therefore, interviews were established first to find the current GSCM factors, then surveys were completed by respondents to generalise the findings. The chapter incorporates key findings such as industry voice and stance on GSCM practices. In conclusion, the mixed methods and the exploratory design is most appropriate for this chapter due to the factors being explored in the Australian dairy industry

CHAPTER 4: QUALITATIVE RESEARCH METHODS AND RESULTS

4.0 CHAPTER AIM

The focus of the first stage was to investigate the matter of GSC practices, barriers, pressures, and performance measures in the Australian dairy sector. The research focuses on existing implementations and practices those dairy managers and owners have employed to gain insight into their current position in the dairy industry. The first aim of the research is to investigate current GSC practices by focusing on the implementation and measurement of GSC practices in dairy businesses. The second aim is to investigate the roles of institutional pressure and drivers towards GSC practices and implementation. Finally, the third aim is to investigate to what extent Australian dairy businesses face barriers to adopting GSC practices.

4.1 QUALIATIVE RESEARCH

Qualitative research is essential as it provides greater information on beliefs, values, perceptions, and practices. Qualitative research methodologies are used to explore why or how a phenomenon occurs, to develop a theory or to describe the nature of an individual's experience (Fetters et al. 2013).

In more detail, a qualitative study is an examination into a social problem that focuses on using words

to build a thorough, holistic picture, relaying specific informant opinions and taking place in a natural setting (Creswell & Plano Clark 2011).

There are several different leading methods among qualitative methods such as document analysis, participant observation, interviews and focus groups, some of the most frequent methods of data collection used in qualitative research. Data analysis, field notes and audio recordings are all used in this process. Interviews can have different structures, including structured and semi-structured interview structures. The structure of the interview was created during the initial research planning. Interviews are the most straightforward method of collecting thorough and rich facts on a topic. The interview style used to gather data can be adapted to the study question, the participant characteristics and the researcher's chosen approach. Face-to-face interviews are the most common. However, telephone interviews are often used, particularly during the COVID period. A well-designed semi-structured interview ensures that vital data is obtained while allowing participants to express their personality and perspective in the conversation (Frels et al. 2013).

4.2 SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews were chosen for the study for the following reasons. One advantage of using semi-structured interviews is that it encourages back-and-forth conversation.

Furthermore, this thesis used semi-structured interviews as these allowed the key interviewer to learn more about the answers to questions as well as the reasoning behind the answers (Gill et al. 2008). Thus, one main advantage of using semi-structured interviews is that this method allows participants to respond to questions with more in-depth information. depth information. The interview questions were derived from literature and gap analysis. The gaps in the research subjects led to the development of each question after careful of the GSCM topic. Example of key interview questions is listed below. The full interview questions are listed in the appendix.

Introduction and background questions (Introduction Questions)

i. Tell me about yourself and your job responsibilities.
ii. What is your firm's current position in the supply chain?
iii. What product(s) do you manufacture in the firm?
iv. What type of experience do you have in supply chain and operations management?

Green (environmental) supply chain management activities (Research Question 1)

- Tell me about what type of environmental activities you currently adopt in the company?

The example of the key questions allowed for an in-depth interview, unlike structured interviews, which have limited scope and lack to test communication, the main justification for the use of semi-structured interview is it allowed for in-depth discussion and understanding of management's focus on GSCM factors. Hence, it was the best method to use to outline dairy business green practices, measurement techniques, institutional pressures, and barriers.

4.3 QUALITATIVE RESEARCH VALIDITY AND RELIABILITY

Qualitative research validity refers to the consistency of the research process and the results produced, as measured by how closely the research adheres to universal laws, objectivity, truth, and facts (Creswell 2010). To improve research validity, several methods were used for data extraction and analysis, including first-tier triangulation (interview and participant data) to ensure data was collected through the perspective of different individuals, by dairy professionals and managers. In conclusion, Feilzer (2010) stated that both participant and researcher biases can be observed in qualitative study, and these are important to control. Also, sometimes participants simply agree with the researcher for completion of the interview and do not provide real information. This leads towards issues of precision in the research. Firstly, one

example of maintaining credibility in the thesis was prolonged engagement with participants during and after the interview stage, contact was maintained. Secondly, another example was applying thick description, in the discussion sections for transferability, thirdly, an inquiry audit in regard to dependability was completed, and finally triangulation of the data for confirmability of the findings. The qualitative stage followed the principles of confirmability, dependability, transferability, and credibility (Lincoln & Guba 1986).

4.4 ETHICS FOR INTERVIEWS

The Human Ethics Committee deemed the ethics application for the interviews to be low risk. The final approval was provided before the interview began (H20REA247). Interviews were completed in the time frame of 2020 between the months of November 2020 till late January 2021 and the duration was overall three months in total. In order to conduct research that adheres to ethical standards, the study used ethical practices. Before beginning the study, a consent form was emailed to the responders in order to get the participants' permission to move forward with it. The consent form incorporated the purpose of the study, its procedures, the participants' responsibilities, and an estimate of the length of time it would take were all included in the permission form. The consent and thesis information can be found in the appendix section.

The participation of the companies selected was voluntary and they were informed that they were free to withdraw from the research at any time as they had the right of withdrawal. The participants were provided with the USQ contact details of the researcher to call or email if they decided that they would no longer take part in the thesis. The research followed de-identification of data; due to confidential requirements, company specifics were not provided.

4.5 INTERVIEW PROCEDURE

The participants were recruited via phone or email from dairy business and processing operations managers in Australia as part of the data gathering process. To help ensure the overall validity of the research, the interviews started with a set of preliminary questions formulated based on the literature review. The participants were selected on their different titles and roles to ensure reliable data collection and representation of the dairy industry and businesses.

Semi-structured interviews were conducted with individual participants who had more than five years of experience in management and industry experience. A total of 19 interviews were completed during the interview stage and interviews went for approximately 30–45 minutes for each participant.

It was found that in the thesis, data saturation was achieved at 19 participants, the critical number was 19 participants, which is well- grounded considering

the large number of authors whose work has shown this and as documented in their publications (Bergeron & Rekik 2017; Pedrotti et al. 2012). For instance, Peinkofer et al. (2019) whose work conducted interviews and thematic analysis with 17 participants.

4.5.1 INTERVIEW DESCRIPTION AND JUSTIFICATION

The interviews delivered in-depth data on managerial insights and influences on the business and probed into the significance of pressures, performance measures and eco- friendly practices. Semi-structured interviews allowed for two-way communication to understand participant responses. The questions that drove the interviews incorporated the pressures and barriers dairy businesses face, along with to what extent the companies implement and measure GSCM practices. The relevancy and originality of the data to the study topic contributes to the literature in the GSC space. In addition, the interview findings add understanding of the situation in the Australian dairy industry.

4.5.2 SELECTION CRITERIA FOR PARTICIPANTS

A selection of firms ranging from small and medium-sized businesses to large corporations was sought in the dairy industry; these firms were organised by business size and companies included micro-businesses, small to medium enterprises (SMEs) and large-scale businesses (IBISWorld

2021). The Australian Bureau of Statistics (ABS) defines an entity employing fewer than 20 employees as a small business and a medium-sized business as a business employing between 20 and 199 employees. A large business has 200 or more employees. The data collection process had specific criteria to be met, including that the business must be fully functional and operating in the dairy industry and must be located within Australia. Participants in management were included from all types of business entities to make sure the data was consistent across the dairy industry.

4.5.3 SAMPLE SIZE

Research sampling and the interview process used in qualitative research generally is less extensive than those used in quantitative research because of the inductive and emergent nature of qualitative research. Categories are generated from the data and used to examine the relationships between types when reviewing research participants' experiences (Sato 2019).

The study reaches a data saturation point where no further interviews would reveal any new information; during the thesis this was achieved after 19 participants. Also, a diversity of participants' expertise and experience in different segments of the dairy industry was included to ensure qualitative validity (Hair et al. 2019).

As shown in Table 1, the table represents dairy managers and experts who were chosen based on

industry experience and number of years in the dairy sector, to provide greater insight into current dairy practices. The selection of participants from each category was strategically selected.

TABLE 1. DETAILS OF INTERVIEWEES

Role	Number of participants interviewed	Category type
Dairy manager	8 dairy managers	Farm
Dairy manufacturer manager	9 dairy managers	Manufacturer
Dairy professional/ industry representative	2 industry representatives	Dairy industry body/large corporation

4.6 THEMATIC ANALYSIS

Thematic analysis was critical in the study as it allowed the discovery, analysis and reporting of patterns within the data. It is also a frequently used analytical method of qualitative research (Nowell et al. 2017). Thematic analysis was used to clarify the relationships between green practices and institutional pressures. To support the thematic analysis, document analysis was investigated with the literature. Thematic analysis allows flexibility in

the research of a theoretical framework. Furthermore, this data analysis technique allows for a rich, detailed description of the data. Thematic analysis is a method of identifying, analysing and reporting patterns within data. When using thematic analysis, there are six steps.

The first step was to develop understanding of the data and it is important to conduct this step before searching for patterns to become familiar with the key findings (Braun and Clarke 2006). To analyse the data a software program was used. NVivo is beneficial for large datasets. NVivo aided in the discovery of codes, sub-themes and themes. The software was used to analyse the data for the first stage of the thesis as it provides an organised and structured approach to analysis and helps to improve accuracy of qualitative studies (Feng et al. 2019).

The first step of the thematic analysis process was crucial to go through all information before proceeding any further; it was also essential to be thoroughly acquainted with the entire body of information (i.e., all the interviews). Taking down notes was very useful at this point with each of the 19 interviews.

The second step includes generating initial codes. NVivo was used during this stage. During this process, the data was organised in a meaningful and systematic manner. Coding divides vast

volumes of data into smaller and more accessible chunks. The data was coded using an inductive approach and 292 codes were developed as a result of first-stage coding (from all the interviews). Then after the initial coding, the main sub-themes were categorised. The initial codes are provided in the appendix with an NVivo example.

The third step was to search for themes based on the long list of different codes. This was established by conducting a theme search using a lengthy list of different codes. There were some initial ideas about themes after finishing all the transcripts. The themes captured incorporated patterns that surrounded the 19 interviews. Most codes are associated with a single theme, but others are associated with several themes. At the same time, all the codes in this sample fit into one or more themes. In the data analysis, many codes were connected to one or more sub-themes. Below is an example of the coding process in table 2.

TABLE 2. THEMATIC CODING EXAMPLE OF THE INITIAL STAGES.

INTERVIEW RESPONSE	INITIAL CODES	SUB-THEMES	THEME
"Look, there's no, there's a number of regulations that occur, so I guess the obvious thing to be mindful of is that EPA has regulations that impact on some businesses."	Environment al regulation applies to business	Environment al regulations	Business pressure
"Probably more assistance in putting up large scale, high- cost energy services such as your solar panels."	Motivation to adopt dairy grants for business	Grants accessible to business	Government assistance and support.
"There is a large exponential growth on the requirement from our farmers and our farmers are looking for the Information and we need to be well equipped to give it to them, farmers want to do the right thing"	Current methods dairy businesses use to measure sustainability	Current information practices	Performance systems and information barriers

The fourth step incorporated the refinement of themes and, if possible, finding the relationships between themes. However, these were separated into central themes for more clarity. During this phase, each sub- theme's information was colour coded. Furthermore, data was associated with each theme to see if it backed up the theme. The following move was to see if the patterns were consistent in the dataset. Once all sub- themes were colour coded, then the main themes were created.

The fifth step was to identify what each theme is about. This was the final refinement of the themes. The fifth step evaluated the ways in which subthemes interacted and contributed to the main theme, focusing on the relationships between the themes. Hence, most sub-themes are connected, which overall supports the main cover theme. The sixth step included producing a report to incorporate essential research to support the themes (Castleberry & Nolen 2018).

The figure below shows the key relationship amongst the themes whilst the other boxes are the sub-themes Figure.5 is provided below.

4.6 THEMATIC ANALYSIS MAP OF FINDINGS

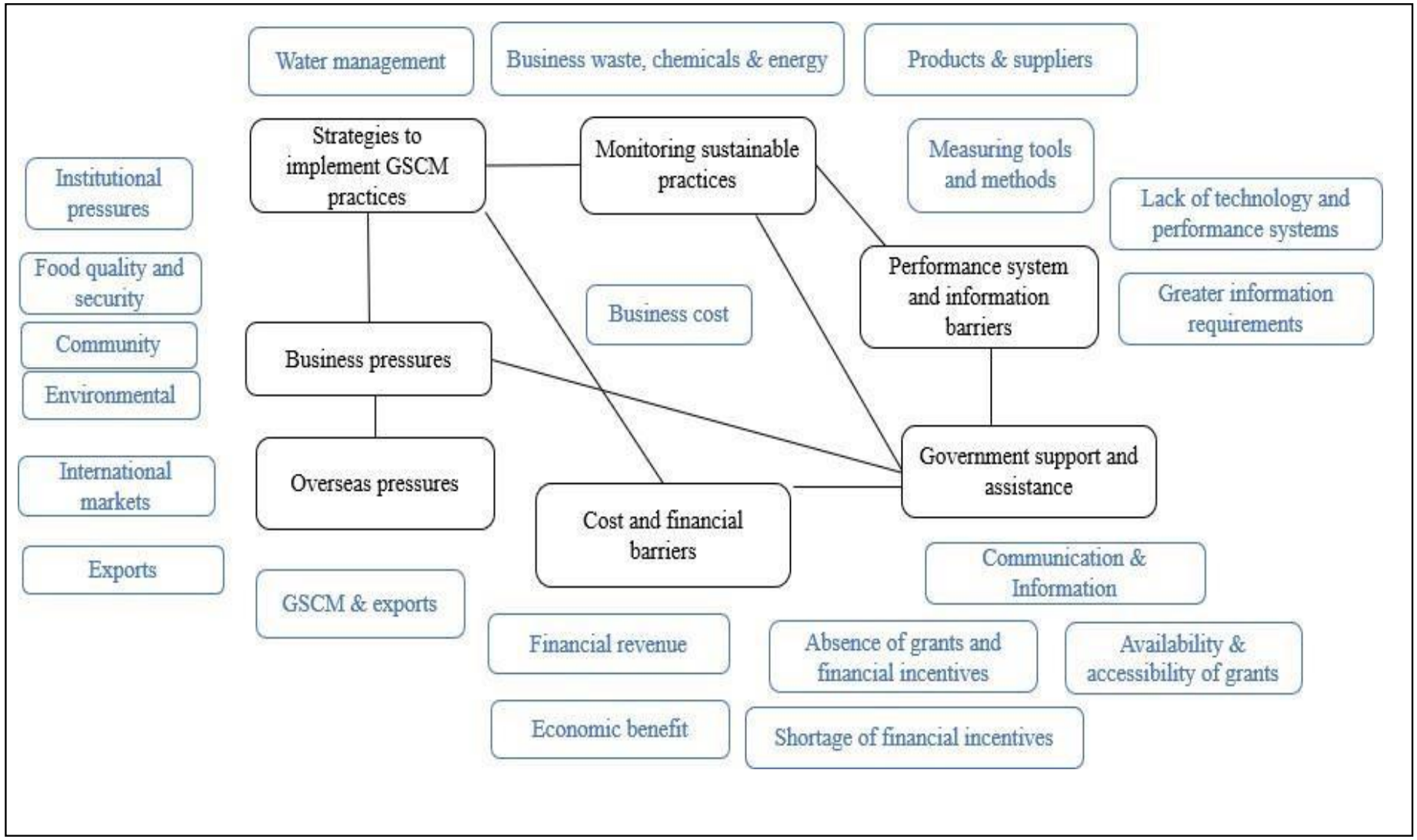

Figure 5. Thematic analysis map with initial sub-themes.

Thematic maps show how the initial codes and themes matured. The findings aim to "identify the 'essence' of what each theme is about;" this is the final refinement of the themes (Braun & Clarke 2006). Finally, the thematic analysis showed that seven themes were relevant to the Australian dairy industry regarding GSCM factors. These themes are: green practices, measurement of green practices, business pressures, overseas pressures, government support, cost and financial barriers, and performance system and information barriers. Figure 6. below, shows the final themes emerged from the interview data. Themes emerge from both the data (an inductive technique) and the investigator's prior theoretical knowledge of the topic under investigation (a priori approach). The figure below shows the main connections amongst the seven themes.

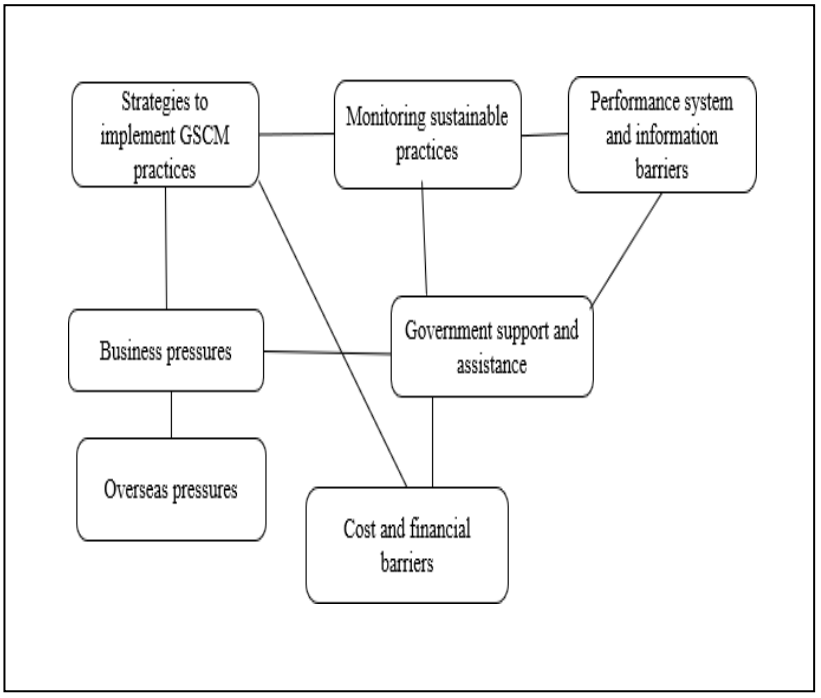

Figure 6. Final thematic analysis of key themes.

The next section outlines the seven key themes, which are discussed with quotes from the

interviewees. Each quotation is labelled as "P" for person. The quotes support the findings.

4.7 OUTLINE OF THE SEVEN KEY THEMES IN GSCM

4.7.1 IMPLEMENTING OF GSC PRACTICES (THEME ONE)

In this thesis, one main objective was to investigate to what extent Australian dairy businesses implement GSC practices. From the interviewees' perspectives, it was found dairy farms and processors have started recently to implement GSCM practices in their business and the supply chain, but not to a full extent; this is due to a variety of barriers and inadequate support. In the Australian dairy supply chain, some strategies have very high popularity amongst the dairy processors. For example, many businesses had a strategy to reduce wastewater, recycle water, minimise business waste and minimise chemicals. However, a more critical strategy needs to be explored for dairy businesses to manage supplier product materials more effectively, such as building a business model of supplier awareness. Water management in the dairy industry was a leading practice outlined in the interviews. Water management is crucial to enable greener supply chain practices and can be classified as cleaner production. Dairy companies are currently improving their water management practices as this ensures more resourceful business practices. Furthermore, In the dairy industry water is utilised

extensively in the dairy sector, including cleaning, sanitisation, heating, cooling and floor washing of dairy sites to properly dispose of dairy effluent (Feil et al. 2020). Dairy farmers are especially aware of and motivated to save water in their supply chains due to the environment and conditions (Bazan et al. 2017).

Recycling water in dairy farms and processes refers to repurposing and reusing water, with the resulting water being referred to as recycled water. The most critical aspect of efficient water management in the food business is to guarantee that the water used in specific operations is sufficient. The dairy industry's most significant water uses include technical operations, cleaning systems, cooling systems, steam generators, fire prevention systems and water utilised for social purposes (Finnegan et al. 2018). Recycling of water as a GSC practice is a term used throughout this section; however, there are a few other terms used in the water industry to denote recycled water or the process of making it.

There is an increasing trend of farmers and producers who are incorporating this practice as water is scarce in the dairy sector.

(P1):

Recycling water is going to the fields, which is undoubtedly not recycling but the water from the shed is being recycled to be used again.

Dairy businesses are seeking out new systemic solutions and technologies in this area to increase

water management efficiency, such as including a measurement technique with technology to collect the data and compare it to previous water recycling amounts (Rao 2011). Therefore, performance and information system is needed to ensure higher monitoring of these practices.

One method discussed was water recycling, while another was wastewater minimisation. Effluent is the term for wastewater in the dairy industry. Large fluctuations in effluent quality and quantity are especially problematic in dairy operations, both in terms of production and processing, because each milk product has its own technical line. When a new cycle of the manufacturing process begins, the composition of dairy effluent changes, making in-factory wastewater treatment systems inoperable (Shortall et al. 2018). Effluent was discussed by the interviewees in discussing how they collect wastewater.

(P8):

So that's really our own, only the wastewater it's collected. We have three settling ponds that it gets collected in and it either evaporates out of there or we use.

Therefore, the industry strives to enhance and measure efficiency in water consumption in both the farming and manufacturing sectors (Augustine 2012). Business waste in the dairy sector describes the waste material generated by commercial enterprises. One interviewee discussed their view

on reducing business waste in the dairy factory.
(P13):

So, we have got a lot of activity and all the waste management, but probably before that, we have more efficient procedures. So, if we use less water in the first place, we will have lots of activities to take the total volumes down once we have got the volumes. We have a range of activities that do filtering and separation so we can use wastewater for other purposes to reduce the amount of water we need to be on-site because we use a lot of dairy processes.

Implementing a business waste standard can involve costly prices to implement a model (Renwick et al. 2018). Government support can be crucial to achieve these practices. The lack of government support in the Australian dairy industry is discussed in the later themes, showing further development is required for dairy farmers and processors in reducing business waste. Chemicals like herbicides are utilised on dairy farms. Good planning and management reduce risk to human and environmental health. Reducing chemicals on dairy farms and factories is something regulated by government. One interviewee discusses their own opinion on this topic.
(P2):

It's something we are aware of and try to limit it with applications every week rather than to big applications in a year, and containing the effluent

is a regulation it's not allowed to get past you there. It must be contained and then spent on the farm. It cannot overflow into any waterway.

Regulation places a large pressure to reduce chemicals as many dairy businesses also found reduced chemical use and environmental burden in agriculture are becoming increasingly desirable. Dairy community reporting standards must shift due to efforts to reduce pesticide use by governments and farmers (Waters et al. 2009). The literature suggests suppliers and factories generate emissions from their processes. Therefore, the characteristics of a product and its supply chain are the determining factors for a carbon footprint (Wang et al. 2018). One interviewee [a dairy manager] suggests recycling supplier material, also known as managing plastic on the dairy farm such as silage. Silage, otherwise known as silo, is the containers or plastic wraps that store harvests and crops on a dairy farm.
(P9):

Farms try to recycle the silage products from their suppliers, such as [silage wraps]. Dairy,farmers use a lot of fodder for storage.

In this case, to become more recyclable dairy firms might also concentrate on supplier waste such as silage, plastics and other materials. As a result, it is critical for dairy firms to include environmental standards in their supply agreements (Lee et al. 2018). Actions such as measuring and monitoring their usage are required. Dairy businesses are also

looking to reduce supplier and product waste. One owner describes their supply process as more environmentally friendly in the supply chain.
(P8):

The milk leaves the place in bulk; we use boxes that have been used in most of the things we have silos. So, all our rights and our pallets come in and out because it is the cheapest way to do it and the most environmentally friendly. Everything is delivered in bulk, and we have a waste management skip on the phone that gets taken away, which gets recycled.

Dairy businesses are focusing on silage waste generation from suppliers. Therefore, supplier development is also another key practice found in the interviews, as both dairy farms and processors incorporate material or raw product suppliers. One other dairy practice found in GSCM practices involves the strategy of packaging for the product. Packaging, whether in glass, metal, paper or plastic, contributes significantly to the solid waste stream (Beske et al. 2014) In addition, one interviewee discusses their practices in reducing product material.
(P16):

Yes… some of the customers require us to look at using packaging that can be recycled at the other end. So, with cardboard and things like that. You are looking at the possibility of recycling. That is the other end, whether we can separate the plastics in the paper from the type of paper bags. I am just

using less packaging as well. So instead of small packages, we are looking at bulk.

Recyclability of dairy product packaging is at the forefront of both dairy businesses and farmers' awareness. In addition, reducing packaging is a crucial GSCM practice in dairy businesses.

4.7.1.1 SUMMARY OF THE FIRST THEME

The first GSC practice that was outlined includes reducing wastewater and recycling in the dairy industry. Dairy businesses are focusing on this practice as water is a critical component to a circular economy. These practices allow for a longer water supply and reducing pollution. The Australian government often mandates companies to monitoring and analyse their water management, and chemical management. In addition, dairy business is currently considering minimised chemicals. Dairy companies are implementing strategies to reduce chemicals. Business waste is also another factor that is being seen as a key practice. Lastly, dairy businesses are currently considering reducing product materials and supplier waste, this can help to reduce waste on the dairy site.

4.7.1.2 INTERVIEW TO SURVEY TRANSITION

The following categories will be further generalised in the study, (1) strategy for dairy business to reduce wastewater, (2) strategy to recycle wastewater, (3) strategy to minimise business

waste (4), strategy to minimise chemicals, (5) strategy to reduce product material and the (6) strategy to reduce supplier waste. These categories will be explored in a larger sample of dairy businesses around Australia during the second phase of study.

4.7.2 MONITORING AND MEASURING GSC PRACTICES (THEME TWO)

Theme two consists of monitoring and measuring environmental practices, these practices are analysed below. Measuring business waste and chemicals is outlined based on the interviews and suppliers and product materials are discussed. Lastly measurement of energy used by dairy processors and farms is discussed.

Any water used in the dairy from a stream, a dam capturing overland flow, a spring or a bore requires permission from the water authority. Roof-captured rainwater, municipal water and recycled or reused water are exempt from licensing. One interviewee discusses the way in which their business monitors and saves water. (P13):

We often capture the condensate. So, what happens is steam, and we capture that and turn it into the water again. That is a great use, so we are doing that in the factories and on the farms. Again, water reuse is probably looking at water that is fit for purpose, so the high quality. Potable water is used to clean the plant, a level of water is used for

something else, and then the wastewater can be used to clean things like concrete surfaces.

In addition, dairy farmers need to strategically calculate which sections of the business require greater water and where to implement wastewater. Measuring water assists in identifying water-saving opportunities (Boguniewicz-Zablocka et al. 2019).

Another aspect found includes monitoring business waste on dairy farms and processing sites. Monitoring business waste management can benefit both businesses and the environment by decreasing waste treatment and disposal costs and possibly generating new revenue streams by finding secondary markets for recyclable products. Monitoring waste generation and disposal is critical for environmental compliance, stock control and measuring improvement (EPA 2020). However, regarding measuring, the dairy companies may need greater support as one manager outlines no current management practices to measure business waste:

(P8):

No, no experience in managing any of that.

It may be due to the outsourcing strategy as well.

Similarly, other business owners respond, the same perspective of measuring business waste.

(P2):

Not really, no … just try and get bills down. However, there is some comparison to other industry standards that are often looked at and I suppose I read comparisons that Australia puts out as to what would be the average usage in a farm ahead or see how we compare.

However, a business manager from a [larger] company discusses business waste.
(P16):

We have seven parameters that we must measure each year for them. And that's reported on so much recycling of carbon emissions and what we do with our waste and liquid waste, what we do with the solid waste coming in. All the other trends, again, we have environmental managers, so they monitor as well... how much gas we use, all those sorts of things as well.

Advanced techniques for various agricultural activities are being developed daily. There are various critical, cost-effective, and efficient methods, and inattention to effective waste management results in massive pollution and nutritional loss. A better grasp of these strategies will undoubtedly improve farm operations' efficiency (Vourch et al. 2008). It can also be said that dairy SMEs in the GSC may need more assistance in monitoring and measuring costs (Santos 2011).

Another component includes supplier waste, supplier waste can be defined as the environmental performance of supplier products that enter the dairy business. To measure supplier waste, usage must be measured on an activity-by- activity basis (Prosman et al. 2018). These estimates help demonstrate the amount of transport packaging that could be saved and could be translated into cost savings (Blome et al. 2014). The participant discusses environmental initiatives from suppliers: (19):

Oh, yes…even the packaging from our supplier sometimes and the packages that we use for our cheese, you know, this type of packaging we want to be able to recycle and be more environmentally friendly.

Measuring and assessing supplier performance is critical to lowering costs, increasing process efficiency and improving company success. In addition, they aid in the prevention of product faults and post-payment defects and drive supply chain improvements (Yu et al. 2012). Monitoring product materials is both important for business and revenue. Product removal expenses are the second-largest expense after labour – and for many manufacturers, they are the largest (Holzapfel et al. 2018). One manager discusses their unique strategy to monitor and reduce product material. (P16):

We'll use and observe bits and pieces of the

cardboard boxes that I've perceived as packaging, just stop moving around. How does the customer perceive that if they do not see bits of cardboard sort of broken up and folded up so that something inside a box does not rattle around and bounce around? And I often wonder, never asked customers, I just do it anyway. It gets rid of cardboard. It is sort of a recycling, I suppose, reusing of the cardboard, but it is still probably the most professional of the packaging, but I like to think that.

Efficiency in materials is getting more done with less and eventually saving money. It refers to generating a product or service with fewer input materials or with the same quantity of material generating more products or services. Dairy factories can focus on cardboard and plastic, while dairy farmers can focus on reducing silage (Nenes et al. 2012). One factor focused on in the interviews is the measurement of energy on the dairy farm. Most dairies can reduce costs by focusing on electricity more efficiently (Bazan et al. 2017). Another manufacturer manager mentions.

(P14):

The technical answer is no, we never did any examples of those types of things. We were conscious of power use and cost, and we did consider putting up solar panels on the roof of buildings.

Dairy farms consume more energy and pay more for it than other farms. Therefore, energy efficiency

is becoming more critical as electricity rates rise (Mosert et al. 2018). One dairy manager discusses the importance of measuring energy in their business and compares to other sources of power for the dairy site.
(P13):

[Energy measurement] is big thing we can use and monitor alternative sources or more environmentally friendly power source is an additional use of geothermal energy.

Finally, dairy businesses are focusing to measure their energy consumption, along with find more alternative sources to cut down costs on the dairy site.

4.7.2.1 SUMMARY OF THE SECOND THEME

Businesses need greater support to measure their GSCM practices. It was found in the interviews that dairy businesses may monitor their water strategies on the dairy farm or site. Although needs to be further explored in the next stage of the thesis to provide a fuller understanding of measuring GSCM. In addition, monitoring waste water and recycling water is the key findings in the interviews. Along with measuring energy, businesses are considering measuring energy on the business site to reduce costs and create plans for their future energy consumption. Furthermore, business monitoring waste and chemicals need to also be further explored, which may be due to resources

available for SMEs. Even supplier and product waste has been outlined as a key measurement strategy.

4.7.2.2 INTERVIEW TO SURVEY TRANSITION

The following categories will be further generalised in the study such as (1) measures energy, (2) monitors wastewater, (3) monitors supplier waste, (4) monitors recycling water, (5) monitors business waste and (6) monitors product material. These categories will be explored in a larger sample of dairy businesses around Australia during the second stage of study.

4.7.3 GOVERNMENT ASSISTANCE AND SUPPORT (THEME THREE)

One unique theme found in the research is discussion of government support. As mentioned above, companies are trying to implement and measure GSC practices; however, these practices are not being achieved due to lack of government assistance and support. Moreover, based on the interviewees' responses, there was a significant motivation and consensus that dairy businesses want to implement more outstanding GSC practices and have more incredible environmental performance. However, government assistance and support would be the focus for the industry to help dairy businesses.

Support from the government can be included in

many ways, for example, incentives. Incentives can include government subsidies in two ways:

through a direct grant from the government (e.g., grants and schemes) or through the market (Naglova et al. 2016). The Australian government must promote GSC practices to dairy partners to make sustainable products. One manager discusses about the environmental practices of planting trees and scarcity of grants

(P2):

I guess, funding to put in trees to stop erosion would be great too... there are not many grants, I do not think, up for establishing shelter. I think we might have access to one maybe ten or five years ago, but. I have not seen many more.

Other examples include water management, water recycling programs and many more mentioned in the interviews to help dairy farms and processors. The sustainable practices adopted by the businesses operating within the dairy industry are through their commitment to installing solar panels. Although many businesses have tried this green practice, one industry expert who focuses on farm regions mentions.

(P9):

Certainly, sometimes some of the energy efficiency upgrades can be quite expensive. And so, with the absence of grants available, that may not be something that we would do.

The government should implement assistance programs to dairy businesses that are struggling to adopt environmental initiatives (Khan et al. 2013). More significant government assistance and support have been suggested, as dairy business interviewees outlined a lack of know-how to help them increase their sustainable activities. In addition, it is suggested that governments must support dairies in some situations to encourage support for organisations focusing on adopting green practices (e.g., solar energy implementation). For example, a small dairy business suggests.

(P2):

Oh, I would love to put in solar, but I cannot afford to put it in, and effluent spreading would be good, but that is also an expensive project.

To support the development of novel environmental processes and dairy products, which is critical for the sector, grants might be awarded to qualified applicants. Even the most basic dairy processes, however, require greater resources and finance to implement GSCM practices. One dairy farm business owner suggests that not all businesses get the same treatment.

(P6):

So, the big farmers, have got to do about it, and they are the ones that are getting ahead in the industry, whereas they got the mom and dad farms that have been on the side of thirty years and

cannot be bothered, do not have the resources or the money available. They get left on because the end of the production affects the quality of the milk. So, therefore, suppliers right through to their cash flow.

The interviewees suggest that dairy companies need more environmentally friendly grants, and these are currently a scarcity. Even if government grants can help with solar power, greater focus is needed on water irrigation, especially for dairy farm suppliers. One interviewee who operates a dairy farm suggests costs are increasing and something needs to be done immediately. Greater support is required for specific practices such as water irrigation and dairy farm suppliers require action. Water irrigation is helpful, especially for dairy farm suppliers, as it can help the business reduce water and long-term costs. However, it costs financially to implement such irrigation systems. Another business manager mentions.
(P13):

There have been times, funds and grants that allow people to, whether it is farming businesses or industry, modifying or improve practices, and sometimes they are not particularly well targeted like.

The government needs to target all businesses that want to improve and have the motivation to integrate such practices. Another aspect would be

to focus on communication closely. Grants, communication and information from the Australian government were also strongly reported throughout the interview findings. Some dairy producers and farmers also suggest that grant offers should be sent through the mail due to technology barriers in the application process. Smaller businesses without technological advancements should receive more communication with a specialised focus. Moreover, another interviewee responds that there should be a greater priority in frequent communication between government and dairy businesses.
(P11):

I think they should advertise it [grants] a lot more. Many things get announced or not announced but are available. We do not hear about it.

Another dairy farmer mentions that the inclusion of all businesses should be a priority. There is a lack of standardisation within the dairy industry that needs to be addressed to communicate grants and schemes. Once asked about grants and schemes, one dairy manager also mentions. (P11):

Yeah, I am not quite sure where to go about it … You could see so many people know it all, but they get all the information. It should be just put out to everyone they do not like usually to come out with yet perhaps grants that are available for this quarter or every six months or something like that, just because there is a lot of things that. We hear

about … probably partly my fault too … but if they made things more available its only needs to be a bloody, an e-mail or a newsletter like you say, that would be helpful.

Moreover, greater communication of environmental grants and support to all business types is a central theme in dairy sector research. As previously stated, dairy farmers and producers require increased monitoring equipment for their water and energy use and to recognise where savings can be made. In addition, they need greater land care grants to help build more sustainable dairy practices, improve business efficiencies, reduce their operating costs and ensure their company's long-term sustainability. Australian dairy companies can then take active steps to reduce their carbon footprints and contribute to environmental sustainability (Eastwood et al. 2016). Sustainable grants must also benefit the business, as there is a shortage of financial incentives and economic benefits perceived by interviewees. The government should focus on current dairy costs and evaluate how companies invest by adopting environmental grants and schemes. In addition, governments need to help businesses understand the cost- saving long-term impacts. Returning to the example of solar power, the same dairy owner suggests a scenario where even 50% of government assistance is still not enough. The owner explains their experience in trying to juggle adopting a business and installing solar panels. (P2):

But the quote for our dairy, to cover up our power, something like eighty-three thousand dollars and the assistance from the government, I cannot even remember what it was, might have been fifty per cent. So, it is still a large outlay for panelling, which needs batteries because dairy farmers operate. Well, we start at five a.m., so there is not much sunlight at five a.m. Sunlight does not hit the roof, the dairy till about 7:00 a.m. So, we have got everything operating for two hours every day and we cannot directly use the panels. So, you need batteries as well. And that adds that is an added cost to the installation of the panels and it does turn out to be expensive.

Many participants suggest that adopting solar power, for example, may have costly short-term impacts and later more significant long-term rewards for business can be seen. Ahmed et al. (2018) also indicated that GSCM practices have a positive impact on economic performance. Although it is relevant in this theme, government support will highly assist the dairy sector as it can help identify and address obstacles to help farms and processors and complement their risk management activities with potentially cost-effective financial tools to support GSC practices (Mahul et al. 2018).

4.7.3.1 SUMMARY OF THE THIRD THEME

Dairy businesses suggest economic benefit is

essential when adopting environmental grants. Economic benefit was one of the first sub-themes to be explored and this involves whether participants agree that there needs to be an economic benefit to consider environmental grants in the business. A shortage of financial incentives to adopt environmental grants for GSCM was suggested There is a lack of financial incentives and economic rewards indicated by interviewees. In this case, the government should focus on current dairy prices and assess how companies spend through environmental incentives and programs. There are limited environmental grants accessible to businesses for adopting GSC practices. The Australian government requires GSC dairy sector knowledge. Dairy businesses need help to develop more sustainable activities, according to the interviewees. Information on adopting environmental grants needs to be more accessible. Another consideration is to pay special attention to the communication of grants. Grants from the government and information from the Australian government are also frequently mentioned in the interview findings. Communication is key to adopting GSC environmental grants for dairy businesses. Due to technological barriers in the application process, some dairy producers and farmers suggest that paper grant offers be mailed. There should be greater availability of environmental grants.

Sustainable grants can help the sector develop innovative environmental processes and dairy products, but first the business needs a better

supply of minor dairy procedures. Firstly, it is clear from the interviews that the research has found a large consensus among interviewees that there is increased motivation to adopt more GSC practices. However, assistance is just not available to support these costs and changes. Thus, the theme discusses government assistance and support. In the interview stage, many participants mention that it is quite costly to implement energy- and water-saving projects, which along with the absence of environmental grants can be a challenging factor. The interview sub-themes found that greater government involvement and support are required, which should also consider businesses' financial situations and economic benefits.

4.7.3.2 INTERVIEW TO SURVEY TRANSITION

The following categories will be further generalised in the next phase of study, (1) economic benefit to consider environmental grants (2) shortage of financial incentives to adopt environmental grants. (3) If environmental grants are accessible to the business. (4) Whether there is information to adopt grants (5) Communication of grants and lastly (5) availability of grants.

4.7.4 COST AND FINANCIAL BARRIERS (THEME FOUR)

In this section the key financial barriers to dairy

businesses are outlined and discussed. Due to the deregulation of the industry in the early 2000s, farmers and producers are struggling to cope with the price of producing sustainable products as it can be an expensive venture. Interviewees suggest that the cost prices of milk, cheese and other dairy products make it difficult to incorporate sustainability costs.

(P8):

The viability of the dairy industry is only going to be here while we get paid enough, and we do not determine what we get paid. So was the dairy, the dairy companies, one flat supply of milk, which means we must produce milk and an efficient time of the year, which then exposes us to risk, which is purchasing for the grain, things like that.

In some cases, extra costs may be incurred from the company side to obtain the required "environmental" product if it is not available and then the organisation has to put extra efforts in both monetary and physical terms. Sometimes the resource obtained may be below the estimation, which will directly increase the cost per unit of the final finished goods. It was found that the Return on Investment (ROI) was also an impacting factor on adopting GSC practices (Saeed et al. 2018).

ROI is a metric used to compare a business's initial investment by net profit and initial cost. ROI is a good process for measuring GSCM strategies and their success. It is based on the expectation or forecast of how much return the investment will

make (monetary and non- monetary) (Zhu et al. 2017).

Dairy businesses in the supply chain want to make sure their sustainable GSC activities are supported through ROI. One dairy manager questions the costs of adopting environmental practices.
(P7):

About the financial impact on whether it is financially viable to do some things, you probably should not do it?

Another dairy business owner suggests that greater incentives can assist company owner to adopt more practices (P5):

Yeah, put more incentives and make it a little easier. What is the word? You know, we do not want to go to a lot of trouble putting something in then finding out it is a dud.

Ahmed et al. (2018) suggested the most important part of ROI planning for sustainable projects, is that it is integrated. A simple way to figure out how much money the business spent on a strategy is to map it, make reports about how it worked and show how it made practices better. Dairy managers can use this strategy to improve their GSCM site practices and measure ROI (Razi 2021). On the other hand, the public sector can support ROI initiatives that promote capital flows to social,

environmental and financial challenges, with financial aid. In some countries, tax incentives or reduced regulatory barriers may demonstrate this support (government assistance and support) (Shashi et al. 2018).

One other key cost and financial barrier is business costs. The business costs involve the costs incurred by the company in removing business waste materials. It is an additional cost, but it is also required because if the firm does not take measures to decrease or clean waste, a fine may be imposed. Society is growing increasingly concerned about how companies alter the character of the items they use and whether they hurt the environment. As a result, appropriate waste disposal will help an organisation acquire more clients and boost its income. It also aids in the reduction of environmental waste by promoting environmental sustainability (Omri & Belad 2021). One manager discusses business costs and the difficulty of having high business costs.
(P13):

The amount of effort that is required to get prices to change can be enormous. That alone can put people off wanting to do it, and they are unsure of the outcomes if people are in a business sense if people are used to a certain way of doing things or comfortable with the cost of custom on income structures that come along for that. There must be a good business case. That is a compelling reason to encourage change.

Dairy businesses may require extra effort in terms of financial and resource needs, as companies must incur extra costs to maintain sustainability (Wang et al. 2021). Extra management may also be needed to maintain a high level of sustainability, which can be costly to a business (Miglior et al. 2017). One manager discusses the cost issues in them buying greener products.

(P2):

So, at the moment, no, unfortunately, no, because conception is there the demand is there, you know, and people tend to think about that but in our discussions this week, we tried to think about and of course, we have to assess how cost effective everything is.

Managers can influence social and environmental change through the funding they extend, and this is increasingly motivating. Managers should be part of the business commitment to being responsible (Sharma 2000).

Another business cost and financial barrier is the lack of finance to implement solar. Additional cost to go green refers to the cost incurred to maintain environmental sustainability. In other words, it can be said that this is the additional cost incurred to maintain sustainability in the environment (Liu et al. 2016). One manager discusses solar panel costs.

(P2):

Well, we have solar panels on our roof of the house, and I just know that the rebate is only about 11 cents per kilowatt, whereas you get charged 29 to 33 cents in the house. The other dairy, it is more so. It is, you know, hardly pays for itself in southern Victoria, if you lived in Western Australia or Queensland or outback New South Wales might be a different story with much more sun. But down here you must have the batteries to make it viable.

Another participant also mentions solar power costs and viability.

(P8):

And then how long do they last? I heard some people say solar panels only last 20 years. So then you must go through it all again, and then you get a lifespan of that length of time. I know things do not last forever. We realise that things have to be replaced and repaired or whatever. It is a big cost to run a dairy.

There is an increased expense as a result of a company's commitment to environmental sustainability or becoming green and the expense may be greater than the gain in some cases. As a result, the expense incurred is not justified. This is the organisation's additional cost, which raises product per-unit costs and total business costs (Yang et al. 2015). Going green in dairy supply is extremely costly due to conversion expenses not

always being covered. It is difficult to manage additional expenses, especially given current dairy sector issues including product price fluctuation, as discussed in the industry key challenges (Chen et al. 2017). One other factor found under the key theme of cost and financial barriers is environmental revenue. There is a lack of environmental revenue in the sector. Environmental revenue refers to revenue derived from the environment (i.e., generated from different green practices) (Song & Gao 2018). One interviewee mentions that environmental revenue may even be a supplier issue. The manager discusses dairy production and retail pressure.

(P16):

The supermarkets keep pushing for lower, lower prices of their goods, and it is just a constant squeeze to comply with all the regulations that there is no additional revenue to sort of help achieve that.

Another dairy manager discusses their views and provides some advice on the lack of environmental revenue in running a dairy business due to hefty costs.

(P18):

The dairy industry, the thing is, 70 per cent of the cost is the cost of milk. So, it is just a very high level, sort of like break down, you have got 20 per cent is your plant and energy costs, and you have got 10 per cent is your labour cost, that is very

rough industry guidance. You do everything you possibly can to make sure that your product is made right the first-time minimal loss is possible. Every litter that milk goes you want to get, you do not want to be pouring any of the solids down the drain because that is what you are paying for.

However, it is evident that additional costs are associated with maintaining environmental sustainability and going green in businesses. In some cases, the cost incurred is more significant than the benefit received; in these cases, the cost is not justified, resulting in an additional expense to the organisation and an increase in the cost of products and the total costs of the organisation (Wang, Wilson & Li 2021). Organisations would like to implement more practices, although one interviewee suggests. (P10):

Some energy efficiency upgrades can be quite expensive, with the absence of grants available, that may not be something that farmers would do as a priority.

There are many benefits of financial support provided by different organisations or governments. As such, it helps in increasing the environmental balance and contributing towards maintaining ecosystems. One manager discusses their view that environmental revenue has a connection with financial incentives and support.

(P18):

Look, I support if there were grants out there to help companies deal with, I suppose, specific industry problems, that would undoubtedly be a benefit to allow them to invest in other research development and that could reduce their overall footprint, but there would also have to be an economic benefit for corporate to want to do that.

As mentioned by the above interviewee, there needs to be more governments grants to help the industry problems of improving GSC practices.

4.7.4.1 SUMMARY OF THE FOURTH THEME

The cost price of products is suggested as a barrier to GSC practices. The product cost price is the actual cost incurred to achieve the required product environment; it refers to the actual cost incurred to obtain a natural resource. It was found in the interviews that participants agree that due to the nature of dairy products, there are some inclusions of a cost price, especially the price paid from producers to farmers.

Return on investment may be difficult to measure for GSC practices. ROI can also be used as a management tool to determine whether a corporation should invest in a particular project or task. The interviewees suggest that companies put much effort to ensure that a return is made with any GSC projects, especially solar. The business cost of running a dairy farm is a barrier to many

dairy businesses in adopting GSC practices. There is an agreement that the business cost overall from running a dairy firm needs to improve.

The business cost includes the cost incurred by the company when it discharges waste material into the environment because the business generates waste. Businesses agree there is an additional cost for products and materials to go green. The additional cost to go green refers to the costs incurred to maintain environmental sustainability. In other words, it can be said that it is the additional cost incurred to maintain sustainability in the environment (Liu 2021).

Environmental revenue is essential to dairy businesses in Australia and can be a barrier. Environmental revenue refers to revenue derived from the environment (i.e., generated from different green practices). In addition, it is the revenue provided by different institutions to maintain environmental sustainability. Absence of grants and financial incentives is a challenge for dairy businesses in Australia. Environmental financial support is associated with government financial support. Environmental financial support is financial assistance for the environment provided by institutions or generated by environmental resources.

4.7.4.2 INTERVIEW TO SURVEY TRANSITION

The following categories will be further generalised

in the next phase of study, (1) cost price of products (2) return on investment difficult to measure (3) business cost for sustainable practices (4) additional cost for environmentally friendly products and materials (5) environmental revenue difficult to measure (6) absents of grants and financial incentives.

4.7.5 PERFORMANCE SYSTEM AND INFORMATION BARRIERS (THEME FIVE)

Dairy companies in the Australia can use greater technologies to improve environmental practices; this is one area that needs further exploration in GSCM. Performance systems and technology specifically refer to the systems used within business environments to measure data. Performance systems (technology) provides for the automation of tasks, as well as assisting farmers and producers in increasing the amount and quality of their products and tracking environmental activities on a continuous basis (Gargiulo et al. 2018). Maestrini et al. (2018) also suggests it is more effective for firms to measure their business products materials using performance system (technologies). In the Australian dairy industry adapt systems and information practices for GSCM should have greater significance. One interviewee shares their views on running a dairy farm and using systems to measure practices.

(P5):

I do not have any systems in place. I am still in the really early stages of trying to replant a lot more

trees … So, I have not even gone down the road of trying to measure any benefits, and what I know is we must because it is very important. The heat is going to it will never disappear, so every step we can take will be beneficial, and if we could monitor it and see the benefits like solar is an easy one.

The same interviewee also shares their opinions on the importance of water management and monitoring water using systems.
(P5):

Well, focusing on water management is this really big thing on dairy farms. You want to catch every single drop of water back off your farm. So as whenever you are using any water, you are catching it to go back into the recycle dam and run it back around so you can use it to when you are irrigating.

In addition, whether companies measure and monitor water or energy, these are crucial factors that need to be looked at more closely with industry support. Performance systems and stainability can be a significant challenge for dairy businesses, especially dairy farms (Yanto et al. 2019).

Another factor that was mentioned includes Key Performance Indicators (KPIs) concerning sustainability are recognised as a necessary

procedure for any organisation. Performance indicators in sustainable supports keep track of sustainability progress and track the position regarding improvement in future. The energy consumption rate provides insight into the energy consumed by the organisation, which can be tracked over time to improve organisational performance in energy efficiency. One organisation manager suggests this barrier can be overcome by taking into consideration these essential factors.

(P14):

What I think is important... what do we need to measure? Is it being measured? Because that then becomes a point that you can compare your business for one year to the next, plus other businesses to see whether it is farm-related or manufacturing that would provide an opportunity to make those comparisons, and because that is where you start looking at those numbers. That is when you can identify whether you are going or whether any money that you have invested in trying to make improvements have paid off by comparing for one year to the next.

One of the main obstacles concerning measuring KPIs is the list of possible measurable KPIs, which is extensive as well as somewhat daunting. Deciding precisely what is significant to track can be a very critical task.

One other barrier involves dairy businesses incorporating a benchmark for GSCM measurement. As Dubey et al. (2017) suggested, sustainability benchmarking remains a critical

managerial challenge that affects business performance. Benchmarking of sustainability refers to analysing the sustainability performance of many voluntary standards and certifications organisations that focus on applying sustainability measures or making positive effects. It is also one of the significant barriers in the interview findings, as one participant suggests.

(P19):

High production from the farm and into the future, but maybe there could be other ways around this depending on rather than the regulations. Perhaps it could be monitoring. So what data could be collected off those farms to indicate that a farmer is travelling in the right direction with regards to the environment or could sort of benchmark their business against either themselves or against other farms in the area. So maybe that because I am not really aware of any program like that where there may be an individual project, I might be doing a case study on a specific farm but to make that broader. So yes, it may be that that could be a way forward rather than using the regulation. It sounds like there will be penalties involved, and they have enough farmers to have a lot to deal with, let alone adding more governance to the mix.

Moreover, measuring sustainability and incorporating KPIs and benchmarks provides the necessary level of support to evaluate a program against existing best practices (Jorgensen et al.

2006). There are also other interviewees who talk about benchmarks. One interviewee has appropriate benchmarks.

(P16):

Quantifying sustainable can also be a challenge… we measure each year, So I got, and they are all the same parameters so we can compare one year to the next. It is like all the parameters of the factory with quality. We have management reviews all the time, always trying to improve. I guess ultimately it gives us more profit this year.

Knowing which dimensions to measure in operations and production activities can be more effective for large dairies, due to resources and costs, larger companies have a system of measurement in place. Although it can be a significant challenge for most small businesses. One management says.

(P1):

We probably do a lot more practicing, and we realise that when you get asked a question, we think, oh, well, it is just a natural thing we do anyway.

Rao (2011) suggests focusing on quantifying sustainability is recognised as a balance of economic success, ecological protection and social responsibility. This includes ensuring relevance and alignment with effectively developed initiatives. One manager discusses their view of measuring sustainability and quantifying which practices to

measure

(P6):

I think it is important to quantify it because it justifies any expenses, and as I said, engage or analyse what impact you are having made at the farm level or factory level if you are implementing the strategy.

In addition, it is important to look at a wide range of green (sustainable) information and types of business data. This includes collecting and analysing data on many different aspects of sustainability (Sharma et al. 2017). Some examples: energy and resources, GHG emissions and supply chain performance are all examples of sustainable data types (Geng et al. 2018). Business data helps businesses get the information they need to guide sustainability projects and make the most of their resources.

Some businesses that choose to measure sustainability usually hire someone else to do this work for them. One more interviewee suggests information systems are very important.

(P16):

There is a large exponential growth on the requirement from our farmers and they are looking for the information, and we need to be well equipped to give it to them, farmers want to do the right thing.

One other sub-theme found greater information-sharing with suppliers is required. Additionally, information-sharing in the supply chain can improve traceability and visibility (Green et al. 2012). For example, one dairy processor discusses information and their suppliers; companies need to go beyond supplier policies and share more critical information.

(P14):

Most suppliers have an environmental policy like the larger companies will, so we can always grab those if our end customer wants it, and I think I think what you will find in this just confined to the dairy industry, this would be across the board that people would say, yeah, we want to be involved into environmentally friendly, we want to have more sustainability.

Furthermore, integration of environmental information provides sources of information to facilitate the innovation of new eco-products and green practices (Zsidisin & Ellram 2001). Many aspects are significant, such as information accuracy, timeliness, frequency and credibility (Wang et al. 2014). However, some business can important traditional modes of environmental communication.

(P12):

With the supply base. we are a small company. I cannot say there is anything that goes past, I guess that verbal interaction with suppliers.

Small dairy producers and farmers require greater technology use in Australia. Performance systems affect the supply chain from the suppliers to the buyers. However, SMEs may not prioritise new technology and innovation in the supply chain (Rao 2011). One participant talks about technology to measure effluent (P4):

Processing effluent is a big issue, is one that always on the radar is one that always can be managed. It is one of the keys and most talked-about areas, and it is not so much an effort as a resource that we could utilise better. So, it is continuing to evolve with technology and with an understanding of what we can do with that.

In addition, it is all about capturing the data and information (Thomas & Esper 2010). It is clear businesses need more effective implementation of technology to achieve, such as performance systems. An environmental performance system evaluates the interaction level between an organisation and the environment. They have been developed to visualise environmental performance and facilitate the needed identification and prioritising of environmental elements to succeed with effective communication about relevant environmental information.

4.7.5.1 SUMMARY OF THE FIFTH THEME

Monitoring and measuring sustainability are

challenging factors in dairy businesses. Informed sustainability management relies on the quantification of sustainability. This is used to track progress, stimulate stakeholder participation and evaluate sustainability, benefits and goals. Managers did not have any measurement systems in place yet, especially the smaller dairy businesses. Benchmarking sustainable practices may be a barrier in GSC practices. Sustainability in the business is challenging to quantify. Additionally, determining the best use of dimensions to measure operations and manufacturing activities is a huge issue and roadblock for most small enterprises.

Many dairy farmers do not have a measurement system and find this to be a natural occurrence in GSC daily activities. Greater information both within and outside the business is required in dairy businesses. Information on measuring environmental practices needs to be further applied also. Internal business practices are required within an organisation to apply to external environmental initiatives to improve environmental management. More information from suppliers can benefit dairy businesses.

During the interview phase, it was found that businesses have performance systems and information barriers such as technical requirements and measurement systems to formally assist them in measuring GSC practices. The main sub-themes found in the interviews were benchmarking barriers, measuring sustainability challenges, more

critical information required on how to adopt sustainable practices, more meaningful information from suppliers, more information on measuring sustainability and consensus on whether companies monitor and measure GSC practices and whether they have the technical requirements.

4.7.5.2 INTERVIEW TO SURVEY TRANSITION

The following categories will be further generalised in the next phase of study, (1) benchmarking sustainable practices (2) sustainability challenging to quantify (3) more information need to adopt sustainable practices (4) information from suppliers (5) monitoring and measuring practices
(6) Technology (7) more information on measuring sustainable practices.

4.7.6 BUSINESS PRESSURES (THEME SIX)

The first business pressures outlined below incorporates regulation pressure. To begin with, regulation pressure applied by political stakeholders. These influential stakeholders such as government, provide clear advice in the form of regulations, rewards and even fines (Seles et al. 2016). It was found in the interview's regulation pressure may influence businesses regarding implementing specific environmental practices. Furthermore, one interviewee discusses their view on current regulation pressure impacting the dairy community.

(P16):

The political parties and the extreme groups getting more and more pressure on the politicians, and politicians tend to change to get a few things which then put pressure on the farming.

However, interviewees also mention they face regulation pressure constantly and regulation is quite extensive in the industry, as one interviewee who runs a dairy business mention.

(P13):

Look, we are fully exposed and fully burdened by regulatory issues. Whether it is from farm activity or factory activity, so it is an everyday business for us to interact in that regulatory sphere.

According to Wang et al. (2016) outlines dairy farms and processors can be challenged by the volume of regulations to which they must adhere. Greater incentives may be required on regulation pressure.

Another interviewee also suggests regulation may not reflect current challenges in the dairy industry.

(P2):

Government regulation comes out of an inappropriate understanding of exactly what it is and how it is in other ways of trying to solve problems that the dairy farmer wants.

Zhu et al. (2010) also implies regulation pressure can highly influence corporations to implement

green strategies as the pressure that government and regulatory authorities impose on them. One business manager mentions that regulation is also based on air emission measurement.

(P10):

The business must monitor air emissions, and because the businesses is in the countryside, noise is not an issue. But I know other companies have noise regulations as well that they have to comply with through Environmental Protection Agency.

As a result, regulation pressure may be a single plan, or a collection of strategies created by regulatory authorities to establish targets for attaining the greatest levels of sustainable benchmarking. An additional interviewee also suggests they must report their wastewater management from the farm:

(P13):

Wastewater management is part of the license conditions … also, the farms they have done to go all the time, which is something that we what happens on the farm reflects on us. So, if a farm has no influence, entrapment or food flows into creeks and rivers and water sources, or if their food is running from their farm into a neighbour's farm, the dairy regulators will act first on them on the farm. But because they supply us to the conditions of their order determined by us.

Furthermore, government regulation is influencing

dairy business to focus on specific environmental practices. Government legislations have a substantial impact on the dairy sector and the supply chain.

Furthermore, another key factor found in the interviews is competitive pressure. Competitive pressure is defined as the driving force behind mimetic structures such as the motivation to appear like others. In other words, businesses compare themselves to successful organisations, both of which are from external points of view. When issues emerge in the environment, organisations attempt to model themselves on others to overcome them (Ghazilla et al. 2015).

From the literature, the Australian dairy industry has seen a competition-intensive market environment among dairy companies which provides clients with different proposals and business models. The industry has cooperated in certain areas, but this is much less apparent than a decade ago. The more dynamic climate has resulted in winners and losers, and more visibility has resulted from less integration and uncertainty (Gargiulo et al. 2018). However, in practice, competition is not as relevant as it may seem. Interviewees regularly mention competitive pressure and some interviewees also mention that it is not as strong a pressure but still relevant. It is more indirect pressure due to market volatility.

(P2):

We talk to other dairy farmers, and we have farm days when you go to another farm and say what new practices they might be employing, and say, if you want to employ them on your place, it is whether or not you think it suits your style of farming or whether you would it would sit well with our practices and whether we can afford to do it. Indirect competitive pressure may only be in looking at what other businesses are doing.

As a manufacturer discusses that competitive pressure is indirect in their business.
(P18):

And look at all the dairy companies are always looking at each other, how they are doing and making sure that they are sort of keeping up with the Joneses if you like, and that is all that's just been in any sort of mature market and that is happening in.

It was also found that competitive pressure has a connection with regulatory pressure, as there is a significant buying preference that may impact on smaller farmers and producers. There is competition in winning contracts with the more significant customer buyers. Environmental sustainability is one of the tangible aspects that can influence a more significant buyer to sign a contract with smaller suppliers. A dairy manufacturer also states that customer pressure and demands for sustainability and quality are significant priorities in

choosing the right supplier.

(P10):

Certainly, some of the biggest customers, certainly. Have expectations and some of the buying preferences coming from the way they purchase. Companies like to act and say whom they are competing with … Sometimes winning a contract comes into two facts, those less tangible aspects like environmental sustainability and animal welfare.

Competitive pressure can act as a positive impact on dairy business and GSCM practices, as it is evident that most companies are focusing on the price of products and gaining customer preference through environmentally friendly goods sourced by dairy farmers. Organisational customer pressure is also another pressure found. Organisational customer pressure can be described as business-to-business pressure in the supply chain. Organisational customer pressure can influence businesses to use less plastic, recycle, manage chemicals and fertilisers. Firstly, the sustainable pressure from large business buyers is an administrative approach implemented in policies and purchasing contracts. Dairy businesses implement policies and purchasing agreements due to larger dairy businesses having thousands of farm suppliers, and it is timely and costly to inspect all suppliers (Sarkis 2008).

In terms of GSC practices, dairy producers suggest using less plastic due to buyer pressure.

(P11):

Yes, some of the business customers require us to look at using packaging that can be recycled at the other end. So, with cardboard and things like that, you are looking at the possibility of recycling. That is the other end, whether we can separate the plastics in the paper from the type of paper bags. I am just using less packaging as well, so instead of small packages, we are looking at bulk.

Research suggests firms with a higher level of product activity face more significant GSC concerns and implications (Choudhary et al. 2018). In turn, they may influence their business partners more strongly. On the other hand, this pressure is not relevant in many of the businesses, as another dairy site mentions that customer pressure comes from the manufacturing side, suggesting.
(P11):

No, not really, that pressure is put on the milk factories, or the processor, pressures to the processor, and then they address us, what needs to be for the product to be in in a quality that they need it to be.

Seman et al. (2019) suggested that emerging environmental awareness by the public and implementation of the regulations imposed by the government bodies and organisations are increasing pressure. Based on the current interview

findings, organisational customer and competitive pressures are not as strongly suggested. There are three additional pressures found in the interviews which influence Australian dairy companies. These are surprising and significant findings that contribute to the research. These additional pressures are: community pressure, food and security pressure and environmental pressure. Due to the nature of the dairy industry, there is much influence surrounding and addressing climate change (Eastwood et al. 2016).

According to the findings, due to tree planting, usage of rivers and association with nature, Australian dairy businesses, especially farmers, may face public community pressure. Communities and customers want to see environmentally sustainable goods and packaging because of their growing environmental consciousness. Dairy companies face growing community pressure (Eastwood et al. 2016). One dairy farm manager discusses the impact of community pressure.
(P12):

There is more pressure coming on to be more sustainable, not only from an environmental point of view but also ethical, animal welfare, all sorts of things. Farmers are very conscious of having sustainable farms to pass on to the next generation, and in the next generation.

Williams et al. (2011) suggested businesses now have a more outstanding obligation to society's

members, implying that GSC efforts are needed. With the increased understanding of the risk of manufactured supply chain crises, it is not surprising that social factors prompt companies to implement sustainable practices. One interviewee suggests that changing the business model and incorporating consumers into real farm practices can minimise community pressure. On the other hand, Buys et al. (2014) suggested that links to the community can increase the significant social impact on businesses. Furthermore, the public can influence organisations and can be influenced by social norms. The focus needs to be on changing the business model and how to incorporate consumers into real farm practices. Another aspect of community pressure is also relevant in the digital world. Many dairy organisations mention that social media has increased dairy industry awareness and with NGOs and consumer groups, customers need to be more involved in dairy farm and sustainable practices.

(P10):

Animal liberationists were trying to shut down the bobby calf market, we are getting paid bobby calves. same price since 1988. Now, goats and sheep meat and everything is going through the roof of and. bobby calves haven't and because all the chain the responsibility are very scared of industry getting shut down completely because the animal liberationists. The governments and universities and the educated need to be more aware of where the food comes from and help the

producers and have a bit of respect for them.

Environmental management is a crucial topic for dairy businesses, since it involves regulating effluent from dairy farms and ensuring that nearby farmers follow all standards. That is, dairy processors and farmers must adhere to industry-recommended tail docking and carbon-reduction guidelines. The community is the crucial factor, where businesses engage in open dialogue about sustainability.

One of the most significant pressures faced by dairy farmers and producers is the quality of their products. It has also been linked to packing and security, and these two discoveries have merged. For example, sustainable product security is equal to high food quality. They have a direct connection. One business manager who produces cheese products mentions.
(P17):

The other one is milk quality and sustainability. We have got two projects in the quality. One of them is antimicrobial stewardship. So, we are trying to reduce the amount of antibiotic use within three years. And the other one of our sustainability is ensuring that our food is safe with respect to. Monitor the temperature of the milk soon as it comes out of the cow, right through to when we collect it. Just want more control over that as well as the equipment is cleaned.

Dairy producers are constantly in contact with dairy farmers to ensure their food quality and security requirements are being met regularly. Security and packaging are other essential elements of action concerning the challenges of sustainable food consumption and it is essential to have environmentally friendly packaging systems so that the carbon footprint on the environment can be reduced.

Packaging is a main element of food and its preservation of quality by controlling food quality during the storage period. It prevents safety issues with food and prevents diseases. There are significant positive effects seen in reducing food waste due to the extension of shelf life. Packaging is wrongly considered an additional economic and environmental cost and is not considered an added value for waste management and reduction. In the plastic-based industry, packaging is generally oil-based. To tackle the problems related with oil-based packaging, several aspects regarding raw materials need to be attended to (Wantao et al. 2014).

Most products are placed in packages that prevent damage and make the product more acceptable. Whether in glass, metal, paper or plastic, packaging significantly impacts on the solid waste stream.

However, there is the earlier pressure of food

quality and safety pressure. Interviewees indicate that food quality and security are significant issues in the dairy sector. One specifically focuses on incorporating environmentally recyclable packaging.

(18):

It is crucial to ensure the primary packaging seal is not broken. A problem with environmental packaging is that it is made from recycled products and is not always strong enough for packaging lines.

Business plants sometimes cannot support new packaging lines. One interviewee who owns a dairy manufacturing plant and another interviewee also mention a trade-off between food quality and security and incorporating sustainable packaging. Companies can change the product packaging, although the quality may reduce in the products, as mentioned in the findings.

(P14):

The problem with a lot of environmental packaging was, you know, it is made from recycled paper. It is making this and whatever and looking at two things. It is not strong enough for the packaging line. you have to build a completely new plant.

Dairy businesses need to investigate an innovative way of creating packaging that has the main goal of addressing food waste problems and the loss of food by preserving the quality of the food, as well

as issues with food safety, through the prevention of diseases that are borne of food and chemical contamination in food origins (Meena et al. 2019).

Another theme found is environmental pressure; this ensures farmers and processors are taking care of the land and the environment around them. It was also found that dairy farms and producer businesses face general environmental pressures listed in the literature as broader environmental pressures such as environmental stakeholder pressures and even consumer and climate change campaigns. Implementing environmental practices is a significant adaptation to environmental pressure and one industry expert mentions.
(P2):

And mainly silage wrap, which uses less, but there is still a lot of plastic that we do not like. So, if there was, I think I might have heard my employee talking to someone who is doing something with silage wrap, that I cannot think what it was, but that is a huge waste on the farm environment.

Environmental pressure can also be seen as climate change pressure and is significant in dairy businesses' minds. Climate change's effect on growth and water resources has placed enormous strain on Australia's dairy industry in recent years. The industry has a significant impact on the country's carbon footprint, animal health and productivity. As a result, the industry is adopting

green practices and addressing production, storage, logistics and manufacturing issues (Emamisaleh et al. 2017). In turn, maintaining long-term sustainability is becoming increasingly necessary (Raut et al. 2019).

4.7.6.1 SUMMARY OF THE SIXTH THEME

Business pressures are more frequent than overseas pressures on the GSC impact of dairy businesses. Environmental regulation is a frequent pressure on dairy businesses. Dairy farmers and producers report constantly answering enquiries about animal health, water management, chemical usage control, etc. Regulatory forces are fundamental in the sector and often appear in strict laws or rules. However, interestingly, organisational customer pressure is not found to be a frequent pressure on dairy businesses. While customers can pressure businesses to use less plastic, recycle and conduct other GSC activities. this is not a key pressure in the findings and not frequently faced by interviewees, unlike the other pressures. Competitor pressure may be a driving force in dairy businesses. The drive to appear like others is known as competitive pressure. In other words, organisations compare themselves to successful organisations from the outside. When environmental difficulties arise, organisations try to emulate others to resolve these. Community pressure may be a driving force in dairy businesses due to the response to the increased environmental consciousness, communities and customers desire

to see environmentally sustainable items and packaging. As a result, dairy companies are more subject to community pressure. Environmental pressure is a frequent driver for dairy businesses to adopt GSC practices. Aside from the specific environmental constraints outlined in the literature, it has been discovered that dairy farm and producer firms face broader environmental challenges such as stakeholder pressure, international pressure and climate change campaigns. Food quality and security may also be a driver for dairy businesses to adopt GSC practices. Dairy businesses report that one of the most significant concerns they face is food quality. Because it is linked to packaging and security, we merged the data on these two. For example, sustained product security is synonymous with high food quality and the two are therefore inextricably linked. Thus, dairy managers agree that food quality and security are strong pressure

4.7.6.2 INTERVIEW TO SURVEY TRANSITION

The following categories will be further generalised in the next phase of study, (1) environmental pressure (2) community pressure (3) environmental regulation pressure (4) organisational customer pressure (5) competitive pressure (6) food quality and security pressure.

4.7.7 OVERSEAS DRIVERS AND INFLUENCES (THEME SEVEN)

Another key theme found in the interviews is that dairy farms and processors focus on international strategies to implement GSC practices. New Zealand sets general conditions within a regulatory framework to encourage companies to follow more sustainable supply chain practices (Powell et al. 2009). One dairy farm interviewee says about New Zealand.

(P12):

I think they have got a good system now regards to government and industry.

For example, in New Zealand dairy farmers have a budget which allows them to monitor fertiliser. Dairy businesses calculate how much fertiliser leaves the farm and then they can repurchase that amount of fertiliser. In addition, companies maintain previous benchmarks for fertiliser. A manager of a dairy processor mentions their views and influence on sustainability practices.

(P8):

If you go to New Zealand, it is simple, you have to have a nutrient budget over there, so you cannot apply more fertiliser than they deem that you use. So, they calculate what leaves the farm … and then allow you to purchase that amount of fertiliser back again. So, you can. But you can only maintain historic levels of fertiliser and stuff. And I would assume at some point in the future, that will be

here too.

Many dairy companies in the interviews referred to New Zealand environmental practices being leaders in reducing carbon and providing quality dairy milk (Saunders et al. 2010). Another international focus, that was mentioned in the interviews incorporate Europe as a key driver. European dairy farms and processors shows a more significant transition through various supply chain actors, providing consumers with the confidence to enter new market segments. Moreover, one manager mentions that Australia is behind in sustainable regulations.

(P12):

The standards that are required and they're just getting tighter and tighter. Yeah, and, you know, I support good regulation. I support good food and beverage, it is the number one, it must be very well regulated, but we seem to have taken it to a new level. Europeans are laughing at us.

Other countries were also mentioned in the interviews including China (Asia) where for a more sustainable dairy future, high milk-demanding nations like China must match the production efficiencies of the world's leading producers. This would result in considerably lower GHG emissions and reduced land use.

(P14):

China built these big, vertically integrated businesses from the far right through to retail

product. And so, what happens is there is no competitive tension within that supply chain.

Rising worldwide knowledge of the environmental effect of manufacturing processes is putting growing pressure on manufacturers not only in the developed world, but also in Asia's emerging economies. This is an important statement, as an image demonstrating environmental respect can make such access easier. Therefore, the less competition influences greater GSCM implementation. As well as U.S was also mentioned as a key driver for GSCM practices, one manager discusses American tracking strategies.

(P16):

Track of generating their gas and electricity, do not know how far they are going with that. There are found in America that the crews will and looked at for the larger farms.

The dairy business in the USA is setting an example by committing to environmental sustainability. The industry is working towards goals that include cleaner water with more recycling and carbon neutrality. Interviewees mention that US practices that may impact on their own business and provide a positive influence.

(16):

The farms are going to go down the track of generating their own gas and electricity, they are

found in America in the [dairy] larger farms, that we have looked into. In addition, there's also lot of farmers looking at composting. So just leaving the the debris around the farm, they'll put that into composting so it's more controlled and spread it out on the paddocks, water runoff.

The next section focuses on exporting, business exports from dairy businesses also play a role in green practices. Australia exports many agricultural products, especially dairy milk, cheese and yoghurt-based products (IBISWorld 2021). For example, one dairy farmer says.
(P6):

We do cheese and so Bega cheese, Mainland cheese and shredded cheese as such, as opposed to cheese like that. So that is a domestic product, and we export product to overseas companies.

Another interviewee mentions that exports play a significant role in different dairy products in the business. Warehouses and distribution centers may use a lot of power and energy that can impact on the environment.
(P17):

Export processing, the sites that are going to be big stores, of course, use a lot more. Energy to run the refrigeration, so it is very hard for us to compete between sites on power usage.

Companies take into consideration their export

activities and the impact of this on GSC practices. Furthermore, depending on the location of factories, farms and sites, companies must also monitor their export facilities and energy use. Finally, the dairy business plays an essential role in generating employment opportunities and contributing to a positive export rate, essential for economic development. It should integrate sustainable practices throughout the export process (Shashi et al. 2018). Another dairy manufacturer discussing exporting suggests.

(P12):

We are competitive in the northern hemisphere in providing premium milk, and when you are competing in the export market, that can be a challenge.

In addition, it can be challenging to compete and incorporate sustainable practices. Exporting can influence businesses to go green and improve supplier relationships. Environmental parameters have a favourable impact on business reputation (Christmann & Taylor 2001). Furthermore, data shows that implementing exporting techniques, as well as working towards the adoption of GSCM, boost a company's reputation (Garcia et al. 2021). In addition, it is easier for businesses to expand their worldwide operations if they have a green reputation among their suppliers and customers (King et al. 2000).

4.7.7.1 SUMMARY OF THE SEVENTH THEME

Firstly, it was found that GSC business pressure is categorised into two streams, one being business pressure and the other being overseas influence and pressure. The interviewees suggest that they go through six central drivers such as focusing on exports and exports impacting GSC practices, New Zealand, Europe, Asian countries and U.S influence. Finally, exporting products was also a main sub-theme found in the interviews.

4.7.7.2 INTERVIEW TO SURVEY TRANSITION

The following categories will be further generalised in the next phase of study, (1) New Zealand influence (2) Europe influence (3) U.S influence (4) Asia Influence (5) Exporting products (6) Exporting products influence on sustainable practices.

4.8 CHAPTER CONCLUSION

Dairy managers are key leaders in the sector and managers look forward to implementing environmental activities. The conclusion of the interviews stipulates that manager should strive for improvement and that they should be given the resources (both financial and informational) necessary to achieve this aim of implementing GSCM practices. Along with following key ideas from international markets and striving to expand their business and measure GSCM practices.

Greater support is required for dairy farm and processing businesses to remain open and support the innovation of GSC practices. It is theorized the main reason the dairy sector has not been able to successfully implement all GSCM practices is, of course, cost being a significant barrier and drawback, there is greater need for overseas influence and awareness and the needs for innovation in dairy technology on GSC practices, which the government should provide further support for GSCM practices and technology. These themes are prominent factors in influencing dairy businesses that were interviewed for this study throughout their production journey of dairy goods. In addition, these themes have a dynamic dimension to them, as what is importation to the industry changes over time. These seven key themes will be explored further in the next chapter.

CHAPTER 5: QUANTITATIVE RESEARCH METHODS AND RESULTS

5.0 CHAPTER AIM

The thesis was divided into a sequential exploratory method which incorporated the initial phase of the data collection and analysis being qualitative, followed by a quantitative data collection and analysis phase (Creswell 2003). The main reason for the sequential method was to uncover the current environmental practices, pressures, and performance measures in the dairy sector. The first stage consisted of collecting qualitative data and determining the findings and the second phase consisted of the quantitative data results. The findings from the first phase informed the survey questions in the second phase. A semi-structured interview study method was used as the first research tool. The research interviews were then transcribed for data processing and coding. The second stage was distributing a survey to research participants in the dairy industry. This chapter discusses the second stage of the thesis and the quantitative sections, to generalise the themes.

5.1 QUANTITATIVE RESEARCH

The main reason for using quantitative research methods in the second stage was to generalise the findings further and guide business decisions and a course of action. Firstly, this enables decision-

makers to base their management on reliable results based on quantitative models and computer-based tools such as SPSS statistics and MATLAB (Chien & Shih 2007). Secondly, quantitative methods allow for quantitatively grounded comparisons, as they can act as a benchmark between businesses. Quantitative research is more justifiable in this case as it builds on already developed statistical work within the field (Tuni, Rentizelas & Duffy 2018). The quantitative methodology concentrates on statistical, mathematical and numerical analysis of the data obtained from the survey. Quantitative analysis was crucial for the research study; the focus is on many variables in GSCM that all have essential impacts when ensuring environmental initiatives and success in adopting these practices (Apuke 2017). Moreover, the quantitative stage in this thesis was crucial to this thesis as it generalises the interview findings and supports the connections made between the themes. The quantitative stage incorporates the survey results.

The survey results are analysed by measuring the mean, mode, median and central tendency. For the statistical analysis of each theme non- parametric tests were used in this thesis due to the collection of survey data, which is scaled. Each theme is then statistically analysed using the one- sample Wilcoxon rank test and the Kruskal–Wallis test using SPSS statistics were analysed for each theme.

The themes are then connected using regression analysis from SPSS statistics and a predictive model using MATLAB. The software MATLAB was introduced in the later thesis stages to run the predictive analytics on the fuzzy logic design model. Furthermore, one insightful section of the survey is the findings from the short-answer questions. These findings are introduced as "further findings" and are labelled “industry voice” throughout the thesis. This is because they provide some insightful details on the current and future expectations of the dairy industry.

5.1.1 SURVEY METHODS

There are different kinds of data collection processes by which quantitative data can be collected. Some of the most used procedures are surveys and questionnaires to obtain data. Surveys give a high degree of general reliability in addressing a larger population. When contrasted with different information-gathering strategies, surveys can extract information close to the larger population’s specific characteristics. Surveys can be provided in various ways, such as by email or internet (Roeser et al. 2015). The online survey strategy has been the most utilised method for data collection from the target population and it is also most appropriate during the COVID period. Considering a survey’s great representativeness, it is comparatively simpler to discover statistically significant outcomes.

Therefore, numerous factors can be easily analysed with the help of survey techniques (Jones et al. 2013).

5.2 SURVEY PROCEDURE

Surveys were distributed mostly online as this covered a wider population and encompassed a higher response rate. The survey was sent to business managers in the Australian dairy industry. The survey was the second stage of the research to generalise the qualitative findings. An amended ethics application had to be processed before distribution, including the questionnaire approval. Ethics amendment approval was obtained before the survey was distributed H20REA247 (v1). The survey questions were formed as part of the exploratory design to generalise the key themes found in the qualitative stage. The questionnaire is listed in the appendixes. The survey focused on introduction to the dairy business and seven sections: (1) strategies to implement GSCM practices (2) Monitoring sustainable practices (3) business pressures; (4) overseas pressures; (5) government support and assistance; (6) cost and financial barriers and (7) performance system and information barriers.

5.2.1 SAMPLE AND DATA COLLECTION

The data was collected from the sample for analysis and conclusion about the entire population; a sample is taken for study and represents the entire

population (Stuart & Rhodes 2017). The population was determined through industry analysis. Hence, the survey was sent to
500 dairy businesses in Australia. Most analysts concur that an acceptable range is approximately 10% of the population (Majid 2018). The data collected consisted of information about 78 dairy processor/farmer businesses collected from managers. The survey response rate was 16% and representativeness was ensured as the survey was strategically sent to all dairy businesses and farmers. The businesses produce and manufacture products such as milk, cheese and butter. Data was collected via the USQ survey tool, and a reminder was sent by email and phone.

5.2.2 RECRUITMENT OF RESPONDENTS

Recruitment of respondents was established by the following method:

- First, create a database of potential candidates.
- Source contact emails through online searches through purposeful sampling.
- Email businesses: contact details were primarily accessed from referrals or online sources.
- Connect with industry partners such as Australian Dairy Farmers (ADF).

5.3 DATA ANALYSIS METHODS

The thesis uses charts for each theme, representing each survey item's mean and standard deviation. For example, central tendency measures include different statistical measures like the mean. In contrast, the measure of dispersion contains different measurements like the standard deviation, both of which were established (Juul et al. 2021). When descriptive statistics is utilised, it is helpful to summarise our collected information using a blend of tables, graphs and charts, and statistical commentary (i.e., a discussion of the results) (Kaur, Stoltzfus & Yellapu 2018). Finally, statistical software was used to organise, collect and analyse the statistically framed data (Ong & Puteh 2017). Descriptive statistics can describe a sample, while inferential statistics can connect different questions and test whether all the samples are different in facing environmental supply chain pressures (Huang, Tan & Ding 2015). Inference statistics are crucial to the findings as they identify the fundamental highlights of the collected data. This introduces information more significantly, which permits a more straightforward understanding of the information. Hypothesis testing was also implemented to show connections amongst the key themes. This enables us to learn the general ideas and characteristics of the data under study. This measurement includes an analysis of different kinds of graphical representation (Mishra et al. 2019). Therefore, it can be said that graphical representations are used

to create understandable visualisations. SPSS and MATLAB were implemented throughout the analysis phase, as they give very reliable and valid results. They are also very dynamic and fast. They are menu-driven software; in this software, tables, graphs and other visualisations can be created along with the data analysis. First, SPSS was implemented for the descriptive tests, statistics analysis such as the Wilcoxon signed-rank test, Kruskal–Wallis test and regression analysis on SPSS. Then MATLAB was applied to conduct predictive analysis of the data findings and a specific software package was used for the fuzzy logic model not provided on SPSS.

5.3.1 WILCOXON SIGNED-RANK TEST

Each theme is analysed using the mean, median, standard deviation and one-sample Wilcoxon signed-rank test. The one-sample Wilcoxon signed-rank test is a non-parametric equivalent of the one-sample t-test. It is used when the data does not meet the assumptions of the parametric test, such as violating normality (Neuhauser 2011). The one-sample Wilcoxon signed-rank test is used to investigate whether the median of a sample is equal to a theoretical population value. Therefore, the test's null hypothesis is that the sample's median equals the theoretical population value. The alternative hypothesis is that the sample's median is not equal to, is more significant than or is less than the hypothesised population value, the hypothesised median score is 3 for the themes.

The one-sample Wilcoxon signed-rank test assumes that the sample is a simple random sample obtained from the target population, that observations are independent in the sample and that the distribution of the population is symmetrical. Therefore, the numbers of values above and below the median should be roughly the same. The test is based on two different test statistics and yields the same test outcome. The first test statistic is denoted the W_1 statistic and is also known as the T-statistic. This test statistic is computed by summing all the ranks corresponding to the second test statistic, denoted W_2 and calculated by multiplying the rank of the absolute difference score by the sign of the difference score for each remaining difference score. Then add the sum of all the products, i.e., $W_2 = \Sigma\ sign_d * R_d$ (Gibbons & Chakraborti 2014).

Like any other hypothesis test, statistical decisions are made using the critical value or the p-value approach. While using the critical value approach, the null hypothesis is rejected when the test statistic is greater than the critical value. While using the p-value approach, the null hypothesis is rejected when the p-value of the test statistic is less than the chosen level of significance. The table of critical values for the test statistic W_1 is usually based on the lesser selected test statistic. The test's advantage is that it does not rely on the form of the population distribution or its parameters. Moreover, the test is robust and does not require

any assumptions about the shape of the distribution. On the other hand, the disadvantage of the one-sample Wilcoxon signed- rank test is that it is less powerful than its parametric equivalent. Therefore, the p-value and significance approach of (0.05) was used for the table in the next section.

5.3.2 KRUSKAL–WALLIS TEST

The results obtained from the preliminary analysis of each theme were also compared to the dairy respondents' business size and business location. Kruskal–Wallis analysis is employed to examine whether there is a statistically significant difference between the medians of independent groups. The Kruskal–Wallis test does not assume that the data is normally distributed (Conover 1999). Additionally, it is assumed that the observations are completely independent of each other. To have a good measurement scale for the dependent variable, it should be at least ordinal (Vargha 1998). Post-hoc tests were analysed for the significant findings of groups lower then ($p = 0.05$). The differences were analysed using the comparisons on SPSS statistics (Bonferroni was used for post- hoc Dunn's pairwise tests). Thus, it can allow an understanding of difference amongst the groups (Katz & Mcsweeney 1980).

5.3.3 HYPOTHESIS TESTING USING REGRESSION ANALYSIS

Regression analysis is a mathematical tool for evaluating which factors have an effect. Regression analysis is performed to discover which GSCM components are the most important, which GSCM components impact and the confidence in these characteristics utilising a significance approach. In regression analysis, the GSCM elements are referred to as variables, such as the dependent variable, which is the fundamental aspect to grasp or forecast. Then there are the independent variables, which are the components that can impact the GSCM dependent variables (Gallo 2015). Many authors have established quantitative analysis using near 70- near 100 sample size. Ghadge et al. (2017) analysed 104 dairy companies. Sharma, Chadna and Arvind (2017) outlined 74 completely answered questionnaires. Saeed et al. (2018) also incorporated initial 73 responses from their survey. Ali et al. (2017) also used a quantitative approach using a non-probability sampling of 84 participants. In addition to other studies as mentioned above, the sample size in this thesis is similar to papers in the GSCM research. The thesis collected sufficient data of 78 samples to have an estimate with a desired level of accuracy for hypothesis. Below shows the hypothesis outlined in the next section of the chapter.

5.3.3.1 HYPOTHESIS OVERVIEW

The hypothesis was developed after the qualitative methods and findings section. The first regression analysis analysed the connection between business pressure and the key themes, including environmental strategies (GSCM practices), monitoring sustainable practices and business barriers.

Hypothesis 1: Business pressures impact on dairy businesses adopting environmental strategies GSCM practices.

Hypothesis 2: Business pressure impact on dairy businesses monitoring sustainable practices.

Hypothesis 3: Business pressure impact on dairy businesses facing business barriers.

The second regression analysis analysed the connection between government support and the key themes, including environmental strategies (GSCM practices), monitoring sustainable practices and business pressures.

Hypothesis 4: Government support impact and the adoption of environmental strategies (GSCM practices) in dairy businesses.

Hypothesis 5: Government support and connection to business pressures.

Hypothesis 6: Government support impact and dairy businesses monitoring sustainable practices.

The third regression analysis analysed the connection between business barriers and the key themes, including environmental strategies (GSCM practices), monitoring sustainable practices and government support.

Hypothesis 7: Business barriers influence dairy businesses implementing environmental activities (GSCM practices).

Hypothesis 8: Business barriers influence dairy businesses monitoring sustainable practices.

Hypothesis 9: Business barriers and lack of government support in dairy businesses.

5.3.4 FUZZY LOGIC DESIGN

Fuzzy logic design evaluates fuzzy inference methods used to represent complicated system behaviour. The Mamdani design is used in this thesis to predict the function of GSCM practices based on the survey findings and connections of the hypothesis. Fuzzy logic solves problems more efficiently. Fuzzy logic employs non-numerical language variables (Anselin et al. 2009). These are then applied to the business scenario provided in the thesis.

5.4 VALIDITY AND RELIABILITY

Validity and reliability are essential factors in determining the quality of research. Therefore, validity and reliability are considered measurement parameters against which the

analyst's estimation of the procedures' adequacy and precision are assessed quantitatively. Validity was implemented in the initial stages of the survey. It was based on known theory or the results of prior research, such as the interviews developed in stage one (Nijholt 2017). The questions were properly phrased to generalise the interview themes. The thesis also utilised suitable sampling techniques to choose participants (strategically). Before sending out the request for interviews, the sample was strategically chosen, and industry analysis was conducted to get generalisable conclusions. It was ensured that sufficient participants were representative of the population. Once the data was collected, reliability statistics were performed to ensure an effective sampling method. The validity of an experiment determines how well the concept has been understood before experimenting. The most important statistical measure used to test homogeneity and reliability is Cronbach's alpha (Mohajan 2017). Table. 3. is the reliability statistics table providing Cronbach's alpha coefficient. For example, a score of over 0.7 shows high internal consistency (Iniguez et al. 2017). In this case, α = 0.733, which shows the survey questionnaire is reliable.

TABLE 3. SPSS RELIABILITY STATISTICS

CRONBACH'S ALPHA	N OF ITEMS
0.733	43

i. KAISER–MEYER–OLKIN (KMO) MEASURE OF SAMPLING ADEQUACY

The proportion of variation in the variables that an underlying factor may cause is measured by the KMO. The KMO method determines whether correlation amongst variables is minimal. The following are the basic KMO measuring guidelines (Frels 2013):

- Less than 0.5 is considered poor
- Between 0.5 and 0.6 is considered average
- Between 0.6 and 0.7 is considered acceptable
- Between 0.7 and 0.8 is considered good
- More than 0.8 is considered excellent

From Table 4, the KMO value is 0.6, which is considered an acceptable result as it exceeds 0.5.

TABLE 4. RESULTS FOR THE KAISER–MEYER–OLKIN (KMO) MEASURE OF SAMPLING ADEQUACY AND BARTLETT'S TEST OF SPHERICITY.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.599
Bartlett's Test of Sphericity	Approx. Chi-Square	103.288
	df	10
	Sig.	0.000

ii. BARTLETT'S TEST OF SPHERICITY

Bartletts test of sphericity check the correlation matrix to see if it is an identity matrix (the diagonal value s is 1, and the off-diagonal values are 0). This means that the variables are entirely unrelated, making the factor model unreliable. If the p-value of the test is less than 0.05, the questions are valid. Bartlett's test shows 0.000, which is less than 0.05, meaning that the factors from the variables are acceptable. The outcome reveals no high correlations or coefficients amongst the items.

5.5 DAIRY BUSINESS FINDINGS

The descriptive demographic statistics include the frequencies, percentages and means to explore the demographic variable or respondent's business size, industry experience and location.

5.5.1 DAIRY BUSINESS AND BUSINESS SIZE

In Australia, SMEs make up a total of 99.8% of businesses (IBISWorld 2021). As previously mentioned in the literature review chapter and interview chapter, business size plays a large role in dairy GSCM operations. Figure 7. shows the number of respondents from dairy businesses that answered the survey and their business size, representative of the actual population.

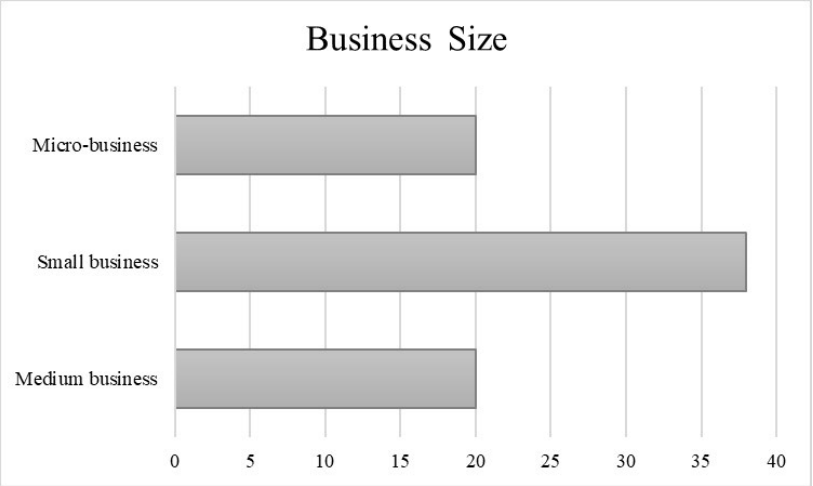

Figure 7. Sizes of respondents' dairy businesses
The business in figure.6 was determined by companies size of employees.

5.5.2 INDUSTRY EXPERIENCE

Figure 8 shows that many of the respondents had 20+ years of experience in the dairy industry, 45 respondents, and 11–20 years' experience for 23 respondents. Eight respondents had 5–10 years' experience, while two respondents had 1–4 years' experience.

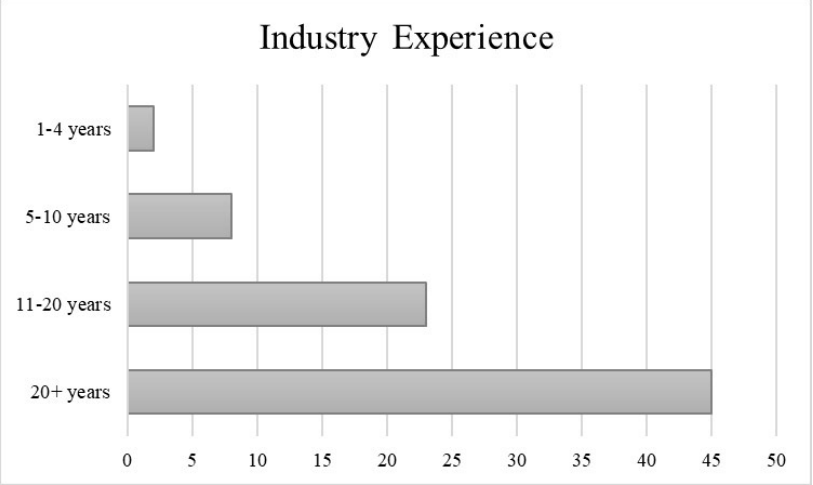

Figure 8. Industry experience of dairy respondents in Australia.

5.5.3 DAIRY BUSINESS LOCATION FROM THE SURVEY RESPONDENTS

Figure 9. shows that 28 respondents were from Victoria, while 13 were from New South Wales. On the other hand, 7 respondents were from Queensland, 7 from Tasmania, 11 from Western Australia and 12 from South Australia.

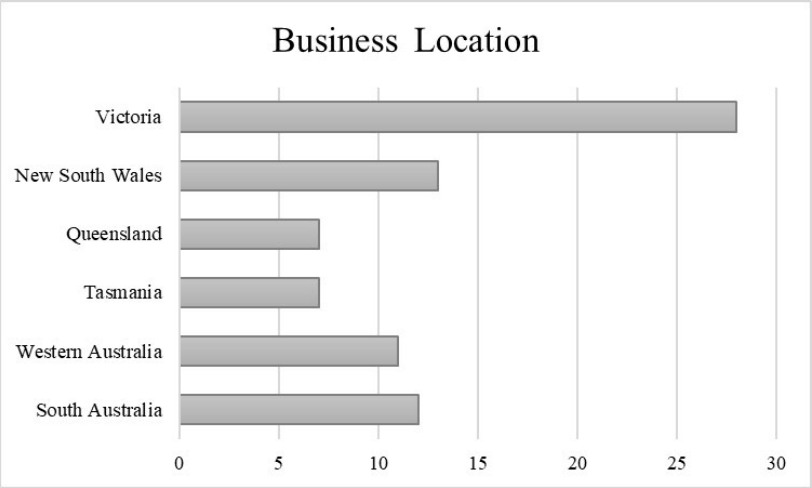

Figure 9. Location of dairy respondents in Australia.

5.6 INTERPRETATION OF THEME FINDINGS

5.6.1 IMPLEMENTATION OF GSC PRACTICES (THEME ONE)

The first theme that was developed incorporated the evaluation of GSC practices. The scale for the first theme was developed to investigate the current implementation of activities found by the interviewees. The scale incorporates: 1. Not considering it, 2. Planning to consider it, 3. Considering it currently, 4. Initiating implementation and 5. Implementing successfully. The chart below shows the mean of each sub-theme. As shown in Figure 10, there is a high

pattern of businesses around 3. Currently considering the GSC practice based on wastewater, recycling water, minimising business waste and managing chemicals.

On the other hand, supplier waste is around 2. Planning to consider it, although the product material mean is 2.6. which is closer to 3, indicating businesses are further focusing on adopting product strategies. Therefore, business managers voiced their opinions that water management, business waste and chemicals are the main priorities in their daily business, while sustainable supplier techniques and packaging are still being developed.

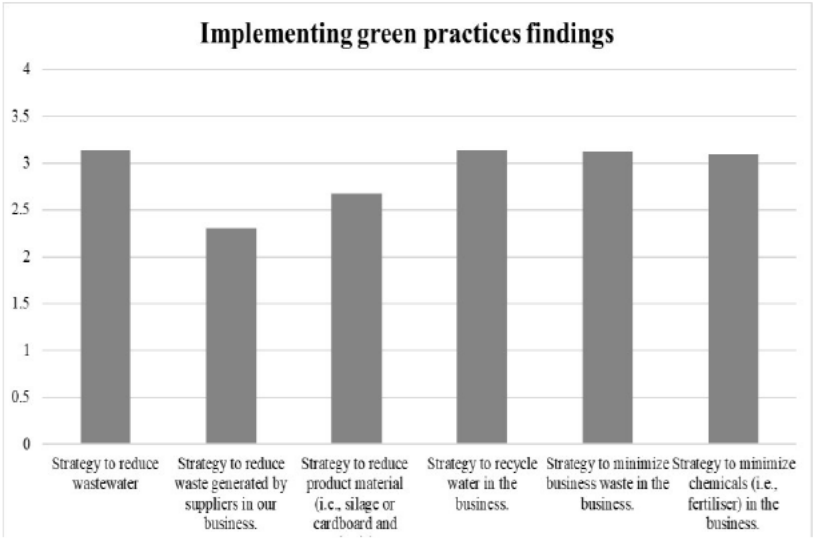

Figure 10. Averages of survey items regarding implementing GSC practices

The first question survey item, which indicates a wastewater strategy, is very relevant to the dairy industry and can be considered a key GSCM practice in the dairy sector. One example is companies are implementing to reduce wastewater

includes using more recycled water, storing the water for cleaning purposes and controlling and reducing dairy runoffs. The data was analysed using the Wilcoxon signed-rank test and the results showed that the median of the data, which is 3, is not significantly different from the main theme ($z = 0.680$, $p = 0.496$). The findings from the Kruskal Wallis test showed no significant difference between whether a company's location ($p = 0.62$) or business size ($p = 0.60$) impacted the strategy to reduce wastewater in dairy businesses. More specifically, regardless of business size or location, there is a consensus reducing wastewater is currently considered.

The next survey item incorporated whether businesses have a strategy to reduce waste generated by their suppliers. Waste generated by suppliers can include product material purchased by the primary business that may later need to be recycled or removed to ensure a more sustainable environment. For example, suppose dairy products such as milk, cheese or butter are purchased by a business to store in a manufacturing site. In that case, the manufacturer must then recycle the material and manage the waste generated by their suppliers. Again, the overall Wilcoxon signed-rank test was

incorporated for the survey item ($z = -4.468$, $p < 0.001$). The median for this was 2. In addition, the findings for this item were significantly lower, which showed these businesses are planning to consider supplier products and waste. However,

they have not successfully implemented this GSCM practice, which may be due to regulation pressure may focus on companies managing water sources and chemicals more than on their product and material aspects. An insightful finding from the Kruskal–Wallis test showed the significance of business size compared to companies reporting reducing supplier waste; business size showed ($p= 0.02$) although business location showed ($p = 0.01$). The post hoc tests for business size, to test pairwise comparisons found that small business and micro business was significantly different ($p = 0.017$).

Small business and medium business were not significantly different ($p = 0.747$). Micro business and medium business were not significantly different ($p=0.482$). The pairwise comparisons test showed micro businesses had a higher method to reduce supplier waste. Queensland had the highest response rate for reducing waste generated by suppliers.

The survey also collected data regarding strategies to reduce product material. Product material on a dairy farm can include plastics used, silage or even cardboard to store the products for the supply chain process. Studies in the agriculture sector focus on reducing silage wastage on dairy farms (Bernardes et al. 2014). The overall Wilcoxon signed-rank test for this showed ($z = -2.199$, $p = 0.028$). The median for the survey item was 3. In addition, there was lower significance to this

survey item and the overall theme, which may be due to the lower mean reported. Other findings showed no significant difference between whether a company's location ($p = 0.27$) or business size ($p = 0.45$). More specifically, regardless of business size or location, there is a consensus reducing supplier waste is currently considered.

Furthermore, the strategy of recycling water in the dairy business, which includes irrigation and using water to produce milk or cheese, was not significantly different from the main theme. The Wilcoxon signed-rank test showed ($z = 0.739$, $p = 0.460$). The median for the survey item was 3. There was no significant difference between whether a company's business size ($p = 0.36$), although there was a significant finding in location ($p = 0.01$). The locations show Victoria, Queensland and Tasmania had the highest response rates regarding recycling water.

In addition to water, the survey also focused on generalising the sub- theme of business waste. For example, business waste on the dairy farm or factory can incorporate waste that has been developed by milk production. Therefore, the more a business can focus on reducing business waste, the greater the environmental impact. The one-sample Wilcoxon signed-rank test showed this survey item was not significantly different from hypothesized median of 3 ($z = 1.084$, $p = 0.279$). The median is 3 and this includes the survey item in line with the key theme of business currently implementing green practices. Other findings showed no significant difference between whether

a company's location ($p = 0.82$) or business size ($p = 0.74$) reduces business waste. More specifically, regardless of business size or location, there is a consensus reducing business waste is currently considered.

Finally, the final survey item incorporated the process dairy businesses are currently implementing to minimise chemicals in their business site. The use of chemicals in dairy can include fertilisers, plant chemicals and many others. The overall response of the managers showed that this is a current practice being considered in their businesses. In addition, it showed that this practice is similar to other practices such as business waste and water management. The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was not significantly different ($z = 0.390$, $p = 0.697$). The median was also 3 for this survey item. Other findings show no significant difference in a company's location ($p = 0.19$) and business size ($p = 0.56$). More specifically, regardless of business size or location, there is a consensus measuring chemicals is a considered practice in the dairy industry.

TABLE 5. SUMMARY OF FINDINGS DESCRIPTIVE STATISTICS AND A ONE-SAMPLE WILCOXON SIGNED RANK TEST AND KRUSKAL WALLIS TEST FOR IMPLEMENTING GREEN PRACTICES

DESCRIPTIVE WILCOXON SIGNED RANK KRUSKAL WALLIS

								Business Location	**Business Size**
Theme: Implementing Green Practices	N	Mean	SD	Mdn	Z	Sig.	R	Sig	Sig
Strategy to reduce wastewater	78	3.1	1.49	3.0	0.68	.049	.08	.62	.60
Strategy to reduce waste generated by suppliers	78	2.3	1.41	2.0	-4.46	.000	.50	.01	.02
Strategy to reduce product material	78	2.6	1.27	3.0	-2.19	.028	.25	.27	.45
Strategy to recycle water	78	3.1	1.45	3.0	0.73	.460	.08	.01	.36
Strategy to minimise business waste	78	3.1	1.11	3.0	1.08	.279	.12	.82	.74
Strategy to minimise chemicals	78	3.1	1.53	3.0	0.39	.069	.04	.19	.06

5.6.2 MONITORING AND MEASURING GSC PRACTICES (THEME TWO)

The second theme that was developed incorporates the measurement of GSC practices. The scale for the first theme was developed to investigate the current implementation of activities found by the interviewees. The scale incorporates 1. Not considering it, 2. Planning to consider it, 3. Considering it currently, 4. Initiating implementation, and 5. Implementing successfully. Figure 11 shows the mean of each sub-theme. As shown in the figure, there is a high pattern of businesses around 2–2.5. The average shows that businesses are planning to measure and monitor green practices.

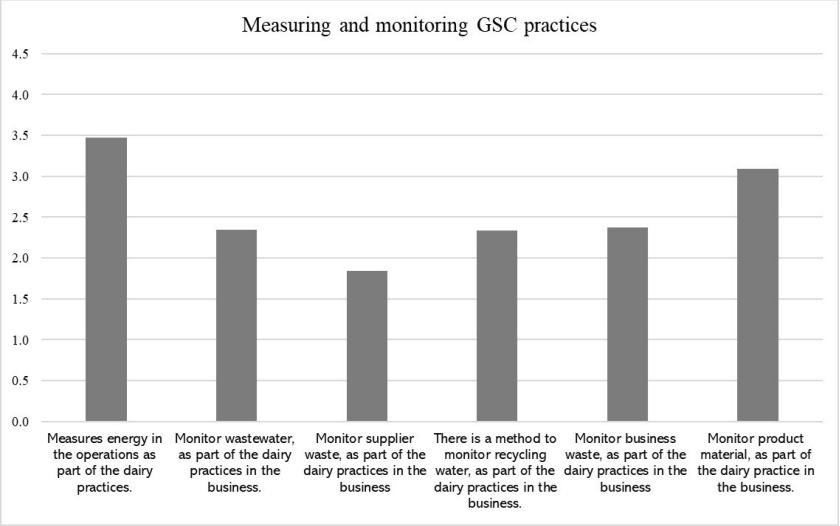

Figure 11. Averages of survey items regarding measuring and monitoring GSC practices.

The first scale item in the second theme incorporating measuring energy, on-farm energy measurement, is one of the critical factors that can help a dairy business reduce costs and positively impact the environment.

The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly higher than the overall theme, as the median was 4 (Z= 2.83, p= 0.005). It showed that businesses were initiating implementation on measuring energy, and most were considering the practice as (M = 3.5). Furthermore, the Kruskal–Wallis test revealed that business location was significant (p = 0.01), while business size was significant (p = 0.02), which is an insightful finding overall. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were significantly different (p=0.025). Small business and medium business were not significantly different (p = 0.608). Micro business and medium business were not significantly different (p=0.703). The pairwise comparisons test showed micro businesses had a higher method to measure energy in the business. Victoria, Western Australia, and Tasmania had the highest practices to measure energy.

Furthermore, another survey item that was analysed is monitoring wastewater; in this scale item, the results were very significant and different from the overall theme, as the mean was low at (M = 2.3) and the median was 2. Furthermore, the one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly different (z = −3.808, p = <.001). This

confirms that dairy businesses need greater assistance in monitoring wastewater. Furthermore, the Kruskal–Wallis test revealed that business location was not significant ($p = 0.25$), while business size was significant ($p = 0.00$), which is an insightful finding overall. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 1.00$). Small business and medium business were significantly different ($p < 0.001$). Micro business and medium business were also significantly different ($p = 0.011$). The pairwise comparisons test showed medium businesses had a higher method to monitor wastewater in the business.

In addition, monitoring supplier waste was another survey item analysed and this includes if dairy businesses monitor the product and material waste brought into the business. The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly different ($z = -6.605$, $p = <.001$) due to the observed median being 1. The mean for the data was ($M = 1.8$). Dairy businesses need greater awareness and support for monitoring supplier waste. In addition, the Kruskal–Wallis test revealed that business location was not significant ($p = 0.09$), while business size was significant ($p < 0.001$). It is an insightful finding overall which concludes that business size may play a role in whether businesses adopt monitoring of supplier waste.

One reason behind this is that it may be due to the number of suppliers that businesses need to manage depending on their productivity. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 1.00$). Small business and medium business were significantly different ($p < 0.001$). Micro business and medium business were also significantly different ($p = 0.007$). The pairwise comparisons test showed medium businesses had a higher method to monitor supplier waste, compared to micro and small businesses.

Monitoring recycling water was another analysed practice. It incorporates whether dairy businesses have a system to measure the amount of water they recycle on the dairy farm or plant. The Wilcoxon signed-rank test revealed that the median score of this survey item was significantly different ($z = -4.381$, $p = <.001$) due to the observed median being 2. The mean for the data was 2.3. Comparable to monitoring wastewater, dairy businesses need assistance to monitor wastewater as they are planning to consider this practice on average. In addition, the Kruskal– Wallis test revealed that business location was not significant ($p = 0.64$), while business size was significant ($p = 0.01$), which is an insightful finding overall. Business size may impact the processes used to measure water compared to company resources. The post hoc tests for business size,

to test pairwise comparisons found that small business and micro business were not significantly different ($p = 3.49$). Small business and medium business were significantly different ($p = 0.010$). Micro business and medium business were not significantly different ($p = 0.69$). The pairwise comparisons test showed medium businesses had a higher method to monitor recycling water in the business.

The next item was the investigation of monitoring business waste; this includes whether dairy businesses measure product wastage and overall materials left over during production. The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly different ($z = -4.617$, $p < 0.001$) due to the observed median being 2. The mean for the data was 2.4. Businesses were mainly planning to consider implementing this practice. However, it has not been implemented yet. Furthermore, the Kruskal–Wallis test showed that business location was not significantly different at ($p = 0.68$), while business size was significant at ($p < 0.001$). The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 1.00$). Small business and medium business were significantly different ($p < 0.001$). Micro business and medium business were also significantly different ($p = 0.002$). The pairwise

comparisons test showed medium businesses had a higher method to monitor business waste, compare to micro and small businesses. The last survey item, which included product material, covered whether businesses monitor and utilise their product material such as cardboard, silage and plastic, and monitor their usage for sustainable practices. The one- sample Wilcoxon signed-rank test revealed that the median score of this survey item was not significantly different ($z = 0.402$, $p = 0.068$) due to the observed median being 3. The mean for the data was 3.1. Businesses were mainly "considering the business practice". In addition, like the other survey items, business location did not have a significant impact ($p = 0.68$), while business size did ($p = 0.01$). The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 0.46$). Small business and medium business were not significantly different (p 0.173). Micro business and medium business were also significantly different ($p = 0.01$). The pairwise comparisons test showed medium businesses had a higher method to monitor material.

TABLE 6. DESCRIPTIVE STATISTICS AND A ONE-SAMPLE WILCOXON SIGNED RANK TEST AND KRUSKAL WALLIS TEST FOR MONITORING GSCM PRACTICES.

	DESCRIPTIVE				WILCOXON SIGNED RANK			KRUSKAL WALLIS	
								Business Location	**Business Size**
Theme: Monitoring GSCM practices	N	Mean	SD	Mdn	Z	Sig.	R	Sig	Sig
Measures energy in the operations	78	3.5	1.30	4.0	2.83	.005	.32	.01	.02
Monitor wastewater	78	2.3	1.41	2.0	-3.80	.000	-.43	.25	.00
Monitor supplier waste	78	1.8	1.03	1.0	-6.60	.000	-.75	.09	.00
Monitor recycling water	78	2.3	1.35	2.0	-4.38	.000	-.50	.64	.01
Monitor business waste	78	2.4	1.08	2.0	-4.61	.000	-.52	.36	.00
Monitor product material	78	3.1	1.37	3.0	0.40	.068	.05	.68	.01

5.6.3 GOVERNMENT ASSISTANCE AND SUPPORT (THEME THREE)

The third theme that was developed incorporates the evaluation of government assistance and support. The scale for the third theme outlines that manager need greater government assistance and support. The scale incorporates 1. Strongly disagree, 2. Disagree, 3. Neutral, 4. Agree and 5. Strongly agree. Figure 12 the mean of each sub-theme. As shown in the figure, there is a high pattern of 2 for the means.

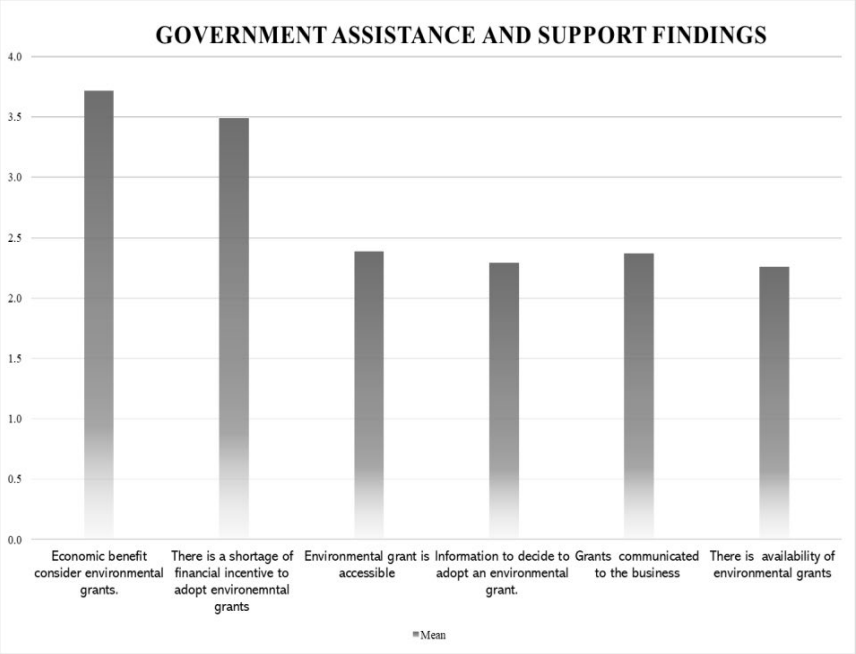

Figure 12. Averages on survey items regarding government assistance and support.

Firstly, in the interview stage it was found that economic benefit played a large role in dairy businesses considering environmental grants. The survey generalised the sub-theme by asking the opinions of managers. The one-sample Wilcoxon signed-rank test revealed that the median score of

the survey was significantly higher than the overall theme ($z = 5.306$, $p = 0.001$), while the median was reported to be 4 and the mean being 3.7. Therefore, it is suggested that business managers agree on the economic benefit of considering environmental grants for the business to adopt GSCM practices. Indeed, greater attention is needed to understand the economic perspective of dairy businesses. The Kruskal– Wallis test revealed that business location ($p = 0.72$) and business size ($p = 0.36$). More specifically, regardless of business size or location, there is a general consensus economic benefit is crucial to businesses.

Comparable to economic benefit, the next survey item asked if there is a shortage of financial incentives to adopt environmental grants. The one-sample Wilcoxon signed-rank test revealed that businesses agree ($z = 3.455$, $p = 0.001$). The shortage of financial incentives for adopting environmental grants was slightly higher ($M = 3.5$), as many participants agreed. The median was also 3 for this sub-theme. Similar to the first item, the Kruskal–Wallis test revealed that business location ($p = 0.91$) and business size ($p = 0.20$). More specifically, regardless of business size or location, there is a general consensus there is a shortage of financial incentives to adopt environmental grants.

Many dairy businesses during the interview stage expressed concern that environmental grants were not accessible to their business; this concern was

also found in the survey. The sample Wilcoxon signed-rank test revealed that the median score of the survey was significantly lower than that the hypothesized median of 3 ($z = -4.997$, $p < 0.001$). Therefore, it is indicated that environmental grants are not as accessible to dairy businesses. The observed median was 2.5. Moreover, environmental grants being accessible to businesses was also quite low on the scale; out of 78 participants, the average was 2.4. The Kruskal–Wallis test revealed that business location ($p = 0.35$) does not affect whether businesses perceive environmental grants accessible to implementing GSCM practices. However, an insightful finding is that business size does play a role ($p = 0.01$). As a result, it can be suggested that smaller dairy businesses may find it more difficult to access grants than larger dairy businesses. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 0.961$). Small business and medium business were not significantly different ($p = 0.60$). Micro business and medium business were also significantly different ($p = 0.011$). The pairwise comparisons test showed medium businesses had a higher access to environmental grants.

The next survey item includes whether dairy businesses agreed that there was information to adopt environmental grants, as the interviewees found in the qualitative stage of the thesis. Most businesses disagreed that there was sufficient information to adopt an environmental grant. The

observed median was 2, which disagrees with the survey found. Information from the Australian government about environmental grants was also relatively low in the findings as the mean was lower (M = 2.3). The one-sample Wilcoxon signed-rank test revealed that the median score of the survey was significantly lower than the hypothesized median of 3 ($z = -5.252$, $p < 0.001$). The Kruskal–Wallis test revealed that business location ($p = 0.18$) was not significant. However, an insightful finding is that business size does play a role ($p < 0.001$), whether managers agreed or disagreed that there is enough information to adopt environmental grants. As a result, it can be suggested that smaller dairy businesses need more assistance on information to adopt environmental grants. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 0.99$). Small business and medium business were not significantly different ($p = 0.89$). Micro business and medium business were also significantly different ($p = 0.001$). The pairwise comparisons test showed medium businesses had higher information regarding environmental grants.

Comparable to the survey item on information and grants, the other sub- theme evaluated whether grants were regularly communicated to the business. This was one theme that most dairy businesses wanted to receive more communication. The one-sample Wilcoxon signed- rank test revealed that the median score of the survey was significantly lower ($z = -4.589$, $p < 0.001$). The

observed median was 2, which disagrees with the survey. Moreover, dairy businesses reported that grants from the Australian government were not well communicated (M = 2.4). The Kruskal–Wallis test revealed that business location ($p = 0.83$) does not affect whether businesses receive grant communication to implement GSCM practices, similar to business size ($p = 0.93$). More specifically, regardless of business size or location, there is a consensus on poor communication from the Australian government on such grant opportunities.

The survey asked participants about the availability of environmental grants. The one- sample Wilcoxon signed-rank test revealed that the median score of the survey was significantly lower than 3 ($z = -4.917$, $p < 0.001$). Moreover, environmental grants from the Australian government were not as available in the Australian dairy business view. The observed median was 2. Moreover, business managers disagreed that environmental grants from the Australian government were readily available to their business, as this sample's mean was relatively low (M = 2.3). Furthermore, the Kruskal–Wallis test revealed that business location ($p = 0.71$) does not affect whether businesses perceive grants available to implement GSCM practices, similar to business size ($p = 0.25$). More specifically, regardless of business size or location, there is a consensus on the lack of environmental grants.

TABLE 7. DESCRIPTIVE STATISTICS AND A ONE-SAMPLE WILCOXON SIGNED RANK TEST AND KRUSKAL WALLIS TEST FOR GOVERNMENT ASSISTANCE A SUPPORT.

DESCRIPTIVE WILCOXON SIGNED RANK KRUSKAL WALLIS

								Business Location	**Business Size**
Theme: Government assistance and support	N	Mean	SD	Mdn	Z	Sig.	R	Sig	Sig
Economic benefit to considering environmental grants for the business	78	3.7	0.95	4.0	5.30	.000	.60	.72	.36
There is a shortage of financial incentive to adopt environmental grants	78	3.5	1.17	3.0	3.45	.001	.39	.91	.20
Environmental grant is accessible to the business	78	2.4	0.89	2.5	-4.00	.000	-.45	.35	.01
Information to decide to adopt an environmental grant.	78	2.3	0.94	2.0	-5.25	.000	-.59	.18	.00
Grants communicated to the business	78	2.4	1.12	2.0	-4.58	.000	-.52	.83	.93
There is availability of environmental grants	78	2.3	1.26	2.0	-4.91	.000	-.56	.71	.25

5.6.4 COST AND FINANCIAL BARRIERS (THEME FOUR)

The fourth theme that was developed incorporates the analysis of cost and financial barriers. The fourth theme scale shows that the interviewees' responses were reported on cost and financial barriers regarding implementing GSCM practices. The scale incorporates 1. Strongly disagree, 2. Disagree, 3. Neutral, 4. Agree and 5. Strongly agree. Figure 13. shows the mean of each sub- theme. As shown in the figure, there is a high pattern of 3 and above for the means.

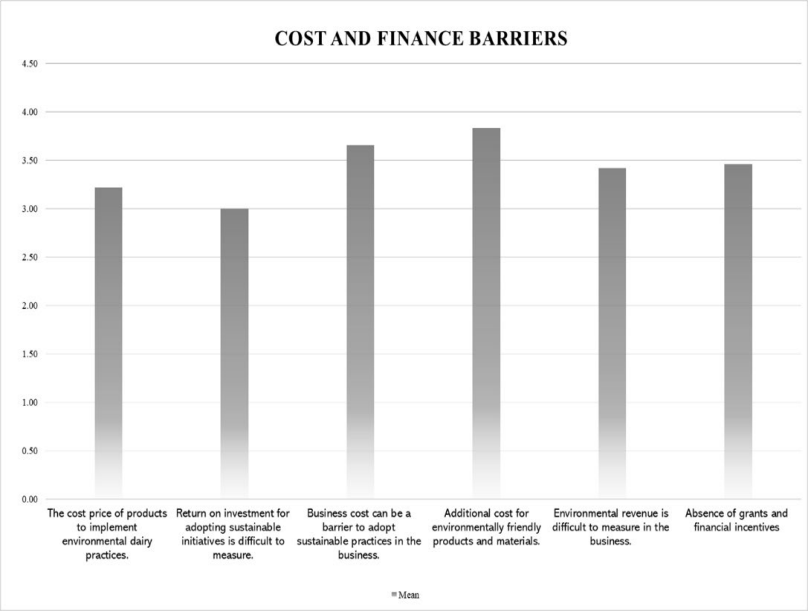

Figure 13. Averages of survey items regarding cost and financial barriers.

The theme which was the most prominent was environmental barriers. Environmental barriers are a significant part as this shows companies may be hesitant to adopt GSC practices. In addition, it suggests what needs to be

improved within the system. Environmental barriers are a sensitive subject, explicitly speaking about finances and environmental performance of companies, which need reassurance that they will survive in the industry. Moreover, environmental barriers play a significant part in government support.

In the first survey item, businesses found a barrier to implementing greener initiatives due to the cost price of products (to go green). The one- sample Wilcoxon signed-rank test revealed that the median score for this survey item was significantly different ($z = 1.490$, $p = 0.013$). The median for this finding was 3. The current findings for the cost price of products show that many businesses had a neutral stance ($M = 3.22$) on cost price products, which is an insightful finding; this may be due to the nature of dairy business products. The Kruskal–Wallis test also revealed significance in business location ($p = 0.04$) and not business size ($p = 0.16$) to managers perceiving the cost price of products as a key barrier. It is noted that cost price may act as a critical barrier to adopting GSC practices. Western Australia and South Australia were the highest to response for cost-price as a key barrier, with New South Wales and Victoria to follow.

Furthermore, businesses suggested that measurement of ROI could be a barrier to

implementing GSCM practices. Businesses invest in solar panels, they also want to see these benefits in the business such that it has a positive impact on their investment and they measure this practice. The one-sample Wilcoxon signed-rank test revealed that the median score for this survey item was not significantly different ($z = 0.066$, $p = 0.947$). The observed median of 3 shows a neutral view of whether ROI for adopting sustainability may be difficult to measure. The survey shows that, on average, businesses found this a barrier to measuring ROI on green products ($M = 3.00$). The Kruskal–Wallis test revealed significance in business location ($p = 0.05$) and not business size ($p = 0.78$) to managers perceiving ROI as a key barrier. It is noted that ROI may act as a critical barrier to adopting GSC practices. Queensland and Tasmania have the highest response rates for barriers to measuring ROI, with South Australia to follow.

The third survey item was concerning business costs. Overall, this can incorporate removing business waste materials or decreasing product material in the business. The one- sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly lower ($z = 4.99$, $p < 0.001$). The observed median of 4 (Agree), which is agreement on business cost, shows it can be a barrier to adopting sustainable practices in a

business. The business cost was one of the higher values, with most companies stating that they are neutral and agreeing that business cost can be a barrier. Moreover, overall business cost shows (M = 4). The Kruskal–Wallis test revealed no significance in business location ($p = 0.51$) or business size ($p = 0.58$) to managers perceiving business cost as a barrier.

The additional cost of sustainable products can also include companies wanting to change the product packaging or even using solar power to make more sustainable products. This can be a costly initiative and act as a barrier. The one-sample Wilcoxon signed-rank test revealed that the median score for this survey item was significantly different ($z = 6.001$, $p < 0.001$). The observed median was 4 (Agree) for additional environmentally friendly product and material costs. Dairy managers found that additional cost for environmentally friendly products was a barrier (M = 4). The Kruskal–Wallis test also revealed no significance in business location ($p = 0.19$) or business size ($p = 0.34$) to managers perceiving additional cost of sustainable products.

Environmental revenue was also another barrier that may impede GSCM practices, and it was found that there is a lack of environmental revenue derived from generating green practices. The one-sample Wilcoxon signed-rank test revealed that the median score

for this survey item was significantly different ($z = 3.468$, $p = 0.001$). The observed median was 4 (Agree) for environmental revenue being difficult to measure in the business ($M = 3.5$). The Kruskal–Wallis test also revealed significance in business location ($p = 0.04$) and business size ($p < 0.01$). To managers finding environmental revenue a barrier, this can include companies in specific states of Australia, and specific business sizes may find environmental revenue less or more difficult to measure depending on the state location and business size, which is an insightful finding. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 0.240$). Small business and medium business were also significantly different ($p < 0.001$). Micro business and medium business were also not significantly different ($p = 0.091$). The pairwise comparisons test showed medium businesses had the lowest response to environmental revenue is difficult to measure, whilst micro business and small business had higher responses. Victoria, Queensland had the highest response rates for environmental revenue barriers. Western Australia and South Australia had lower response rate to environmental revenue barriers.

The last survey item included the absence of grants and financial incentives. It connected government assistance and support to show the

connection between cost and financial barriers, and government incentives. The one- sample Wilcoxon signed-rank test revealed that the median score for this survey item was significantly different ($z = 3.996$, $p < 0.001$). The observed median was 4 (Agree) for the absence of grants and financial incentives. Moreover, the absence of grants is also a key barrier as ($M = 3.5$). The Kruskal–Wallis test revealed no significance in business location ($p = 0.42$) or business size ($p = 0.48$) to managers finding the absence of grants a barrier. Therefore, the absence of grants may be applied to all company locations and sizes.

TABLE 8. DESCRIPTIVE STATISTICS AND A ONE-SAMPLE WILCOXON SIGNED RANK TEST AND KRUSKAL WALLIS TEST FOR COST AND FINANCIAL BARRIERS

	DESCRIPTIVE				WILCOXON SIGNED RANK			KRUSKAL WALLIS	
								Business Location	**Business Size**
Theme: Cost and financial barriers influence	N	Mean	SD	Mdn	Z	Sig.	R	Sig	Sig
The cost price of products to implement environmental dairy practices	78	3.2	2.16	3.0	1.49	.013	.17	.04	.16
Return on investment for adopting sustainable initiatives is difficult to measure	78	3.0	1.09	3.0	0.06	.094	.01	.05	.78
Business cost can be a barrier to adopt sustainable practices in the business	78	3.6	0.92	4.0	4.99	.000	.57	.51	.58
Additional cost for environmentally friendly products and materials	78	3.8	0.87	4.0	6.00	.000	.68	.19	.34
Environmental revenue is difficult to measure in the business	78	3.4	0.99	4.0	3.46	.001	.39	.04	.00
Absence of grants and financial incentives	78	3.5	0.91	4.0	3.99	.000	.45	.42	.48

5.6.5 PERFORMANCE SYSTEMS AND INFORMATION BARRIERS (THEME FIVE)

The fifth theme that was developed incorporates analysing performance systems and information barriers. The scale for the fifth theme shows the interviewees' responses that reported performance systems and information barriers regarding implementing GSCM practices. The scale incorporates 1. Strongly disagree, 2. Disagree, 3. Neutral, 4. Agree and 5. Strongly agree. Figure 14 shows the mean of each sub-theme. Again, there is a high pattern of 3 and above for the means.

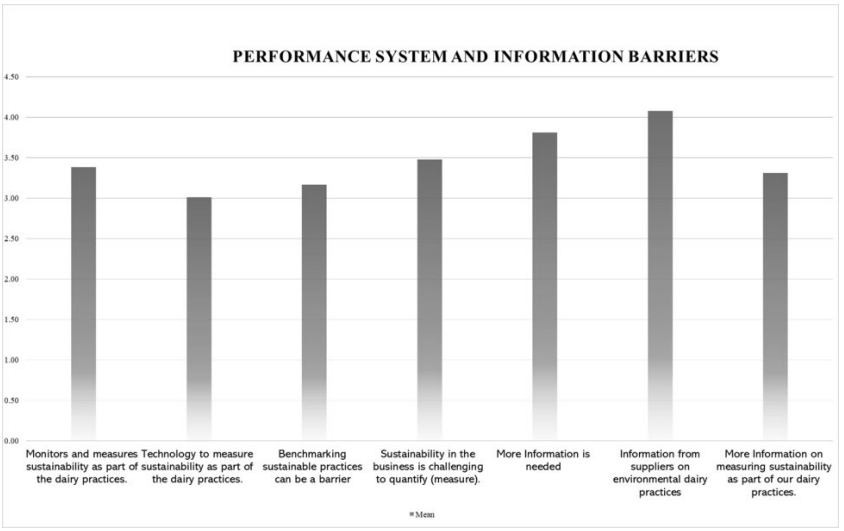

Figure 14. Averages of survey items regarding performance system and information barriers.

The first survey question responded to businesses monitoring and measuring sustainable practices. Dairy businesses were neutral on incorporating a performance system regarding measuring and monitoring GSCM practices. The one-sample Wilcoxon signed-

rank test revealed that the ($z = 2.771$, $p < 0.001$) survey item found a signifant difference the median was also 3 ($M = 3.4$). This finding suggests dairy businesses may need greater monitoring and measuring techniques as the finding was not higher than 3. On the other hand, the Kruskal–Wallis test was interesting as it showed significance for business location ($p = 0.04$) but not for business size ($p = 0.20$). It was found Victoria, New South Wales and Queensland had the higher response rate for monitoring and measuring sustainability.

The second survey item in this theme incorporated the analysis of whether dairy businesses use environmental technology (performance systems) to measure GSCM practices. The one-sample Wilcoxon signed-rank test revealed that the median score for this survey item was not significantly different ($z = 1.405$, $p = 0.685$). The survey item found no large difference in this survey item as the observed median was 3 while the Mean was also 3. This finding suggests that dairy businesses may need greater environmental technology support. The Kruskal–Wallis test was interesting as it showed significance for business location ($p < 0.001$) and business size ($p < 0.001$). It can be suggested that business location and business size can impact whether managers adopt environmental technologies. The post hoc tests for business size, to test pairwise comparisons found that

small business and micro business were significantly different ($p = 0.002$). Small business and medium business were not significantly different ($p = 1.00$). Micro business and medium business were also significantly different ($p = 0.038$). The pairwise comparisons test showed micro businesses need greater support in implementing technology. The states which are more likely to need greater support in technology also include Victoria, being highest on the list, Queensland, and Western Australia as well.

The next survey item incorporates more information on measuring sustainability as part of business dairy practices. In the interview stage, managers indicated the desire to receive more information on improving their measurement practices. The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significant ($z = 2.34$, $p < 0.001$). The observed median was 4, agreeing that more information is needed to adopt sustainable practices. It was also found that greater information is needed for companies to know how to adopt sustainable practices with the Mean being 3.3. The Kruskal–Wallis test showed no significance for business location ($p = 0.50$) or business size ($p = 0.65$). There is a consensus regardless of the size or location of the perception of management that more information is regarding information from suppliers, the survey item connects to dairy businesses wanting to get more data from

their supplier networks to help them make sustainable decisions. The one-sample Wilcoxon signed- rank test revealed that the median score of this survey item was significantly higher ($z = 7.432$, $p < 0.001$). The observed median was 4 for the need for greater information from suppliers on environmental dairy practices. Currently, most companies agree that greater information is required from suppliers on environmental dairy practices ($M = 4.08$). The Kruskal–Wallis test showed no significance for business location ($p = 0.70$) or business size ($p = 0.84$). There is a consensus regardless of the size or location of management's perception of the need for more information from supplier networks. Finally, regarding the need for more information to adopt GSCM practice, the one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly high ($z = 7.05$, $p < 0.001$). Moreover, the observed median was 4, which is an insightful finding and showed that management wants more information to adopt practices ($M = 3.8$). The Kruskal–Wallis test showed no significance for business location ($p = 0.91$) or business size ($p = 0.78$). There is a consensus regardless of the size or location of needing more information to adopt GSCM practices.

Due to dairy businesses needing to report their GSCM practices because of regulation pressure, one additional survey item indicates the

benchmarking approach. The one-sample Wilcoxon signed-rank test revealed that the median score for this survey item was not significantly different ($z = 1.896$, $p = 0.058$). The observed median was 3 (Neutral) for benchmarking of sustainable practices as a barrier. Furthermore, respondents were neutral that benchmarking can be a sustainable barrier as the Mean was 3.1. In addition, companies may need greater technology assistance and support to improve by having a GSCM standard to benchmark their environmental activities. Finally, the Kruskal–Wallis test showed no significance for business location ($p = 0.31$) or business size ($p = 0.82$). There is a consensus regardless of the business size or location. Finally, concerning environmental data, the survey asked dairy managers if sustainability is challenging to quantify. The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly higher from hypothesized median of 3 ($z = 3.929$, $p < 0.001$). The observed median was 4, agreeing that sustainability in the business is challenging to quantify. From the sample size, it is a significant finding that measuring sustainability is a challenge. The businesses also found sustainability challenging to quantify, with respondents stating they agree that it can be a crucial challenge ($M = 3.47$).

The Kruskal–Wallis test showed no significance for business location ($p = 0.40$) or business size

(p = 0.17). The finding suggests there is a consensus regardless of the business size or location.

TABLE 9. DESCRIPTIVE STATISTICS AND A ONE-SAMPLE WILCOXON SIGNED RANK TEST AND KRUSKAL WALLIS TEST FOR PERFORMANCE SYSTEM AND INFORMATION BARRIERS.

	DESCRIPTIVE				WILCOXON SIGNED RANK			KRUSKAL WALLIS TEST	
								Business Location	**Business Size**
Theme: Performance system and information barriers	N	Mean	SD	Mdn	Z	Sig.	R	Sig	Sig
Benchmarking sustainable practices can be a barrier	78	3.1	0.76	3.0	1.89	.058	.21	.31	.82
Sustainability in the business is challenging to quantify (measure).	78	3.4	0.96	4.0	3.92	.000	.44	.40	.17
More Information is needed to adopt sustainable practices	78	3.8	0.60	4.0	7.05	.000	-.80	.91	.78
Information from suppliers on environmental dairy practice	78	4.0	0.64	4.0	7.43	.000	.84	.70	.84
Monitors and measures sustainability as part of the dairy practices	78	3.3	1.07	3.0	2.77	.000	.31	.04	.20
Technology to measure sustainability as part of the dairy practices	78	3.0	1.22	3.0	1.40	.068	.16	.00	.00
More Information on measuring sustainability as part of our dairy Practices	78	3.3	1.02	3.0	2.34	.000	.26	.50	.65

5.6.6 BUSINESS PRESSURES (THEME SIX)

The business pressure theme that was developed incorporates evaluating GSC influence and drivers on GSCM practices. The scale for the theme was developed to investigate current occurrences of businesses facing pressures in the dairy industry. The scale incorporates 1. Never, 2. Rarely, 3. Sometimes, 4. Very often and 5. All the time. Figure 15 shows the mean of each sub-theme. As shown in the figure, there is a high pattern of businesses around 3.

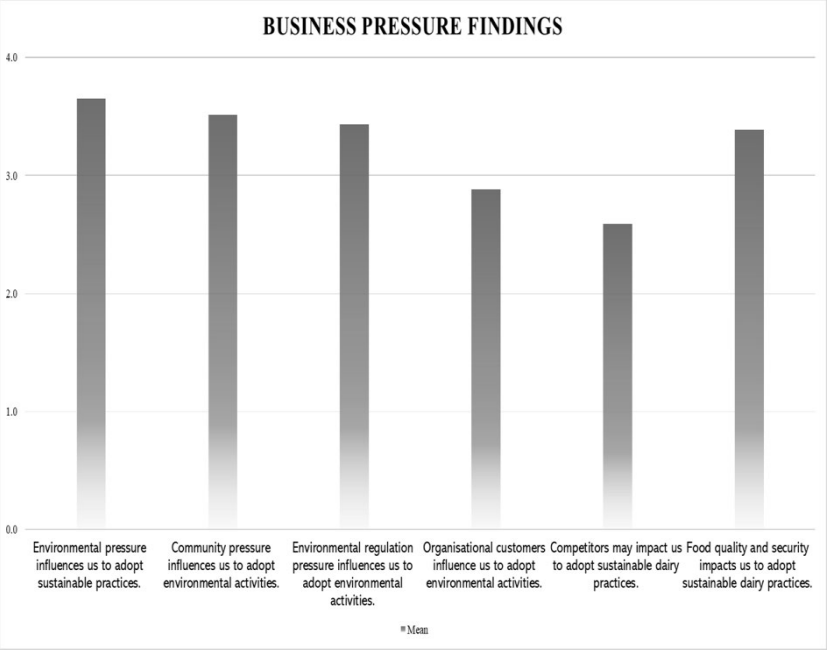

Figure 15. Averages of survey items regarding business pressures

Environmental pressure significantly influenced dairy businesses in the first stage of the thesis. The survey item analysed if dairy businesses regularly face environmental pressure in their business; this can also concern climate change and even environmental land management.

The one-sample Wilcoxon signed-rank test revealed a significantly higher of the hypothesized score of 3. ($z = 5.48$, $p < 0.001$). Moreover, businesses reported facing environmental pressure on the higher end of the scale and noted that it was relevant ($M = 3.7$). In addition, the Kruskal–Wallis test showed significance for business location ($p < 0.001$) and business size ($p < 0.001$). Business location and size can affect whether businesses are influenced by environmental pressure. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were significantly different ($p = 0.047$). Small business and medium business were also significantly different ($p = 0.036$). Micro business and medium business were also significantly different ($p < 0.001$). The pairwise comparisons test showed micro- businesses had the highest response rate, to environmental pressure. The post hoc tests for business location, found Queensland, Western Australia and South Australia had the highest response rates of receiving environmental pressure.

Community pressure in dairy businesses also showed to be a higher driver of their communities in general, impacting the adoption of GSCM practices. The one-sample Wilcoxon signed-rank test revealed that the median score was significantly higher than the population's ($z = 4$, $p < 0.001$). Moreover, on average, this can also be seen very often ($M = 3.5$). On the other hand, the Kruskal–Wallis test showed no significance for business location ($p = 0.45$) or business size ($p = 0.65$). There is a general consensus

regardless of business size and location on community pressure on dairy businesses.

Environmental regulation pressure was also frequently mentioned in the interview stage and found to be a challenge to dairy farms. The one-sample Wilcoxon signed-rank test revealed that the median score of the second survey item was significantly higher then the hypothesize score of 3. ($z = 3.98$, $p < 0.001$). Moreover, it is suggested that dairy businesses face environmental regulation pressure ($M = 3.4$). However, the Kruskal–Wallis test showed no significance for business location ($p = 0.24$) or business size ($p = 0.45$). Regardless of business locations and sizes, they are similarly found to be facing such environmental regulatory pressure.

Organisational customer pressure was found in the interviews, as customers require their suppliers to ensure GSCM standards. an interesting finding, the one-sample Wilcoxon signed-rank test indicated that the median score for the survey item was not significantly different ($z = -0.921$, $p = 0.357$). However, organisational customer pressure is relatively low in the findings compared to the first three pressures ($M = 2.9$). In addition, the Kruskal–Wallis test showed significance for business location ($p < 0.001$) but not business size ($p = 0.19$). Victoria and New South Wales were the highest to face organisational customer pressure, whilst Tasmania was the least.

Dairy businesses suggested that they can focus on other dairy farms, although there is no highly significant competitive pressure in the dairy industry. The one-sample Wilcoxon signed-rank test revealed significantly lower median score ($z = -3.341$, $p < 0.001$). It is suggested that dairy businesses face less competitive pressure, as the hypothesised median is 2. Competitive pressure, like organisational customer pressure, is rarely seen as a pressure in the dairy business ($M = 2.6$). The Kruskal– Wallis test showed no significance for business location ($p = 0.32$) or business size ($p = 0.26$). There is a general consensus regardless of the size or location.

Food quality was another key item found in the interviews mentioned regularly by dairy managers; this may be due to the nature of the products and production. It is highly regulated to ensure food quality is the priority. The one-sample Wilcoxon signed-rank test revealed that the median score of the survey item was significantly higher then the hypothesized score of 3. ($z = 2.95$, $p < 0.001$). Furthermore, on average ($M = 3.4$), this was reported as a business pressure which may be due to the impact of from community pressure. Consumer preference for both food quality and security pressure greatly influences the industry. An interesting finding shows that the Kruskal–Wallis test showed significance for business location ($p = 0.05$) but not for business size ($p = 0.12$). Victoria, New South Wales and Queensland and South Australia were the highest to face food quality pressure. Business location can influence companies on food quality and security drivers.

TABLE 10. DESCRIPTIVE STATISTICS AND A ONE-SAMPLE WILCOXON SIGNED RANK TEST AND KRUSKAL WALLIS TEST FOR BUSINESS PRESSURES.

DESCRIPTIVE WILCOXON SIGNED RANK KRUSKAL WALLIS

								Business Location	**Business Size**
Theme: Business pressures	N	Mean	SD	Mdn	Z	Sig.	R	Sig	Sig
Environmental pressure to adopt sustainable practices	78	3.7	0.82	4.0	5.48	.000	.62	.00	.00
Community pressure to adopt environmental activities	78	3.5	0.94	4.0	4.00	.000	.45	.45	.65
Environmental regulation pressure to adopt environmental activities	78	3.4	0.88	3.0	3.98	.000	.45	.25	.45
Organisational customers pressure to adopt environmental activities	78	2.9	0.97	3.0	-0.92	.003	-.10	.00	.19
Competitors to adopt sustainable dairy practices	78	2.6	0.93	2.0	-3.34	.000	-.38	.32	.26
Food quality and security to adopt sustainable dairy practices	78	3.4	1.19	3.0	2.95	.000	.33	.05	.12

5.6.7 OVERSEAS PRESSURES (THEME SEVEN)

The overseas pressure theme incorporates the evaluation of GSC influence and drivers on GSCM practices. The scale for the theme was developed to investigate current occurrences of businesses facing overseas pressures in the dairy industry. The scale incorporates 1. Never, 2. Rarely, 3. Sometimes, 4. Very often and 5. All the time. Figure 16 shows the mean of each sub-theme. As shown in the figure, there is a common pattern of businesses around 2, as shown in the findings.

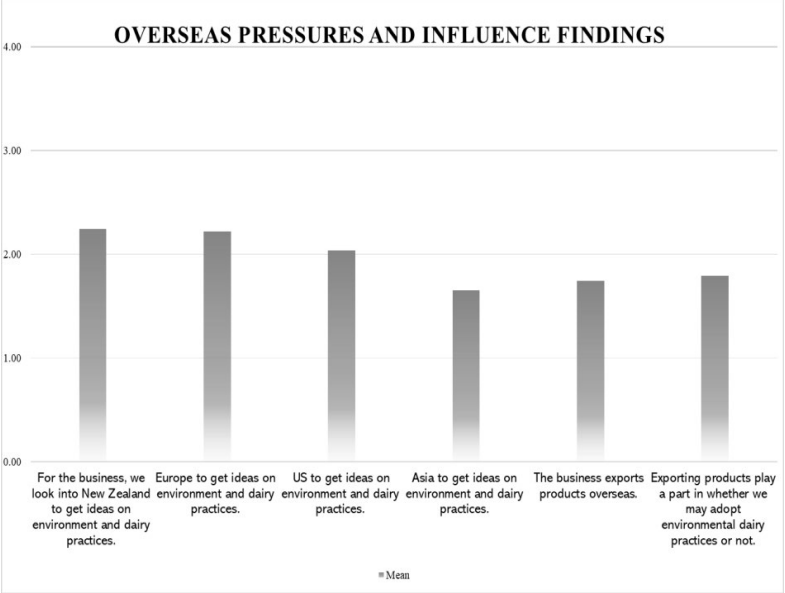

Figure 16. Averages of survey items regarding overseas pressures

The first survey item on overseas pressures included the data analysis for New Zealand. Even though the most findings were low on this theme, New Zealand was one of the top influences on sustainable practices and dairy

farming/processing. The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly lower ($z = -5.189$, $p < 0.001$). Moreover, companies sometimes focus on New Zealand as a source of sustainable dairy practices and pressure. The observed median was low at 2 and the average was slightly higher ($M = 2.24$). The Kruskal–Wallis test showed no significance for business location ($p = 0.72$) or business size ($p = 0.82$), There is a general consensus regardless of the size or location.

The survey also analysed data regarding overseas pressure from European countries in general. For European dairy practices, the one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly lower than that of the hypothesized median of 3 ($z = -5.516$, $p < 0.001$), suggesting that companies rarely focus on Europe as a source of sustainable dairy practices and pressure. The observed median was 2 while the mean was low as well ($M = 2.22$). The Kruskal– Wallis test showed no significance for business location ($p = 0.49$) or business size ($p = 0.18$). There is a consensus regardless of the size or location.

The survey also focused on the USA for GSCM overseas pressures. The one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly

lower than that of the hypothesized median of 3 ($z = -5.937$, $p < 0.001$). The suggests that companies rarely focus on the USA as a source of sustainable dairy practices and pressure. The observed median was low at 2. It was found that dairy businesses rarely focus on the USA to get ideas on environmental practices ($M = 2.04$). The Kruskal–Wallis test showed no significance for business location ($p = 0.21$) but business size surprisingly showed significance ($p = 0.03$). The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 0.66$). Small business and medium business were not significantly different ($p = 0.261$). Micro business and medium business were also significantly different ($p = 0.031$). The pairwise comparisons test showed medium businesses received greater influence from US dairy companies. In terms of the overseas pressure from Asia (China), the one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly lower than that of the hypothesised median of 3 ($z = -7.271$, $p < 0.001$). As a result, companies rarely focus on Asia as a source of sustainable dairy practices and pressure. The observed median was low at 1. The finding was that dairy companies in Australia are not influenced by the environmental practices of Asian dairy businesses ($M = 1.65$). The Kruskal–Wallis test showed no significance for business

location ($p = 0.80$) but for business size surprisingly showed significance ($p = 0.02$). Business size may influence dairy firms to implement green practices through influential drivers from other countries such as China. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 0.168$). Small business and medium business were not significantly different ($p = 0.630$). Micro business and medium business were also significantly different ($p = 0.017$). The pairwise comparisons test showed medium businesses had higher influence from Asian countries regarding dairy practices.

The research also enquired whether businesses export dairy products. The one- sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly lower than that of the hypothesized median of 3 ($z= -6.407$, $p < 0.001$). The observed median was low at 1. It was found that the sample did not have any impact on exporting as the average was relatively low ($M = 1.74$). The Kruskal– Wallis test showed no significance for business location ($p = 0.44$). For business size surprisingly showed significance ($p < 0.001$). Business size may influence dairy firms to implement green practices regarding exporting products; this may be due to larger dairy businesses exporting their products and business size playing a role

in this. The post hoc tests for business size, to test pairwise comparisons found that small business and micro business were not significantly different ($p = 1.00$). Small business and medium business were significantly different ($p < 0.001$). Micro business and medium business were also significantly different ($p = 0.018$). The pairwise comparisons test showed medium businesses had higher export influence on overseas markets. For business exports and adopting sustainable practices, the one-sample Wilcoxon signed-rank test revealed that the median score of this survey item was significantly lower than that of the hypothesized median of 3 ($z = -6.407$, $p < 0.001$). Companies' business exports are not a frequent influence on whether a company decides to adopt green practices. The observed median was low at 1. It was found that exporting products did not play a part in whether businesses adopt environmental dairy practices ($M = 1.79$). The Kruskal–Wallis test showed significance for business location ($p = 0.03$) and no significance business size ($p = 0.09$). There is a consensus regardless of the size. It was found Victoria, New South Wales, Queensland, and South Australia showed the highest response for business exports and adopting sustainable practices.

TABLE 11. DESCRIPTIVE STATISTICS AND A ONE-SAMPLE WILCOXON SIGNED RANK TEST AND KRUSKAL WALLIS TEST FOR OVERSEAS PRESSURES AND INFLUENCE.

	DESCRIPTIVE				WILCOXON SIGNED RANK			KRUSKAL WALLIS	
								Business Location	**Business Size**
Theme: Overseas pressures and influence	N	Mean	SD	Mdn	Z	Sig.	R	Sig	Sig
New Zealand to get ideas on environment and dairy practices.	78	2.2	0.98	2.0	-5.18	.000	-.59	.72	.82
Europe to get ideas on environment and dairy practices	78	2.2	0.98	2.0	-5.51	.000	-.62	.49	.18
US to get ideas on environment and dairy practices	78	2.0	0.96	2.0	-5.93	.000	-.67	.21	.03
Asia to get ideas on environment and dairy practices	78	1.6	0.75	1.0	-7.21	.000	-.82	.80	.02
The business exports products overseas	78	1.7	1.19	1.0	-6.40	.000	-.72	.44	.00
Exporting products play a part in whether we may adopt environmental dairy practices or not	78	1.8	1.17	1.0	-6.40	.000	-.72	.03	.09

5.8 CONNECTING THE GSCM THEMES

5.8.1 REGRESSION ANALYSIS

PSS regression analysis is a statistical method for estimating the relationships between variables. The relationships between the dependent variable and one or more independent variables can also be better understood using regression analysis. Regression analysis is commonly used for prediction and forecasting, and to determine which independent variables are connected to the dependent variable and investigate these connections (Fruend 2006).

In this study, the regression analysis is applied to the overall themes covered earlier in the chapter of business pressure, monitoring sustainable practices, strategies to implement GSCM practices, government support and business barriers. Table 12. Outlines the findings from the first regression analysis of business pressure compared to other themes.

TABLE 12. BUSINESS ENVIRONMENTAL PRESSURE COMPARED TO OTHER THEMES.

Model	*B*	*Std. Error*	*Standardized Coefficients Beta*	*t*	*Sig.*	*Hypothesis result*
(Constant)	0.699	0.527		1.326	0.189	
Strategies to implement GSCM practices	-0.116	0.061	-0.209	-1.913	0.60	Not supported
Monitoring sustainable practices	0.318	0.088	0.453	3.612	0.001	Supported
Business Barriers	0.915	0.108	0.190	1.807	0.075	Not supported

Hypothesis H1: Business pressure in the dairy business impacts dairy business environmental strategies is not supported. The regression analysis table shows a significant negative effect of environmental strategies and environmental pressure from the regression analysis as the standardized coefficient value ($\beta = -0.209$) and the ($p = 0.060$).

Hypothesis H2: Business pressure positively impacts businesses as monitoring sustainable practices is accepted and is a good predictor of this statement. The regression analysis of the coefficient also shows that the coefficient between environmental measurement and environmental pressure has a positive effect as it ($\beta = 0.453$) and the ($p = 0.001$).

Hypothesis H3: Business pressure in the dairy business significantly impacts business barriers is not significant. The regression analysis of the coefficient table shows that the coefficient between environmental pressure and dairy businesses facing environmental barriers ($\beta = 0.190$) and the ($p = 0.075$) is not supported.

Table 13. below outlines the findings from the first regression analysis of government support compared to other themes.

TABLE 13. GOVERNMENT ASSISTANCE AND SUPPORT COMPARED TO OTHER THEMES

Model	*B*	*Std. Error*	*Standardized Coefficients Beta*	*t*	*Sig.*	*Hypothesis results*
(Constant)	2.424	0.473		5.124	0.000	
Strategies to implement GSCM practices	0.009	0.064	0.014	0.132	0.895	Not supported
Business pressures	0.289	0.116	0.255	2.486	0.015	Supported
Monitoring sustainable practices	0.325	0.091	0.409	3.563	0.001	Supported

Hypothesis H4: Government impact is not positively linked with strategies to implement GSCM practices. The regression analysis table shows (β =0.014) and (p = 0.895).

Hypothesis H5: Government impacts have a strong connection with business pressure. The regression analysis of the coefficient has a positive effect as it (β= 0.255) and the (p = 0.015).

Hypothesis H6: Government impacts have a strong connection with monitoring sustainable practice. The regression analysis of the coefficient table shows (β= 0.409) and the (p = 0.001).

TABLE 14. ENVIRONMENTAL BARRIERS COMPARED TO OTHER THEMES

Model	*B*	*Std. Error*	*Standardized Coefficients Beta*	*t*	*Sig.*	*Hypothesis results*
(Constant)	3.974	0.320		12.402	0.000	
Strategies to implement GSCM practices	-0.135	0.064	-0.249	-2.107	0.039	Supported
Monitoring sustainable practices	0.120	0.100	0.176	1.198	0.235	Not supported
Government support and assistance	-0.420	0.109	-0.488	-3.838	0.000	Supported

Hypothesis 7: Business barriers and dairy businesses and strategies to implement GSCM practices is supported as ($\beta = -0.249$) as the significance ($p = 0.039$).

Hypothesis 8: The connection between business barriers and monitoring sustainable practices is not connected ($\beta = 0.176$) and level is not significant at ($p = 0.235$).

For the hypothesis 9: There is a significant link between environmental barriers and government support ($\beta = -0.488$) and ($p < 0.001$), the finding was significant.

5.8.2 *FRAMEWORK FROM QUANTITATIVE DATA ANALYSIS*

The focus of the research is to investigate green practices and the influence of institutional pressure on environmental performance in dairy businesses in Australia and to further analyse environmental activities in dairy businesses and the connections in the research model, as shown in Figure 17.

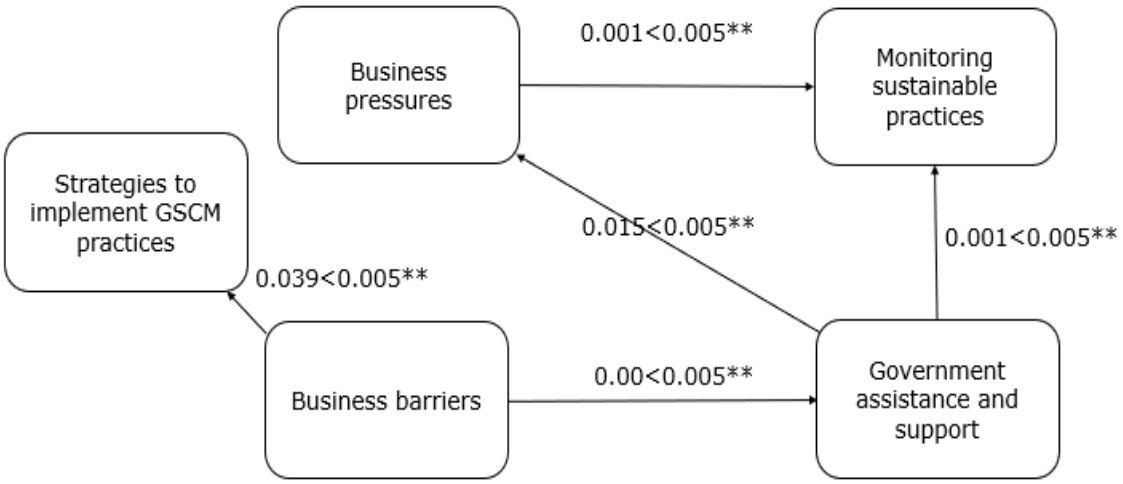

Figure 17. Environmental supply chain framework (supported hypotheses).

5.8.3 *SUMMARY OF HYPOTHESIS FINDINGS*

Figure 17 outlines, the supporting hypotheses, the arrows show the hypothesis (one-way) relationships tested from the results above. The summary of the finding indicates a connection amongst the key factors. The connection shows both direction of environmental pressure and

measuring environmental activities. This connection may be due to, Australian dairy business are required to submit their environmental measures to government agencies and legislation to guarantee compliance and to prevent environmental damage. The connection with environmental pressure and government support is clear. Due to the deregulation of the industry in Australia, companies are focusing on greater government assistance and support to provide monetary funds and more grants available, in order to have the chance to adopt innovative green practices. The relationship between environmental pressure and adopting green practices is rather intriguing, as it was anticipated in this study that there would be a link between these two GSCM factors.

Furthermore, government assistance and support were other key themes in the research. Government assistance was positively associated with environmental barriers, environmental pressure and measuring environmental activities. Moreover, this is one of the most crucial research findings as government support strongly connects to these key themes. The connections between government support and environmental barriers and measuring environmental activities can mean dairy businesses need assistance in overcoming barriers. Dairy businesses need a more robust strategy to implement innovative new

environmental activities that can overcome environmental barriers. The findings also indicate a connection amongst environmental barriers and environmental activities, this may be due to business managers face cost, financial and technology barriers as outlined in the research.

5.9 FUZZY LOGIC DESIGN

5.9.1 INTROUDCTION TO FUZZY LOGIC DESIGN

Many situations encountered in business decision-making can be unclear. Fuzzy logic is a branch of predictive analysis and knowledge representation used to describe ambiguous, unclear situations and assist in decision-making (Mahata et al. 2013). The body of knowledge was first published by Lotfi Asker Zadeh in 1965 and traces back to Ancient Greece. Modern techniques were introduced to business and other applications to create expert systems (Kannan et al. 2014). Membership functions are used in fuzzy logic to assign values, usually with a formula (Bashiri et al. 2012). Membership functions are used to characterise the degree of truth in fuzzy logic. The elements defined for fuzzy inputs are elements in fuzzy sets that are discrete or continuous. These membership functions are expressed in graphical form based on the ordered pairs. Membership functions describe the degree of truth in the fuzzy logic. A suitable range is defined, and the membership functions are assigned values from the given

range. In this thesis, the range used is [0,5]. Some of the most common membership functions are the triangular, trapezoidal, and Gaussian bell membership functions. For this thesis illustration, the fuzzy inputs are expressed using the triangular membership function for up to three levels of the given range. The fuzzy logic classifies every fuzzy input as accurate but marked within a set from the defined range to a different degree. Moreover, the membership function enables us to transition gradually from false to true. The membership rules relate different variables using conditional statements and logical expressions to determine the expected output in fuzzy logic. These rules combine the input in some logical manner to yield output. Joint conditional statements are "if-then" style rules and other Boolean operations used are logical OR, logical AND and logical NOT. These rules demonstrate expert decisions which can be categorised into subsets. In cases where these rules become redundant, they can be adjusted to match the desired state.

5.9.2 *FUZZY LOGIC IN GSCM DECISION-MAKING*

Most business decisions are made after considering several factors. Figure 18. Below shows a fuzzy business model. From the illustration, it is shown as green practices as the linguistic variable and the set of terms as no green practices, low green practices, neutral green practices and moderate

green practices, with high green practices as the key example.

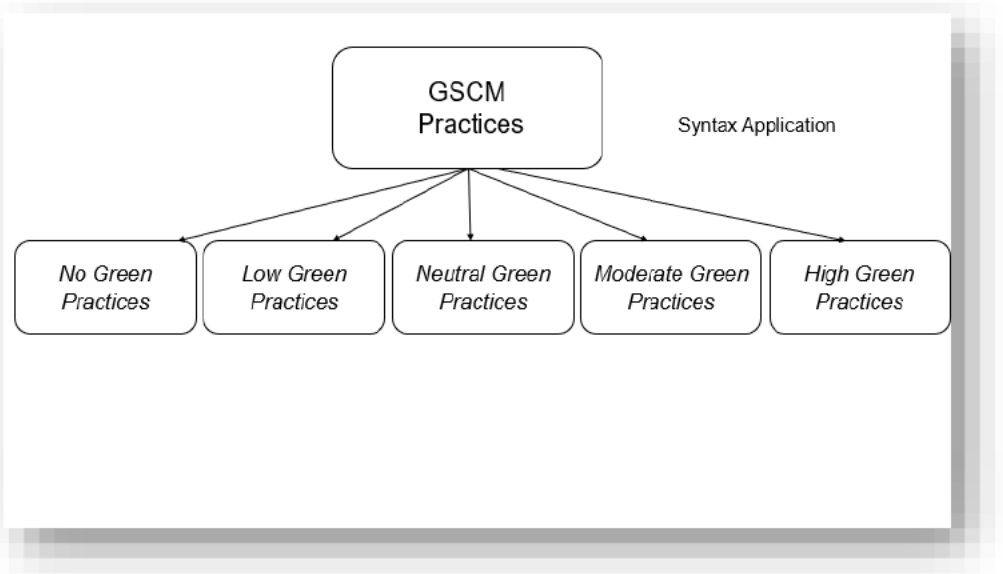

Figure 18. MATLAB scenario for GSCM practices

With the green practices range of 1 to 5, it is seen as 1 it cuts through two sets, i.e., no green practices and low green practices, implying that 1 is regarded as having no green practice and low green practice at the same time. Hence, 1 = {0, 1, 2,0,0,0}. So, to assign the green practices to some terms, the syntax rules are assigned to them. To arrive at the actual value, some semantics are needed such as: What is the meaning of no green practices if it is measured? Green practices, the linguistic variable, is the fuzzy set and the set of terms shows the fuzzy subsets. Hence, as seen, fuzzy logic is experienced when the words are converted into their corresponding numerical values. Moreover, logic gives a bridge between words and numbers.

5.9.3 THE STAGES TO FUZZY LOGIC DESIGN

The stages applied under fuzzy logic to solve problems include rules, fuzzification, inference and defuzzification. Fuzzification: This is the translation of input (crisp numbers) into fuzzy sets. The inputs are calculated by devices and transported to the regulator system for additional processing. As evident in the fuzzification of the examples provided below, the survey data and key findings were incorporated into a fuzzy system approach to create crisp numbers; the thesis used the survey values as input variables in the model.

Inference: This dictates the extent of the match between the fuzzy inputs and the rules. The match percentage decides what rules are to be implemented and the combined rules develop the control actions. The rules are then created based on the survey findings and the data analysis.

Defuzzification: This is the conversion of fuzzy sets into outputs (crisp values). It gives multiple membership functions and a combined value for the output function. The rules and model outputs are shown in a graph to help explain and illustrate GSC practices and scenarios for business decision-making.

5.9.4 THE MATLAB ANALYSIS

This section outlines the MATLAB analysis for the

GSC themes and the fuzzy set models. The first application was regarding GSC practices and measuring in GSC. Moreover, the input data from the statistical analysis was added to the functions. Then, after selecting the membership functions, the rules were also formed. The appendix shows the rules added to the MATLAB functions and the second stage of the fuzzy set application, the inference stage; this level dictates the extent of match between fuzzy inputs and rules. The figures below show the outputs of the MATLAB design. Figure 19 shows the defuzzification of the predictive model of the variable reducing green practices.

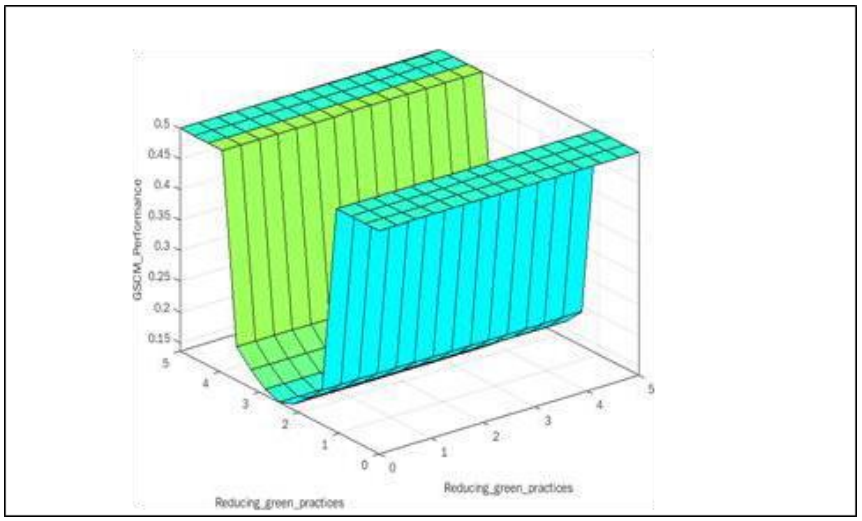

Figure 19. Fuzzy logic map of green practices

Moreover, to elaborate further, based on the dairy industry scenario, two cases have been developed below.

Issue 1: Application of reducing green practices and the measuring/monitoring of sustainability compared to GSCM performance.

Figure 20. The model outlines the following decision making: The less application of green practices and monitoring, the higher the reduction of GSCM performance. Thus, businesses must incorporate both green practices and monitoring to directly grasp the benefits GSCM performance. (For example, management must be reducing product material and monitoring product materials to achieve higher GSCM success). However specific rules are applied below:

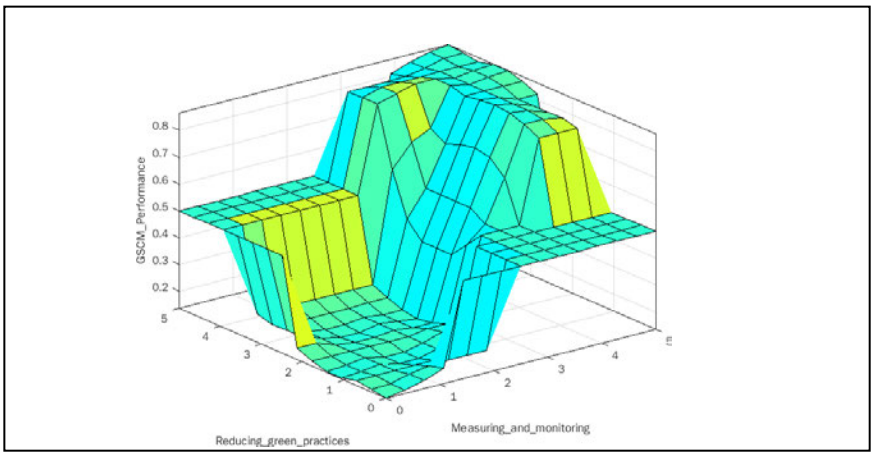

Figure 20. Fuzzy logic map of green practices monitoring.

THE RULE: For dairy companies that are currently considering a practice only but not implementing both yet, GSC adoption may have a negative impact on their overall environmental performance. Moreover, dairy businesses only considering a practice may not reach GSCM performance's full potential.

Issue 2: Application of pressures and barriers in environmental performance.

The overall themes of pressures and barriers; The inputs incorporated significant findings from the survey and regression analysis assisted to predict the impacts of the themes on environmental (GSCM) performance, which is the output variable. In addition, different rules were added to the map to outline different scenarios in businesses. This is shown in Figure 21.

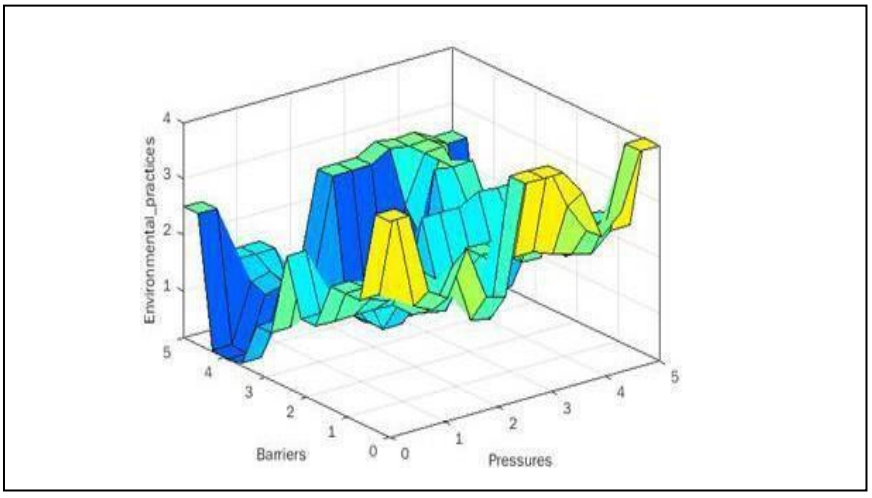

Figure 21. Fuzzy logic output for barriers and pressures.

THE RULE: Dairy companies with high pressures and low barriers are more likely to be motivated to employ GSC environmental performance. Performance and cost barriers can impede a company's results in measuring activities.

THE RULE: Dairy companies with high pressures and barriers cannot increase environmental performance. This shows the importance of financial support.

5.9.5 SUMMARY OF FUZZY LOGIC DESIGN

To conclude, fuzzy inference seeks to map the fuzzy inputs (using fuzzy logic) based on the membership rules defined to describe some concreteness out of the vagueness in the business model. The defuzzification depends on the output from the rules, as shown in the figures above. The survey and data collection analysis created the fuzzy rules for these examples (Pourjavad et al. 2018).

The fuzzy logic of the business model for dairy businesses shows that for GSCM to be improved, businesses must recognise the challenges and barriers that may impact them in the long term and consider monitoring and reducing environmental impacts. Together the membership rules must be based on the best of all the inputs. The fuzzy logic system defines the input variables and the output variables. The membership functions determine the state of the inputs and outputs and are then used to define the membership rules. Finally, the fuzzification process is carried out and the output is defuzzified to show the impact of each variable on the output (Lin 2013). Finally, the data was placed in a prediction model, also known as a fuzzy logic design, based on the quantitative findings. The key rules were developed to predict best future GSC practices. Firms can initiate implementations to achieve higher GSCM performance and try their best to manage the barriers and pressures to increase environmental outcomes.

5.10 FURTHER FINDINGS

5.10.1 THE DAIRY INDUSTRY VOICE

This section describes the further findings from the survey's open questions. The questions include: How do you think time has changed environmental sustainability within your business? What are your expectations of future environmental sustainability? What type of changes can you see for environmental sustainability and the business in the future? These further findings are the industry voice for future change. The survey respondents are provided below. The survey respondents and quotes are list as "s". For example, (S72) is listed below as a quote from a participant.

In the Australian dairy industry, managerial support is essential for developing environmental programs, businesses are also encouraged to follow GSC practices by stakeholders and institutions. As a result, it is vital to investigate whether there is a direct link between this demand and GSC implementation when top management support is secured early.

Lin et al. (2012) state to implement GSCM practices, managers play a critical role for the adoption process. With environmental adoption as a critical process, businesses should understand the pressures and how various types of pressure contribute to environmental requirements in the

supply chain.

The findings outline that the influence to be more environmentally friendly in the dairy business and the external pressures that affect individual companies. (S72): “There are increased pressures in the business from reduced profitability and climate change impacts". In addition, is at the front of society pressure. (S55): "It is becoming more mainstream and socially acceptable" Furthermore one respondent suggests, it can be based on customer choice. (S76): “Customers will continue to choose businesses based on their environmental sustainability". Thus, customers are another essential motivator for managers because they frequently prefer eco-friendly items, which successful businesses provide.

Australian dairy business incorporate motivation to improve. (S76): “We continually look at how we can be more sustainable.” The support from top management, middle management commitment and cross-functional team collaboration are all required for GSC implementation. As a result, to achieve the anticipated effects of GSC procedures which improve environmental performance, cleaner production methods must be applied (Saeed et al. 2018). One manager confirms it is a priority (S31): "Foremost in our minds…no longer an afterthought". Government rules enforce green practices and business owners are legally required to follow them or face penalties. (S76): “Being

environmentally responsible is now an imperative for all businesses". Dairy businesses are very aware that the industry connects with sustainability. Management is critical in a supply chain to create environmental policies and goals and provide resources and training to promote green practices (Dubey et al. 2014). (S55): "Not only is this change inevitable, but it is also essential!" Managers' visions and strategies significantly impact the beginning and successful implementation of organisational change. Thus, sustainability must be embraced by management to establish the necessity for change, a proactive and involved approach is an opportunity for increased GSC practices (Zhu et al. 2013).

Similar to the key findings GSC are also mentioned, water management in farm and factory dairy businesses is a central concept mentioned for the future of the dairy industry. Many respondents indicate that they would like to implement more effective water management GSC strategies. Business wants to see more significant water resources implemented in the Australian dairy sector. One respondent mentions (S33): "Enforcement of recycled water from effluent dams to wash yards. Many farmers do not do this due to the cost of setting it up; however, it would save a lot of environmental resources if done on all farms". Moreover, recycling water can be a cost-saving project once set up in the dairy

business.

Another survey response mentions rainwater-harvesting strategies would assist dairy businesses in improving their water management inputs. Rainwater collection is an excellent technique for farmers to conserve water and run their farms and factories more efficiently. Roof- captured rainwater is known as rainwater harvesting. Rural areas benefit significantly from rainwater harvesting. Finally, many survey respondents indicate that they would like to implement more waste- reduction treatments. Optimising business waste management can benefit both a company and the environment by reducing the cost of materials by increasing efficiency (e.g., avoiding disposal of damaged materials), lowering the cost of pollution treatment and disposal (and possibly generating alternative income streams by finding secondary markets for recyclable products) and decreasing environmental consequences connected with waste disposal (S74): “Also like to convert manure to power in the future.”

Solar energy investments are also favoured by dairy farmers in Australia due to the dry weather conditions. The benefits of dairy businesses investing in solar energy include a pollution-free environment, a free renewable energy source, excellent reliability and lower maintenance expenses (S10): "Any expansion plans will include solar power" and (S54): "Water recycling, effluent recycling, solar power". Dairy companies also want

more effective methods to reduce packaging plastic and incorporate more sustainable packaging. Respondents want to reduce packaging more and generate more sustainable packaging. One manager suggests (S11): "Packaging decisions always include a review of sustainable options" All packaging impacts the environment, use and food waste. Even though eco-design is just one component of this strategy, a complementary collection strategy and recycling infrastructure must also be implemented across Australia. Even the most environmentally conscious packaging is inadequate if the disposal infrastructure is insufficient. It must: be designed holistically to maximise environmental performance while being made from responsibly sourced materials; be suitable for its entire life cycle and aim to protect the product; meet market standards for performance and cost; and be sorted and recycled or recovered (Zhang et al. 2016).

A business should first collect recyclables by separating all the packing materials to begin recycling. As a result, businesses can get a more predictable, higher quality waste stream. This incentivizes investment and innovation in sorting and recycling technology, which boosts green business growth (P55): "We have solar power and rainwater, so our energy and water requirements are sustainable; even less plastic and package are my next area of improvement". More significant effort in the dairy industry is required to measure

and monetize sustainability. Moreover, sustainability should be seen as an investment (S23): "To quantify and monetise sustainability investments". Finance, technology, a lack of expertise and internal motivation are some of the specific influences businesses encounter in implementing sustainable activities (Pressey et al. 2009).

However, one respondent also outlines (S57): "With any environmental malpractice comes a cost, and there is no margin for waste. Public with social media are more informed and therefore more critical". Institutional pressures, namely customer and competition pressures, have strong and positive connections with top management support for GSCM. One manager outlines their view on awareness (S26): "awareness from producers and consumers has impacted demand for earth-friendly practices." According to Lee et al. (2013), numerous companies have demonstrated a correlation between increased environmental performance and financial gains. These companies looked at their supply chains and identified areas to improve their operations and increase profitability (Porteous et al. 2015).

Dairy businesses can be motivated to implement greater GSCM (S63): "Priority to stabilise primary businesses while simultaneously important environmentally sustainable action takes place". There are vital measures to quantify environmental performance. Green concerns are treated

separately in business supply chain processes, according to managers, and unified commitment is frequently disregarded (Rao 2004). One other manager mentions (S65): “Practices are becoming more of a standard with newer businesses and technology”. Because organisations share information and experience and implement informal safeguards based on trust and reputation, supplier collaborations can be performance driver. Dairy managers would like to receive greater information. (S20): "Information from trusted sources (with no financial gain to be had) would be welcome over the information provided by suppliers."

Lee (2015) discovered that GSC processes and providing environmental information to suppliers have the most significant positive impacts. When it comes to increasing social capital with suppliers, the findings suggest that companies focus more on assistance and collaboration. Technology is one tool that can enable sharing of information. One manager discusses the future of the dairy industry (S26): "Technology and awareness of sustainable alternatives will be major influencers". Although the industry is practical, technology may not always be the solution and it should be based on information and implementing this information in farm practices, another dairy manager discusses the history (S32): "I think it has changed a lot with the technology; however, as we work on farmers' sites, these things are based on the farm practices". Encouraging environmental standards in the supply

chain is a significant problem for SMEs, who typically lack the information, skills, capital, and expertise needed to interact with more prominent corporations. According to specific research (Ciliberti et al. 2011; Ilbery & Maye 2005), large enterprises should positively influence green practices by sharing resources and knowledge with SMEs, allowing SMEs to influence their suppliers. As a result, partnership sourcing and associated purchasing practices can assist SMEs in the supply chain (Lee et al. 2012).

Businesses are encouraged to embrace GSC practices by stakeholders and institutions. As a result, it is critical to see a direct link between this demand and GSC implementation when top-level approval is secured early. Government rules enforce green practices and businesses are legally obligated to implement them or face penalties. According to Zhu, Sarkis and Lai (2013), senior management behaviour is influenced by pressure. Customers are another powerful motivator for managers, as they frequently prefer environmentally friendly items, which successful businesses provide.

Lack of management support can lead to apprehension about implementing green practices. Managerial support is essential for establishing environmental programs and it is also required for their success. Management is the driving force behind external green practices (supplier development), which leads to increased supply

chain flexibility.

According to Dubey and Gunasekaran (2014), organisational commitment is essential for implementing GSC processes. Management can assist businesses in achieving good environmental performance by establishing processes and norms in the workplace and encouraging employees to embrace green practices. Managers can even increase industry awareness of sustainability (S74): "Education and knowledge have made farmers aware of environmental consequences in farming practices. Discussion groups have been important in spreading information to many farmers." These suggestions from professional perspectives on what can be done in terms of helping businesses be more environmentally friendly and successful.

Many survey respondents outline current debates and issues in the sector and unveil similarly challenging times in the industry requiring more significant support. One manager suggests (S36): "New technology is available though not always practical or affordable. Political climate and reduction in price have made the industry, especially in Queensland, unviable and unsustainable". Dairy managers also would like greater research in the sector; when asked about expectations, one manager mentioned (S72): "Further research." As a result, it is critical to understand the significant constraints that drive

food industry processing plants' decisions to embrace green practices in Australia (Orlitzky et al. 2011).

On the other hand, there is a gap in the Australian dairy industry in dairy supply chains for maximising their sustainable implementation even though the pressures are increasing (S19): "Growing but the dairy industry slow to pick up or initiate awareness from producers and consumers has impacted demand for earth- friendly practices." Another manager suggests (S72): "Exiting the business is most likely". And cost is a significant factor and can limit management. However, the cost is another significant factor and can limit management (S19): "We are very keen but cynical that our product return will cover the cost of implementation." History has changed the way dairy management operates. One dairy business manager discusses the change over time in the industry (S71):

"Over the past seven to ten years, significant dry periods have made initiating some projects difficult. For example, tree planting has been challenging due to higher labour requirements during drought. Profit margins have also been tight, leading to significantly less investment in the environment".

When first considering regulation, governments historically believed that farmers possessed limited market power and that they must compensate farmers for the costs associated with enforcing health and safety standards for dry milk and

ensuring stable supplies and prices throughout the year. One respondent suggests (P23): "In the dairy industry, as a manufacturer and dairy farmer, if we were not restricted to price taking, we would have resources to adopt a more environmentally sustainable approach under the current supermarket monopoly. When the ACCC accepts $1.00 milk as sustainable, where do we go from here?" Thus, as outline earlier, financially revenue is an increased driver.

On the other hand, a business responded to the survey suggesting that all the factors that impact their business also make it challenging to adopt sustainable practices. Sustainable expectations for the future depend on many variables (S36): "No plan to expand and this business has got smaller. Unviable prices and substantial climatic changes in weather patterns". Eltayeb et al. (2010) suggests grants and reward incentives has the potential to encourage businesses to adopt sustainable practices, and remain profitable, such as the vital link between economic and environmental practices (one study found that turnover was positively associated with sustainable processes) and improved health and safety practices. (S71):

"Provided that milk prices continue to remain high, the investment will be made into sustainable initiatives on the farm. However, if the weather turns dry, feed price increases or milk price drops, there will be more pressure on profit and fewer

funds allocated to environmental management.” One survey response suggests that being more sustainable requires a greater return (S71): “Require greater product return”. Many businesses would like a solution for their financial situation. The industry has a challenge of focusing on other product costs. Moreover, businesses need assistance in investment (S71): “Profit margins have also been tight leading to significantly less investment into environmental sustainability”. The financial situation plays a large role in the dairy sector. Many survey responses indicate a need for price change (S61): "Owners have concentrated on cost savings which have improved sustainability and environmental practices". Another dairy business manager suggests the political climate has changed; the dairy sector's regulation has become more stringent with the dairy price, especially milk (S36): "Political climate and reduction in price have made the industry, especially in Queensland unviable and unsustainable". With the industry's volatility, paired with climate change, pandemic regulations in 2020 and current price changes, it is only a matter of time until support and government assistance are required for the market.

One participant from a small business mentions they have no sustainable expectations for their business (S36): “No expectations as our next move are out of the industry.” Moreover, government support should not only be based on GSC practices but also provide for financial viability for

companies, which is another issue we found in the interviews and surveys. One survey participant mentions that the dairy industry is volatile due to price changes. Another mentions that business is on the decline as well. Price does play a large role in the sector as many responses to the survey indicate a need for price change (S36): "A more viable price would ensure a more viable and sustainable industry." Moreover, cost, and financial barriers play a major in greening the supply chain.

5.11 CHAPTER CONCLUSION

The main aim of this chapter was to generalise the data from the previous qualitative findings, seven themes were further explored such as implementing GSC practices, measuring GSC practices, government support, cost and financial barriers, performance system and information barriers, overseas barriers, and business pressure. The survey items were tested against the Wilcoxon signed rank test and compared to business location and size using the Kruskal Wallis test (and post-hoc test). It was found specific findings may vary due to business size and location. The findings also led to hypothesis development where the themes were tested for a significance, it was found that there was a significant relationship between key factors. The findings also include a prediction model design. Finally dairy industry voice was outlined in the last section.

CHAPTER 6: DISCUSSION

6.0 CHAPTER AIM

The primary objective of this chapter is to discuss the research results and explain the outcome in relation to GSCM in the Australian dairy industry. The chapter also goes through each objective and provides an overview of the approach. Finally, the discussion merges findings from the qualitative and quantitative stages for a comprehensive summary.

6.1 SUSTAINABILITY FINDINGS

Environmental sustainability is critical for both communities and businesses. The business environment comprises farmers (producers), dairy businesses (processors) and consumers. These three can adequately contribute to environmental sustainability which can be achieved when sustainable measures are implemented by businesses (Shah 2021). Applying GSCM practices in the dairy industry can improve managerial strategies to ensure a greener supply chain. Dairy farmers and processors play a large role in ensuring environmental sustainability; they can do this by using sustainable inputs in their farming, therefore benefiting the environment and the business (Sahota et al. 2009). Business location and business size may play a role in the findings as discussed below.

6.2 IMPLEMENTING AND MONITORING GSCM IN THE DAIRY INDUSTRY

The thesis primary objective of the thesis was to discover current green supply chain practices in Australia's dairy industry. Under the first theme, six key green practices were discovered. These practices incorporate, managing water, wastewater, business waste, supplier waste, chemicals, and product material. Furthermore, the findings in this thesis outline that green supply chain practices are crucial in the dairy businesses as they recognise the environmental impact. The most relevant practices in the findings include recycling water and wastewater, reducing business waste and minimising chemicals. This outcome is significant as a dairy business must recycle water and use less waste; such options are all eco-friendly and result in greater environmental outcomes (Peerini et al. 2007). The findings indicate that farm managers are focusing on specific practices; this idea is supported by the finding that managers are currently examining and intending to minimise chemicals and business waste, recycle water and reduce effluent. In addition, reducing product material and supplier waste will be a future strategy used in businesses. Chen et al. (2018) suggests in Australian dairy businesses, products such as cheese factories, produce saline water is the major waste product and it has adverse effects on the environment. In regard to business size and location:

The findings indicated that regardless of the business's size or location. Australian dairy businesses are improving waste management practices and minimising chemicals in dairy farms and processors.

Current methods in the dairy industry also include reducing business waste as a main priority and reducing the use of chemicals on the business site. In addition, dairy businesses are trying to limit the use of fertilisers and ensure they do not get into the waterways. The survey found that minimising business waste and chemicals was a stronger practice than the rest. Graham (2014) outlines that for in farming activities, there is a high probability of excessive application of fertilizers which result in nitrogen pollution. Many farm inputs also have adverse effects on the environment. To ensure environment efficiency, Australia is regulating the application of detrimental farm inputs to foster environmental sustainability and promote a clean green and dairy production image.

The results of the thesis suggest that managing water and recycling water is currently the most significant practice in daily operations. Water recycling such as effluent management has proven efficient in recycling techniques that provide a longer-term water supply (Abdel-Shafy et al. 2018). In reference to business size and location:

Concerning the strategy of recycling water, findings

indicated that regardless of dairy business size, there is a widespread understanding among businesses to improve their strategy to recycle water. The locations indicated dairy businesses in Victoria, Queensland and Tasmania responded with the highest indication concerning recycling water.

Dairy farmers and processors use direct use of water, which may be necessary for yard cleaning, milk pre-cooling, hot washing of milking equipment, cow drinking water, as well as other uses across the dairy site (Shortall et al. 2018). It is suggested that each dairy farm and processor has diverse requirements and the magnitude and efficiency (litres of water per dairy cow, litres of water per litre of milk produced, etc.) of water use on dairy farms varies depending on irrigation requirements, type of production system (e.g., grazing or confinement), milk production, type of milking system (conventional or automatic), geographical location, and environmental conditions. Understanding water use differences may safeguard public water systems and local freshwater sources and optimise infrastructure for a cost-effective water system (Shine et al. 2020). Furthermore, business water management methods must be prioritised (Dewi et al. 2019). The major pressure that may impact water management practices is regulation influence. Regulation drivers are a significant institutional pressure that may have a substantial effect on

businesses. Governments wield considerable influence over individual businesses and may persuade dairy management to guarantee that their water measuring, and management activities contribute positively to the environment (Machini et al. 2014). Water management may also be impacted by the dairy industry challenges such as seasonal conditions and price fluctuations. Furthmore, Voulvoulis (2018) suggest reducing the production and release of wastewater, businesses manipulate techniques such as regulating the generation and consumption of commodities that develop into water corruption. Thus, wastewater generation is curbed. The businesses should also focus on developing environmentally friendly commodities and reducing the impact production of these commodities has on the environment.

In the thesis it was found that greater evaluation is also required for supplier waste management and strategies to reduce product material were weaker practices than the other dairy GSCM practices. In regards to business size and location:

The findings indicated that reducing product materials is presently receiving significant attention regardless of the business's size or location. However, there is a widespread consensus among businesses that greater assistance may be needed to implement strategies for reducing product material. On the other hand, dairy businesses also

require greater support systems in reducing supplier waste.

The findings indicated that micro-businesses responded to a higher method to reduce supplier waste (this may be because micro- business have fewer suppliers to manage; they can also keep track of individual supplier materials and environmental programs). Dairy businesses in Queensland responded with the highest indication for reducing waste generated by suppliers. In addition, in the dairy sector, micro-business in Queensland can outline positive supplier waste practices as an example.

Dairy businesses can improve their supplier material strategies and minimise product material by following a lifecycle approach. It was found that business size may impact whether companies adopt practices to minimise chemicals and reduce waste from suppliers. Beske et al. (2014) also suggested that providing transparency and building partnerships between suppliers are important for green supplier integration. This additional commitment will make a firm and its suppliers more willing to set long-term goals, integrate knowledge and pool resources. These are suggestions that companies can incorporate for better supplier practices.

Mahajan et al. (2016) suggested the lifecycle approach can be used to analyse waste, focusing on the supply chain and the use of power without limiting stages. Firms that begin the value- creation process with raw materials may provide raw materials to value-added firms. Final- customer activities involve distribution and logistical activities. One suggestion from the thesis is that dairy businesses should focus more on reducing silage wraps. Thus, building supplier relationships and implementing a lifecycle approach can help companies with their GSC practices, specifically focusing on reducing harmful products that may impact the environment.

The first objective of the thesis also focused on monitoring and measurement green supply chain techniques. The pattern of results is consistent with the first theme of implementing GSC practices and consistent with the current strategies outlined under theme one. The qualitative stage concluded that smaller businesses might be outsourcing their GSC practices and may only focus on savings and costs, rather than measuring practices, compared to other industries such as the poultry industry. Measuring and monitoring environmental practices is crucial to business as it aims to reduce the negative impact caused by activities and processes through changes and improvements. Some environmental practices include long-term and short-term environmental factors that should be

considered in decision-making and measurement techniques. Biodiversity and ecological integrity must be protected, considering improved value, pricing, and incentive mechanisms (Bengtsson & Seddon 2013).

The thesis found that dairy managers intend to measure energy, wastewater, business waste and product materials. In addition, it was found that measuring supplier waste generation was not a current priority in many businesses. Similarly, greater focus was on managing water and business waste than other GSC practices. The results represent the findings in relation to the first objective of discovering GSC practices. Therefore, this may be explained by the idea that the Australian government often mandates dairy managers to analyse and identify their water use and business practices as part of regulation pressure. It was also found business size may impact all the practices of monitoring and measuring GSC practice. Thus, company size may find this a challenge due to resource constraints.

The findings indicated that medium-sized businesses responded to a higher method to monitor wastewater in the business. As well as, the findings indicated, regardless of dairy location, that the monitoring of wastewater was presently receiving significant attention. In addition, micro-business and small businesses need greater

assistance in monitoring the wastewater from their dairy practices.

The findings indicated that medium-sized businesses responded to a higher method to monitor recycling water in the business. In addition, micro-business and small businesses need greater assistance monitoring recycling water from their daily practices. In addition, regardless of dairy location, the monitoring of recycling water required greater attention. The findings also indicated that medium-size businesses responded with a higher method to monitor supplier waste than micro and small businesses. Similar findings were incorporated for monitoring product material. Again, the findings indicated that smaller businesses need greater assistance. Although regardless to business location, there was a general consensus for all firms.

The findings indicate that micro-business and small businesses need greater assistance monitoring their supplier waste from their daily practices. Although, regardless of dairy location, there is a general consensus. The findings indicated that medium-size businesses responded to a higher method of monitoring business waste than micro and small businesses regardless of dairy location and that monitoring recycling waste required more attention.

One surprising finding indicated, is the micro-businesses responded to a higher method to measure energy in the business. For example, dairy businesses in Victoria, Western Australia, and Tasmania responded to the highest practices to measure energy. This may be due to micro businesses can focus on their expenses and bills more efficiently as the dairy site is small.

Rad et al. (2014) outlined Australian dairy and environmental practices, with the rising environmental issues such as energy consumption and waste production as Australia is taking on stringent strategies that are aimed at improving environmental efficiency. The environmental issues addressed are curbed by use of technological means and systems that can be beneficial in promoting environment conservation. Optimization of available resources is also being considered as a great way to avoid wastage (Bewsell et al. 2015). Even though the dairy business has a strategy to reduce wastewater as found under the first theme, they may need more technical help to monitor wastewater. Monitoring wastewater was a significantly weaker practice and businesses were only planning to consider it. This is observed to be similar to the way monitoring supplier waste not being currently considered which is unlikely the GSCM practices where businesses were planning to consider reducing waste from suppliers. Due to managerial responses to their current practices,

another interesting aspect found in the thesis was that in most survey items for the monitoring GSCM practices theme, the business size was a significant factor, this may be because medium to larger dairy businesses have a method and resources to measure their GSCM practices. In contrast, smaller dairy businesses that may need more support and financial aid.

6.3 APPLYING FINDINGS TO ANOTHER INDUSTRY

This research can also be applied in the poultry industry to follow GSC activities as in the dairy industry. The poultry business has material- related procedures. Recycling, avoiding potentially hazardous materials, product design practices and standardised components are utilised to promote reuse (Leinonen et al. 2016). Disassembly requires identifying materials. Workplace safety and waste disposal should be improved, such as poultry by-products. Future meat demand will place a strain on water and agricultural land. Water is a scarce resource for all industries and the Australian poultry business uses a contemporary, efficient production method to maximise environmental efficiency (King et al. 2018).

6.4 INFLUENCE OF GOVERNMENT SUPPORT ON THE DAIRY INDUSTRY

Australian dairy businesses need greater support to succeed both in the industry and in GSCM practices. GSCM practices can lead to business success and

increased profitability (Huang et al. 2015) Although the deregulation of the dairy industry has contributed to declining support, causing many farms and processors to leave. Government support connect with the second research as a key driver in the Australian dairy sector, as found in the thesis section of industry voice, key dairy industry challenges such as climate change remain an issue and businesses are exiting the industry. Dairy businesses need greater support as they lack financial incentives and economic rewards, specifically the SMEs. Business size may play a role in environmental grants being accessible to the business and whether there is adequate information to adopt environmental grants. Environmental activities are costly to implement, and funding is scarce. Environmental grants are few and poorly communicated as noted in both stages of the thesis. The dairy system should also regulate the prices for processed dairy, ensuring it is affordable to its consumers. While addressing productivity, the government must provide funds and direct them to the field of research and development; this should include testing soils, ensuring that the soil is not deprived of nutrients required to grow the required crops. However, farmers should also be educated on which crops grow best on their farms, increasing productivity (Higham et al. 2017).

The findings indicated that regardless of dairy business size or location, businesses have a

widespread understanding in relation to economic benefits, environmental grants, shortage of financial incentives to adopt environmental grants, communication of grants, and availability of grants. Alternatively, regarding information about adopting environmental grants, the findings outline that medium-size businesses responded with higher information concerning environmental grants. Such as accessibility of grants incorporated a higher indication for medium-size businesses. It could be suggested that micro and small businesses need more information and accessibility to grants.

Dairy businesses are experiencing trouble receiving and implementing grants, thus as a key suggestion government support needs to be increased of businesses to receive environmental funding. Therefore, the Australian Government should supply more information and communication to rewards and incentives, and implement national strategies for recycling and managing water, products, and business waste to obtain these rewards and incentives.

The thesis found few financial incentives for embracing grants, specifically it can also be suggested government support can help businesses on the use of plastics and other non-biodegradable substances should be eradicated or reduced. Dairy industry plastics can be recycled to prevent dumping, which negatively affects the environment. Another method can include support

for adopting performance systems to monitor water sources is another thing the government can actively help with; measures should be taken to acquire more land to increase the quantity of dairy products (Chu et al. 2017). Furthermore, in the thesis findings it was suggested dairy businesses are influenced be more eco-friendly can receive funds for implementing GSCM practices on dairy sites, this may be motivation Australian SMEs more due to environmentally sustainable dairy businesses are more appealing to customers, since dairy businesses can continue to grow their business and consumers are more likely to buy dairy products from a store that values good products for the environment. Subsequently, green dairy businesses can increase their sales.

Sahota et al. (2009) suggest government support can offer incentives to business owners in this industry to motivate them to use eco-friendly energy sources and equipment in their production and processing activities. It can offer the businesses tax rebates if they meet green standards and offer them loans and grants to boost the transition to be more environmentally sustainable. The government can offer tax rebates to businesses that meet the newly set environmental regulations and standards. Tax rebates will improve the demand for environmentally friendly products and services as dairy business owners strive to meet the new

environmental regulations and standards. Examples of government incentives that influence sustainable practices include financial, technical and business support, and fiscal and regulatory incentives (Ullah et al. 2021). Financial incentives are untaxed financial support such as loans, grants and subsidies. This incentive is fundamental in steering dairy businesses towards environmental sustainability as it will help them purchase environmentally friendly equipment. Technical support incentives can include facilitation services, research and development, technological packages, and other extension services. For example, governments can send out a technical team to offer free training to businesses on using technological advancement to attain environmental sustainability, influencing dairy businesses to go green in their production and processing activities using fiscal and regulatory incentives (Warner & Zheng 2013). In addition, regulatory incentives to influence dairy businesses' sustainability. These incentives involve offering the businesses favourable regulations, such as monetary and near monetary rewards, to induce polluting organisations to minimise dangerous pollutants (Barksy et al. 2019).

The government can also influence dairy businesses to be more environmentally sustainable by financing them to transform energy and industrial systems, solve environmental pollution

and protect natural capital. The dairy industry can grow if the growing urgency around environmental degradation and climate change is addressed. Governments can also provide grants to research and academic institutions to fund innovation and development of transformative technologies such as renewable resources, waste management and carbon capture (Koontz 2006). Lebacq et al. (2015) suggest governments can also invest in solutions based on nature and agriculture to protect the ecosystem and develop a sustainable dairy system and low-carbon or renewable energy sources for direct industry support. Additionally, the government can offer businesses loans at lower interest rates to achieve environmental sustainability. It can also offer lending and sustainable financial facilities favourable to promising businesses like green bonds and sustainability-based loans (Sahota et al 2009).

6.5 COST AND TECHNOLOGY BARRIERS IN THE DAIRY INDUSTRY

The other aim of the thesis was to examine the barriers that impact dairy industry in implementing environmental practices. The themes of cost barriers and performance and information barriers are the key barriers faced in the industry. In the thesis factors such as business cost, additional cost to go green and absence of environmental grants were mostly recognised by managers. However, managers were mindful of

factors such as ROI for the remainder of the factors and the price of products was also suggested, although business costs and environmental revenue showed higher averages. One explanation can connect to a finding that business location and business size was found to have an impact whether a dairy business measures environmental revenue also.

Irrespective of business size, there was a significant consensus amongst respondents that the cost price of a product can be a key barrier. Dairy business location may also impact as it was observed Western Australia and South Australia were the highest indication for cost-price as a key barrier, with New South Wales and Victoria to follow. These dairy states may be facing higher industry costs. There was a consensus amongst the findings that business size was insignificant. Australian states such as Queensland and Tasmania have the highest indication for barriers to measuring return on investment, with South Australia to follow. As well as, regardless of business size, there was a large consensus amongst respondents that return on investment can be a barrier.

The findings also indicated that medium-size businesses responded with the lowest indication that environmental revenue is difficult to measure, whilst micro-businesses and small businesses responded with higher indications. Dairy states such as Victoria and Queensland responded with the highest indication for environmental revenue

barriers. Conversely, Western Australia and South Australia responded lower to environmental revenue barriers. Therefore, it can be suggested that micro and small businesses in Victoria and Queensland need greater assistance in measuring environmental revenue on GSCM .Regarding business costs, additional cost to go green and absence of grants and financial incentives. The findings indicated that regardless of dairy business size or location, businesses have widespread consensus, which can be a key barrier.

Milani et al. (2011) outlined environmental concerns in the dairy industry are becoming increasingly serious due to expensive business costs. On the other hand, dairy companies want to see greater revenue from such practices and achieve substantial cost savings, but they should also enhance sales and market share, and exploit new market opportunities to increase profit margins to contribute to economic performance According to Kazancoglu and Sagnak (2018) sustainability can include high environmental costs, such as recycling costs, waste treatment costs, disposal costs and energy consumption costs. For example, although it would improve the environmental sustainability of production, recycling cardboard is expensive for dairy producers. Similarly, recycling plastic material and silage wraps also adds to the cost of dairy production in the Australian dairy industry.

The results showed that businesses, regardless of the size or location of the dairy industry, there is a consensus to recognise the need for more support regarding the issues of benchmarking sustainable practices, the difficulty of measuring and quantifying sustainability, the need for greater information adopt sustainable practices, the need for more information from suppliers on environmental dairy practices, and greater information on measuring sustainability in dairy businesses.

The findings indicated that business location played a role in monitors and measuring sustainability as part of the dairy practices Victoria, New South Wales, and Queensland responded to the higher indication for monitoring and measuring sustainability. These dairy states agreed that monitoring and measuring sustainability was a superior challenge. Although regardless of dairy business size, there is a consensus amongst respondents that monitoring and measuring sustainability is a barrier for their business.

The findings indicate micro-businesses need greater assistance in implementing technology. On the other hand, the states more likely to need greater assistance in technology also include Victoria, the highest on the list, Queensland, and New South Wales follow.

Cost and technology barriers have been investigated by other authors before in other sectors and they apply to dairy production and processing. For example, Dhull et al. (2016) suggested that the most significant hurdles to implementing GSCM were cost and complexity. In contrast, brand creation is one of the top motivations of GSCM. Gabriel (2016) investigated the challenges to going green the findings suggested that economic factors played a role (high investment needs and cost pressures). Sarkis et al. (2013) added several relevant factors such as a lack of appropriate technology needed to implement GSCM, resistance to technology advancement adoption, poor planning of sustainability program implementation, lack of effective communication among supply chain teams and lack of top-level management commitment. These were all barriers to adopting GSCM practices in different industries (Kormych et

al. 2019). Similar Luthra et al. (2011) found lack of IT implementation is one of the greatest barriers. Effective information and technology systems support green supply practices through various production stages by helping in the management of forward and backflow of resources. Lack of these systems has caused improper implementation of green supply initiatives. Similar to the studies outlined above, cost and financial barriers were a consistent theme; the cost of running a dairy business and being environmentally friendly are

significant challenges for the dairy industry. The Australian dairy industry needs greater financial support as the literature also outlines that the costly initiatives towards sustainability may be a barrier to sustainable innovation (Abdelkafi & Tauscher 2016). Lebacq et al. (2015) also found dairy industries across the globe are employing self- sufficiency as a mode of encouraging sustainability. Input costs are applied proportionally to the yield. In cases of decreased yield cost, the firm is also able to reduce its input cost hence no economic loss. Also, a higher economic gain is witnessed when the input resources are high and stable resulting in increased outputs. This further enhances industrial sustainability.

Regarding performance and information system barriers, it was found managers require further development for benchmarking strategies regarding environmental practices, monitoring and measuring practices, technology to implement practices and quantifying sustainability that are still being developed in dairy businesses. In this case, the most interesting responses were regarding managers suggesting that greater information would benefit their business in measuring and adopting sustainable practices and they need greater information from supplier networks in their supply chain. In order to solve this growing problem in the dairy system, a shift must occur from

traditional farming methods to more digital farming methods as dairy products that do not harm the environment or the consumers is preferred.

GSCM information from suppliers can benefit dairy businesses. Dairy supply information should be timely, frequent and credible (Wang, Ye & Tan 2014). In addition, sharing information through network technology can help businesses become more environmentally friendly both within the organisations and employees and across their supply chain. Adopting technology in businesses reduces the competitive pressure associated with performance and goals and achieves profitability because of financial payoffs due to improved use of innovations.

In order to measure the environmental sustainability of dairy products, the dairy industry has now developed an audit tool for environmental measurement. It ensures that products being sold are not contaminated and that information is solid and trustworthy; this, in turn, helps protect consumers by ensuring they receive products that adhere to the environmental regulations. Businesses should also develop an audit tool for their achievements in GSCM practices to cut costs and improve business processes (Lee et al. 2014). Furthermore, policies should be put forth to govern environmental performance. These policies can include procedures and investigations to regularly

audit green practices such as reducing wastewater, recycling water, minimising chemical use on the dairy site, supplier material recycling and product recycling (Duman et al. 2018).

Some of the key performance indicators are soil quality, access to water for generation, the ability of the dairy structure to refine dairy, use of chemicals, and carbon footprint and availability of water for irrigation. To meet key performance indicators, the dairy industry must maximise the use of water provided to it. The industry has to focus more on recycling its water to reduce the wastage of this scarce resource. Water from dairy processing industries can be treated and used for irrigation purposes. The public should also be encouraged to use rainwater and recycle water to meet required domestic purposes. The use of organic fertilisers should be preferred over inorganic fertilisers (Jacobi 2020). To reduce the negative environmental effects of a business, a business should focus more on recycling their own products. This way, the environmental effect incurred in producing a new product is alleviated.

Regarding the performance and information system barriers, Pressey et al. (2009) also found barriers were technology, lack of knowledge and internal motives in implementing sustainable activities. Ali et al. (2018) noted various barriers in the SCM

system such as lack of resource-sharing (integration), lack of organisational compatibility, lack of information- sharing, lack of responsibility sharing and lack of planning of supply chain activities. Moreover, challenges and barriers vary from industry to industry. For example, collaboration with suppliers can drive supply chain performance since companies share information and knowledge, and introduce informal safeguards based on trust and reputation (Ayuso, Roca & Colomé 2013).

Businesses should implement technologies and SCM systems to improve internal operations and productivity. Computer networks and online services within and across organisations facilitate connectivity. Internet of Things and blockchains can address dairy supply chain problems. Technology can incorporate automation to streamline the work. It can also help farmers and producers grow a higher quantity and quality of products and track environmental activities on an ongoing basis. It also allows goods to travel more rapidly and with greater visibility from farms to customer purchasing (Gargiulo et al. 2018). It was also found business location and business size may impact if a company adopts technology to measure practices.

Brown et al. (2018) suggested that one of the challenges facing a business performance system is

the failure to set performance goals and expectations for the industry. A company should dedicate its management and team to ensuring environmental performance standards are met. One factor can be to educate employees on the level of commitment to achieving this essential purpose. Another factor is encouraging teamwork in the organisation to achieve the same goal. When an individual prioritises themselves instead of working with their team, they can negatively affect the industry's performance. Setting long- term goals can prove hard to achieve, negatively affecting performance. Break long-term goals down into short-term goals can prove to be more beneficial and effective in achieving the goals of the industry. Dairy employees should be educated on the goals and the means to achieve them.

Studies have shown that specific goals are met more easily than difficult broader goals. In addition, goals should not be challenging to meet but, rather, applicable and easy to achieve, and goals should be considered to enhance industry performance and employees' performance. Another important aspect is feedback. Performance management should encourage feedback from its employees, both formally and informally (Abideen 2021).

6.6 BUSINESS PRESSURES IN THE DAIRY INDUSTRY

The thesis other aim of the research was to investigate business pressures that may influence dairy businesses in the industry. The findings highlight that business pressures were a key theme in this thesis. Six key factors connected to business pressures in the dairy industry are: Environmental, regulation, community, organisational customer, food quality and security pressures. Firstly, managers discussed environmental regulation, which was a key highlight in the quantitative stage. Managers found that business pressures affect dairy businesses in reporting their environmental practices. In the literature, it is a consistent finding that regulation has a significant impact on business. Hemel and Cramer (2002) suggested that regulation is the main demand that businesses must meet.

The findings indicated that regardless of the dairy business's size or location of community pressure and environmental regulation, they are still outlined as high drivers in the dairy industry.

With competitive pressure, the findings indicated that regardless of dairy business size or location, there is a widespread understanding among businesses that these drivers are low in the dairy industry.

On the other hand, it was found that micro-businesses responded with the highest indication rate to environmental pressure influencing their business. As well as,business location observed Queensland, Western Australia, and South Australia responded with the highest indication of receiving environmental pressure, Thus these states may concentrate more on their responses to environmental awareness.

In regards organisational customer pressure, the states Victoria and New South Wales incorporated more responses for organisational customer pressure then other Australian locations, whilst Tasmania was the least. However, the findings indicated a significant consensus that organisational pressure was a less significant pressure regardless of dairy business size.

The findings indicated that there was a difference in location for drivers of food quality and customer pressure. The states Victoria, New South Wales and Queensland and South Australia faced the highest food

quality pressure. Business location can influence companies to adopt food quality and security drivers. The findings indicated that regardless of dairy business size, there was a significant consensus that food quality and security pressure were high.

Business customer pressure, which was found in the qualitative stage as a key factor However, it was shown to be a less significant finding in the quantitative stage. Buyer pressure can also be dependent on business location. Buyer pressure can be present in intermediary markets where there is a concentrated final producer market and a competitive supplier market, such as manufacturing and the food production sector, where firms increase organically. Moreover, business customer pressure regarding environmental practices is lower than expected in the findings; this may also be due to the market structure (Fouseki 2015). Due to the deregulation in the Australian dairy industry, there is a lack of competition amongst dairy businesses due to the supply chain structure and the authorities that determine prices and milk supply.

Food quality and security are also highly influential, public health, product quality and food safety are the main factors businesses consider when greening their supply chain. Food quality and security pressure can also be dependent on business location. Food quality and security may also be a trade-off for being more environmentally friendly. Technological innovations are viewed as key enablers and drivers for supporting more sustainable, safe and secure farming and food systems (Segerkvist et al. 2020). There is a relationship between environmental practices, milk

quality and animal welfare. Supply chain management in the dairy industry has continuous and significant variation in product quality over time, thus businesses need to implement sustainable practices that are environmentally friendly (Henchion et al. 2022). Due to the high perishability of dairy products, they entail special treatments from milk procurement to distribution hence quality management is the most important factor in dairy industry (Mor et al. 2018).

Environmental pressure was also found to be significant in the thesis. One method dairy farmer can use to address environmental pressure is dairy product lifecycle assessment, which can be one way to manage productivity in a dairy business. Moreover, when combining multiple measures, lifecycle assessment can help identify additional mitigating effects and consider risks for emission increases from trade-offs between different measures; this can assist in preventing emissions along the supply chain (Bui et al. 2018).

Community pressure has a large impact on dairy farms, specifically, animal welfare, environmental sustainability, business operations and dairy products. Ventura et al. (2016) also found dairy production and consumption is based on societal influence, consumers (Market needs drive organisations. This ensures financial stability. Society expects business to ensure the social and environmental sustainability of its operations and

products). Corporate social responsibility plays a profound role in advancing dairy enhancement. The collaboration between governmental, economic, and social actors have resulted in a breakthrough in organic dairy production by increasing the rate and quality of products (Higham et al. 2017). Community pressure also translates to trusting that dairy farms produce products safely and sustainably without harming the animals or land. Community pressure was also significant, and it was found that many dairy businesses were frequently influenced by this pressure. Moreover, animal welfare also impacts the community by companies focusing on environmental initiatives they can also provide a better environment for cattle (Cardoso et al. 2016).

Segerkvist et al. (2020) also suggested that dairy farms must show sustainable responsibility by ensuring they follow community voice. Tachizawa et al. (2015) also found main drivers of adopting GSC practices is institutional pressure, competitive pressure and social pressure. Drivers can be legislative laws which constrain organizations to implement green practices before any production activity. Companies are implementing these drivers to effectively enable production and economic growth. The effects of these green supply initiatives on environmental and economic performances are greatly significant.

The thesis found business customer pressure, competitive pressure, and regulation pressure in the findings, which can be linked to the institutional theory. Institutional theory is frequently used to help enterprises better ensure their social fitness and credibility by complying with the rules and policies within their operational environment (Yawar & Kauppi 2018). The institutional theory method divides drivers of GSC into three categories: Coercive pressures, ethical pressures and mimetic pressures. Coercive pressures are widely regarded as the most powerful and include influences from the government, regulatory agencies and other institutions or organisations. Ethical or normative pressures are derived from social duties imposed by NGOs, labour unions and the general public. It is possible to experience mimetic pressures when rivals implement sustainability practices, and companies are subsequently urged to take on similar sustainable initiatives (Pérez-López 2015). Even though based on the Australian dairy industry, regulation pressure is the most prevalent in the findings at both stages of the thesis. These results represent the first direct demonstration that institutional theory can be explored in different industries because these patterns of results are not consistent with the previous literature. Future research can also explore these institutional pressures through diverse industries. The most significant finding was the additional drivers/pressures found, such as environmental

pressure, food quality and security, and community pressure.

6.7 OVERSEAS PRESSURES IN THE DAIRY INDUSTRY

The thesis also found a key theme of overseas pressures. This insightful and new theme first appeared in the qualitative stage when managers discussed international dairy industries. These factors were further explored in the quantitative stage, although it was found overseas pressures were not as significant. It was generalised in the second phase of the project managers did not receive high pressure to be influenced by NZ, Europe, the USA and Asian countries such as China. The effects of business export products on dairy firms were not as apparent. The thesis found exporting product pressure has little effect on GSC practices in the dairy industry.

Furthermore, in contrast to hypothesized, the research did not find a significant influence of overseas pressure driving GSCM practices. It was found that established companies may focus on NZ, greater than other countries. The NZ industry is a large exporter of dairy products, including cheese, butter, whole milk powder, ice cream and lactose. NZ dairy industries implement sustainable practices by embracing balanced environmental techniques such as pollination, soil fertility and

habitat restoration. Australian dairy producers are concerned about desalination, soil degradation, water and air pollution, chemical residues and biodiversity consequences throughout production and marketing. NZ has adopted biological and ecological techniques such as improved pest monitoring, decreasing use of environmentally hazardous pesticides and more accurate dairy farm fertiliser and water input assessment. NZ dairy industries have used an integrated scorecard approach to sustainable production including sward and irrigation management (Vermier & Verbeke 2006). Other factors based on the dairy businesses' location and size, depending on the business size companies may shift their focus to overseas pressure in Asian and U.S markets.

In regards to overseas pressure such as New Zealand and Europe influence The findings indicated that regardless of dairy location, businesses have a widespread understanding that these drivers are low in the dairy industry. On the other hand, drivers for the other factors such as U.S and Asian and exporting products to countries the findings indicated that this might be a higher driver; it was observed that medium-sized businesses responded to higher indications to focus on U.S. and Asia as GSCM drivers and exporting products overseas. Surprisingly despite the low indication for business exports and adopting sustainable practices, Victoria, New South

Wales, Queensland, and South Australia indicated the highest indication for business exports and adopting sustainable practices. Business size was also not significant in this instance.

Attapattu et al. (2009) suggested businesses can focus on other countries which have implemented policies to boost dairy production, including financial incentives such as water and energy subsidies, ensuring long- term dairy security. In other countries such as U.S and NZ, irrigated agriculture has benefited from investments that have increased yields and productivity and implemented essential strategies in providing more dairy while reducing environmental stress. Finally, technical advancements have made it possible to produce more dairy with fewer resources, thereby addressing the growing dilemma of resource scarcity. As a result, trade- offs have been minimised and synergies across the agricultural, water and energy industries have been maximised sustainably (Hasanain et al. 2012). Different countries may influence the dairy business in Australia, although this thesis found that overseas pressure was not as relevant, as the other themes.

In conclusion, the themes of exporting dairy products and international GSCM influence were not as significant as the other theme findings. These unexpected findings may be due to the participant company size. Larger businesses have

greater power to export dairy products (Powell et al. 2009). This is also confirmed in a quantitative finding as business size may have a large factor on whether businesses are exporting products. The quantitative test found medium business were more likely to focus on exporting products, than small or micro businesses.

Businesses may face difficulties exporting dairy products to other countries, including delays in transporting milk to processing plants and poor transportation (Chowdhary et al. 2018). There are also many other factors that can impact exporting products and GSCM practices. Furthermore, exporting products may also be due to a lack of appropriate technological instruments to handle fresh milk which could translate to poor quality products. Also, dairy products are traded under agreements which specify the manner of handling dairy products, hence leading to licensing hurdles from the importing countries and destination markets where exorbitant fees are charged to acquire compliance with international standards. In addition, quality assurance and dairy safety concerns are major challenges since dairy products are highly controlled commodities. Therefore, they are subject to thorough inspections by the relevant regulatory bodies. As a result, they can be held for longer periods until compliance tests are completed and verified by the importing country or receiving agency, bringing delays that affect

mobility and profits (Kidane & Gunawardana 2000).

Dairy production, transformation and sale of high-value and perishable dairy commodities create significant barriers to international trade. These barriers are compounded by the fact that different standards and institutional capabilities are utilised in different countries. Furthermore, health challenges involving dairy, dairy safety rules and agricultural health regulations are undergoing rapid transformation, as is the public's understanding of the importance of dairy safety in high-income countries. As a direct consequence, laws and regulations governing dairy safety are being updated (Lagrange at al. 2015).

6.8 CONNECTION OF GSCM FACTORS

The fourth aim of the thesis was to investigate the relationship among the key themes that may impact GSCM. This aim is discussed under each theme. To summarise, in connecting the key themes, first it was found that business pressure was associated with measuring environmental activities and government support which is a significant finding. Dairy business managers may face increased business pressure to measure their environmental activities. Second, there was also a correlation relationship between business pressure and the lack of government support. Third, a correlation relationship was found between government assistance and measuring

environmental activities. The thesis results suggest that the greater the support from governments, the better dairy companies can measure environmental activities.

Environmental barriers are connected to themes such as environmental activities, and government assistance. These findings are consistent with previous research showing that companies are highly influenced by cost and technology barriers in implementing environmental activities and measuring GSCM practices. Dairy businesses need to reduce these barriers to become more environmentally friendly. Sharma et al. (2015) suggested that management's efforts to become green were frequently challenged. Business owners and executives must conduct significant review, research and planning to stay committed to their attempts to engage consumers through transparent and sustainable processes. Dairy companies should address the barriers to implementing green practices. In this focus, dairy processors and farmers need to reduce these barriers through environmental awareness. Dairy businesses can increase their environmental strategies by using biodegradable or reusable packaging, managing waterways, and effectively storing water on dairy farms and processors' sites (Texeira et al. 2016).

6.9 CHAPTER CONCLUSION

The research explored current dairy practices, pressures, barriers, and measures in the dairy sector. The study used a transformative approach to explore industry challenges. Firstly, qualitative research allowed for an in-depth analysis of interviews and generated dairy managers' current practices and views. Secondly, the survey allowed for a more generalised consensus on the findings and created a crucial connection between the themes and future analysis.

The present thesis investigated current GSC practices and measuring practices in the Australian dairy business, secondly investigated barriers in the GSC, thirdly focused on pressures and finally developed a connection between the key factors found in the research. Firstly, green supply chain practices and monitoring green supply chain practices are crucial in the dairy sector. By focusing on key GSCM practices this can assist dairy businesses to improve their green operations and initiatives.

CHAPTER 7: CONCLUSION AND POLICY IMPLICATIONS

7.0 CHAPTER AIM

This chapter provides the conclusion of the overall thesis. The main summary is provided below regarding the research objectives and findings of the thesis. The chapter also provides several policy implications that dairy business managers can follow to improve their GSCM initiatives.

7.1 CONCLUSION

The implication in this study have important guidance as dairy managers are motivated to implement greater GSC practices and work towards a greener business. Current barriers such as cost, and performance system barriers may impact such practices and the industry. The business pressures and overseas pressures influence management to be more environmentally friendly, particularly community pressure, regulation pressure, environmental pressure, and food quality and security pressure. The unexpected and insightful finding includes the theme of government assistance and support. This theme is crucial to understanding the industry's current scenario and should be further investigated for greater policy implications.

Moreover, policy implications indicate that all dairy supply chain businesses should increase collaboration to help struggling firms share information about adopting GSC practices. Modernise businesses with technologies and managers should measure environmental practices frequently and implement green supply chain initiatives to their full potential. Government should also provide greater support training and reduce environmental costs for dairies. The main summary of the findings is discussed below:

It was found that dairy businesses are starting to consider and adopt GSCM practices, although they may need further development in managing water sources, product material and supplier waste. Dairy businesses need support on GSCM technologies to assist with recycling water, monitoring business waste, and monitoring wastewater and product material. Business size also impacts monitoring and measuring GSCM practices, as found in the second theme., specifically minimising chemical and supplier waste. It was also found that environmental pressure was high on the list, community pressure, food quality and security pressure, and regulation, whilst organisational customer and competition pressure were low; this may be due to the industry structure. On the other hand, overseas pressure was not as significant as the other key themes; while focusing on many countries (New Zealand was found to be more likely

influential than other international markets such as the U.S, China, and Europe. Exporting products and the role of exports on GSCM were also not found to be leading influences. Furthermore, with regard to performance system and information barriers and cost and financial barriers, these were relevant consensus companies need greater support and help and how they can improve their performance systems. For example, cost and financial barriers included business costs, and the additional cost was a significant barrier, while ROI and price of products may not be as relevant. Furthermore, greater information may be required to adopt sustainable practices, receive information from suppliers, and produce a system to measure/quantify GSCM practices.

In addition, in terms of government support and assistance, this highlighted the need and requirement for the government to provide support to the dairy industry, especially by making environmental grants accessible, available, and easily adoptable by dairy businesses. Dairy businesses also want to see greater information to adopt environmental grants and economic benefits and greater financial incentives. The findings support the link among environmental pressure, GSCM practices and government support. Government support has a key connection to barriers while environmental barriers were also connected to GSCM strategies. Based on the fuzzy logic model, It was discovered that businesses need

to move beyond contemplating a practice to actually implementing that practice in order to realise the full environmental advantages of doing so. Meanwhile, dairy companies with higher pressure and low barriers may be more motivated to employ GSCM environmental performance while dairy companies with high pressures and barriers cannot achieve environmental performance. The additional unexpected finding was the industry's voice that dairy managers had outlined in the survey for future recommendations where managers require greater support to implement environmental practices.

7.2 POLICY IMPLICATIONS

This section of the chapter discusses policy and business recommendations to support GSCM in the Australian dairy industry. There are six policy and managerial recommendations that the dairy industry may follow for greater clarity on the current guidance.

7.2.1 INCREASING COLLABORATION IN DAIRY SUPPLY CHAINS IN AUSTRALIA

One main finding is that dairy businesses require more information- sharing practices with internal environmental measures and external environmental measures with suppliers. Processors and farmers can assist firms with information sharing on environmental practices. Creating more

awareness amongst supply chain members can also assist smaller businesses in increasing their environmental knowledge (Jorgensen and Knudsen 2006). Dairy supply chain in Australia should also emphasise technology, as it would make information sharing practices easier and more efficient. It can also increase collaboration which can be achieved by building green supplier networks and providing management techniques such as policies and terms in supply contracts and building supplier relationships to share common goals on the green supply chain

practices.

7.2.2 INCREASE THE USE OF TECHNOLOGY FOR SUPPLY CHAIN COLLABORATION

Technology is crucial in business today. Firms should place priority on finding the relationship between technology and GSCM. Technology plays a significant role in the distribution of goods and services. Payments and communication systems are all connected through modern technology. It is essential to know how this interconnect with green supply. This way, firms will be able to make informed decisions on implementing GSCM (Umar et al. 2021). Firms should implement GSCM, including the impacts that it could have on the dairy industry and how to implement it to ensure success (Lee 2013).

Moreover, supply chain visibility enables organisations to accomplish higher revenue than those with limited supply chain visibility. According to Silva et al. (2017), supply chain visibility requirements depend upon the industry. Therefore, the degree of supply chain visibility entirely depends upon the industry. In that sense, visibility is high on product tracking but can also [voluntarily] be implemented for environmental practices. The tracking can be done with tools such as the internet of things (IoT)[4] to track dairy products and advanced analytics tools. Here, it is suggested that companies can use new technology to enhance their supply chain visibility, such as IoT and blockchain developments. However, if an organisation can afford to launch these technologies, it can achieve positive results by improving its supply chain visibility effectively. It would be beneficial for the Australian government to implement a GSC system for dairy supply chains in Australia, connecting farmers, processors and retailers on an environmental level to voluntary be part of the program.

[4] The term Internet of Things (IoT) refers to physical items that are equipped with sensors, the capacity to process data, software, and other technologies that allow them to connect to and communicate with other devices and systems via the Internet or other types of communications networks.

7.2.3 INFORMATION-SHARING WITH SUPPLY CHAIN DAIRY BUSINESSES

This connects with the implication above, although it can also be completed through traditional modes of communication. Kim and Kim (2017) also indicate that information-sharing enables companies to make effective decisions in their operations in the supply chain. Information-sharing in the supply chain also enables companies to utilise resources effectively and lower supply chain costs. An environmental strategy and management explicitly aligned with a mission and long-defined objectives are required for dairy processors and farms. Through information-sharing, an organisation can also integrate its suppliers. The organisation will be required to start by conducting due diligence with its suppliers to accomplish this. Then management needs to keep all the lines of communication open to the suppliers. After that, it is necessary to integrate suppliers into the company's compliance system. Once the suppliers become familiar with the compliance system, management should focus on resolving incidents quickly, as they hinder suppliers.

Dairy businesses can also receive information from customers and their own supplier network. In addition, dairy producers and farmers should share information on current GSCM practices. Internal GSCM within businesses alone is not enough to

improve environmental performance; manufacturers must extend their environmental practices to customers. Unfortunately, many firms fail to recognise the importance of such external implementations when adopting environmental initiatives (Laari et al. 2016). Therefore, it is most effective to adopt internal and external practices to improve green activities in firms. Both internal and external green practices are needed to achieve the optimal level of green practices.

7.2.4 GREATER ASSISTANCE AND SUPPORT FROM THE GOVERNMENT

The Australian government can support and help to measure environmental costs. For example, the process involving collecting and processing material that is waste or turning them into a new product is called recycling. Recycling is a process of converting waste material into a useful product. There are many benefits of recycling. It helps reduce waste material as helpful in a waste management system (Chen 2021). Greater support on GSCM practices from the government will assist dairy farmers and processors see the long-term impact of revenue even though economic benefits of GSC may not be as clear at first (Pedersen 2009). Gandh and Vasudevan (2019) outlined a proposed GSC and economic performance model with consideration that government initiatives vary in increasing GSC practices in various industries.

Australian government can also provide a green training program for the dairy industry. The program should also include cleaner production priorities that have been established through customer feedback. As a result, businesses will meet their internal environmental goals while also contributing to the environment outside the company, such as by increasing environmental suppliers. It could be an effective program to help businesses (Teixeira et al. 2016). The program should also aim to provide constant and accurate information on GSCM practices.

7.2.5 TRACEABILITY OF GSCM PRACTICES

Specifically, dairy managers should focus on an environmental strategy and management explicitly aligned with a mission and long-defined objectives. Dairy farms and processors should create a collection of measurable and explicit goals and priorities such as ensuring bio- degradable plastic is used or recycling plastic regularly in the business (Green et al. 2012). In addition, one example of measuring internal practices can be water management used on a farm, ensuring cleaner production as water is a vital resource for the industry. Moreover, the industry aims to increase, track and report on the efficiency of water usage in both the farming and manufacturing industries. There was an increased emphasis on the rising use of water in a year when water was in short supply for much of the industry, especially in the Eastern

states of Australia. An ongoing problem could be mitigated by improving water quality (Kershaw 2009).

Dairy businesses need greater key performance indicators (KPIs). One of the essential aspects of setting a performance system for environmental sustainability within a business is assigning the KPIs and monitoring them to recognise the vital parts of the business performance management. Unfortunately, some businesses do not measure their KPIs for sustainability, although they do for financial KPIs. Due to this, one of the significant challenges that a business faces are introducing sustainability indicators, which must be determined or monitored for the entire task (Sarkis 2011).

Sustainability indicators influence the ability of the dairy industry to conserve the environment and its manipulation of natural resources. Sustainability indicators can include the nature and capacity of agrochemicals utilised, water availability, the different crops and animal breeds present, how the dairy produced affects the consumer's health, and the tenure of the land used for farming can be subject to erosion. Sustainability Indicators of dairy systems also focus on increasing productivity (Jacobi 2020).

7.2.6 IMPLEMENTING GREEN SUPPLY CHAIN INITIATIVES IN AUSTRALIAN DAIRY BUSINESSES.

Environmental measures and methods support companies in measuring the effect of going "green" and its associated impacts. Al-Sheyadi, Muyldermans and Kauppi (2019) suggested that environmental practices affect environmental performance: Environmental impact and environmental cost savings. Key metrics measuring environmental performance and green practices often improve environmental performance (Côté et al. 2008). Sustainability indications can focus on individual business and management can take note on manufacturing processors to ensure each business understands GSCM practices involved in each business process, dairy production and trade as an example for a dairy manufacturer. Managers can also add the quantity, dates and also other indicators to compare to future improvements. Table 15. shows an example of a method that dairy businesses can use to measure processors.

TABLE 15. KEY INDICATORS TABLE FOR DAIRY.

Manufacturing/farm processes

Process	In Raw materials, input material, chemicals, energy, water	Out Products, waste, air, land and water emissions

Adapted by (Zackrisson et al. 2004).

Managers have noted that green concerns are treated separately in business supply chain practices and should be considered jointly. In this thesis, it is recommended that businesses follow the following strategies to improve their green production process in their supply chain.

7.2.6.1 For energy-related matters, the key performance indicators can be the energy consumption and the quantity of energy saved while implementing the improved measures. As suggested in the findings, dairy companies want to see greater solar power adoption for energy reduction, battery power storage and renewable energy.

7.2.6.2 Material: For the material aspect, the key performance indicators can be the rate of utilisation of the raw material, the percentage of non-renewable materials utilised, the percentage of recycled materials utilised and the percentage rate of the product recycling rate. Dairy companies in Australia need to focus more on minimising product plastic, recycling silage plastic and fertiliser bags, and lowering fertiliser uses.

7.2.6.3 Water: For water-related aspects, the key performance indicators can be the footprint of the water utilised or the amount

of water consumed along with the percentage of the water recycled or reused. Dairy companies want to see greater recycled water from effluent dams and rainwater harvesting. Dairy producers use clean field techniques and storage methods to preserve the environment. As much as one-third of a dairy processor's water is reused.

7.2.6.4 Dairy Waste: For the waste-related matter, the business can set the key performance indicators that can be the amount, or the percentage of waste generated, waste distinguished by the type and through the disposal methods adopted by the company and lastly, the rate of waste production. The dairy business needs to see the greater waste reduction.

7.2.6.5 Supplier material: For product and recycling-related matters, the company can track their key performance indicators from their suppliers, such as product materials, plastic, containers, and other packaging. Assuring that suppliers satisfy environmental standards in their own operations, such as avoiding polluting the environment or managing chemicals.

7.2.6.6 Supply chain: For the supply chain management related matter, the key

performance indicators can be the percentage of suppliers who are complying with the establishment of the company's sustainability strategy and the supply chain miles. (Fernando, Jabbour and Wah 2019). Therefore, the supply chain recommendation also includes sharing key indicators with suppliers.

7.3 CONTRIBUTION

The thesis used mixed methods to conduct a transformative design study. Qualitative and quantitative data was collected and analysed separately in stages and then combined to answer the research questions. GSCM is a new concept that has not been around for more than two decades. For this reason, many researchers are yet to explore this field and come up with findings that help in its further development. The main aim of the thesis outlines how dairy businesses implement environmental practices and whether dairy businesses face institutional pressure. The research focused on dairy businesses' key barriers that impact on their environmental practices and how additional pressure can affect environmental performance.

The research incorporated various contributions to both literature and practices. Firstly, it made the key connection between GSCM and the dairy sector. Secondly, this study analysed current

institutional pressure which impacts dairy businesses, and how firms should adopt the culture of GSC practices by showing their leadership within the dairy industry to overcome the misperception of manufacturer toward the green practices. Thirdly, the thesis can assist firms to understand current best practices surrounding environmental performance. Finally, this thesis can also help companies to overcome pressure barriers that may be present with the business towards GSC initiatives and assist business managers in the long-term. The research also contributes to literature in the field by focusing on a specified theory and investigates the theory with constructs such as managerial commitment, environmental performance and various GSC practices. Also mixed methods research added insightful comparison not only to understanding of the connection between institutional pressure and GSC construction but also understand perspective from managers through interviews.

The thesis adds to the literature that investigates the pressures and barriers of implementing environmentally responsible practices. There incorporates a gap in the research to investigate GSCM with a mixed- methods approach and allow triangulation of results to provide a deeper insight into GSC practices, and institutional pressure (Hoejmose et al. 2014). Previous research shows different findings for institutional pressures in diverse countries with varying results (Zhu & Sarkis

2007; Saeed et al. 2018), however further investigation was needed in Australia because it is important to also analyse how managers respond to external business pressures, it is also important to address environmental performance outcomes (Kazancoglu, Kazancoglu & Sagnak 2018). Literature connects the constructs of environmental performance and GSC practices although there is no detail on how managers address environmental performance and current practices being implemented in GSC for industry. Companies are shaped by their systems which they operate in, these include pressures such as coercive, normative and mimetic can influence companies to adopt GSC practices (Chu et al. 2017). Pham and Pham (2017) also confirm firms have had to be confronted with pressure to influence environmental issues in their supply chains. Institutional pressure and barriers can also be applied to other industries. The thesis findings can be applied to other agricultural industries such as the poultry business, even the grain business.

7.4 LIMITATIONS AND FUTURE RESEARCH

The limitation of the thesis includes there was a smaller sample size for the second phase of the study, due to research was conducted during a COVID-19 pandemic period and the availability of businesses were limited. Covid-19 has had an impact on Australia's supply chain products,

services, and manufacturing sectors also closing businesses (Ivanov 2020).

There remains a significant challenge ahead to be more environmentally friendly, Moreover, to help with this challenge managers are implementing green initiatives within their companies as well as upstream and downstream of the companies. As well as little research in the dairy industry shows the increasing concern that further investigation is needed. The future of GSCM is still growing and future research is needed. Future research can incorporate another extension to the thesis to emphasize the impact of [dairy retailers] in the supply chain dairy sector to address the research topic. Retailers are a crucial player in the supply of dairy products. Supermarkets, among many huge firms, exert pressure on smaller businesses, and can be incorporated to close the loop of the supply chain perspective.

Closed-loop supply chain is a broader perspective for the thesis can add to, closed loop supply chains can reduce the number of materials which end up in the landfills. On the other hand, producing a product from secondary material is more environmentally friendly as it takes up less energy consumption and emissions into the air (Kazemi et al. 2018). Moreover, future research can also include greater hypothesis with the current factors found in this study and can build greater research

on these factors. Future tests can build scope by looking at the individual sub- themes and creating connection amongst them, for example running a hypothesis on the connection between environmental pressure and ROI measurements specifically.

7.5 CHAPTER CONCLUSION

The main aim of this chapter was to provide an overview of the thesis conclusion. It was found that the dairy industry can improve their GSC practices with recommendations such as, improving supply chain collaboration, increasing the use of technology in the dairy supply chain, information-sharing GSCM practices, improving traceability and environmental indications. Dairy businesses need to improve on their GSCM measures such as energy related metrics and product materials. The current water management such as reducing effluent and recycling water, reducing, or managing business waste, focusing on supplier material and supply chain wastage on the dairy farm of processing factory should also be improved.

The thesis can also be applied to other industries that work in the agricultural space such as grain or poultry. The research contributes to the institutional theory in a dairy perspective by adding three extra pressures such as environmental pressure, community pressure and food quality and security pressure. The research also concludes that

cost and financial barriers as well as performance and information barriers are addressed to ensure the success of dairy industry in environmental outcomes. These challenges may be reassured by and ensuring adequate government assistance and support with a green training program.

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APPENDIX

APPENDIX A: LITERATURE TABLE

Authors	GSCM theme	Discussion	Industry and firm	Research method
Huang et al. (2012)	GSCM practices	Investigates SMEs in different sectors based on GSCM	China SME's	Questionnaire
Lee et al. (2012)	GSCM and organisational performance	the effect of GSCM efforts and other organizational factors on firm performance of small and medium enterprises (SMEs) that serve as suppliers to large customer firms	SMEs in the electronics industry. Korea	Questionnaire
Lee et al. (2008)	GSCM practices	Investigates Drivers for SME's suppliers and green supply chain Readiness	SMEs in South Korea	Mail Survey
Parmar (2016)	GSCM practices	Analysing barriers for GSCM and SME's	SMEs in India	Data collection and Fuzzy AHP
Klassen and Lee (2008)	GSCM practices	Drivers and enablers for environmental management in SME's	2 large buying firms	Qualitative case study
Huang et al. (2015)	GSCM practices	Pressures and drivers of GSCM in China.	Manufacturer SMEs in China	Questionnaire
Govindan et al. (2016)	GSCM practices	Investigation on the barriers in the context of SMEs in Malaysia	Various industries and SMEs in Malaysia	Questionnaire

Rao (2007)	GSCM practices and environmental performance	GSCM constructs and environmental performance	Various SMEs in the Philippines	Questionnaire
Cote (2008)	GSCM practices and environmental performance	Influences, and opportunities for environmental SME's Management	Three SMEs in Canada	Interviews
Zhang et al. (2005)	Environmental performance	Presents a GSCM performance assessment	Manufacturers	Questionnaire and case study
Zhu et al. (2005)	Operational, financial, and environmental performance	Analysis's drivers, practices and performance, links together a measurement index	Chinese firms from different industries	Questionnaire
Chien & Shih (2007)	Environmental and economic performance	Analyses GSCM activities, economic and environmental performance.	Electronic sector	Questionnaire
Zhu et al. (2007)	Operational, financial, and environmental performance	Discusses GSCM pressures, drivers, and activities for overall supply chain performance.	Chinese firms in the Automotive Industry	Questionnaire
Zhu et al. (2008)	Operational, financial, and environmental performance	Evaluates a scale for environmental practices	341 Chinese firms from various industries.	Questionnaire

Wu et al. (2012)	Economic performance and environmental performance	Researches the connection between information transfer and GSCM performances	Technology industries in Taiwan	Survey (Analysis: Fuzzy set theory)
Zhu et al. (2010)	Operational, financial, and environmental performance	Evaluates the effect between both internal and external green supply chain practices on the three pillars of environmental performance.	Various Chinese Production Firms	Questionnaire
Azevedo et al. (2011)	Operational performance: consumer satisfaction, quality control. Environmental performance: waste management. Financial performance: Cost efficiency, and green costs	The relationships between GSCM activities and SCM performance	Five companies from an automotive firm in Portugal	Interviews and case study
Duarte et al. (2012)	Learning and growth, business process, consumers, and financial performance	A conceptual model was linking lean and GSCM performance.		Conceptual framework
Lin et al. (2011)	Environmental performance, financial, and operational performance	Criteria in green performance in manufacturing firms	Automobile production Industries	Fuzzy set theory
Jabbour et al. (2014)	Environmental performance	Analyses the link between GSCM activities and environmental performance	Brazilian firms	Questionnaire
Dubey et al. (2015)	Company pressures and environmental performance	Looks at the effects of supplier partnerships and quality management based on environmental performance.	Companies in India	Questionnaire
Chuang (2014)	Environmental performance	Provides a framework with five staged processes to analyse and enhance environmental performance	2 Companies from Taiwan	6 sigma approach
Lin et al. (2014)	Green supply chain management performance	Analyses 26 factors to BSC approach for GSCM performance and practices	Taiwanese firms	Case study

Mangla et al. (2014)	Green supply chain management performance	Evaluates factor for performance in GSCM	Production companies in the plastic industry	DEMATEL
Jabbour et al. (2015)	Environmental and operational performance	The effects of GSCM practices on the operation and environmental Performances	Firms in Brazil	Case study
Govindan et al. (2015)	Environmental performance and economic performance	Analyses to understand the GSCM activities that improve both financial performance and environmental performance.	A case study approach in the car industry	Fuzzy set theory
Zhang and Yang (2016)	Operational performance, economic, and environmental performance	Discusses the impact of GSCM on the performance pillars	Various Manufacturers in China	Questionnaire
Jabbour et al. (2016)	Operational performance and environmental performance, "Green."	Analyses both direct and indirect effects of barriers, both internal and external on performance.	Various companies in Brazil	Questionnaire
Larry et al. (2016)	Economic performance and environmental performance	Analyses the relationships (both direct and indirect in consumer driven GSCM and performance measures	SMEs in Finland	Questionnaire
Yu et al. (2017)	Environmental performance and operational performance	The analysis between the GSCM supplier perspective and performance	Car Industry in china	Questionnaire
Zhu et al. (2017)	Environmental performance and economic	Reviews the effects of GSCM practice	SMEs in China	Questionnaire

	performance	and performance within the space of customer relational governance		
Geng et al. (2017)	Economic performance, environmental performance, operational performance, and social performance	Discusses the association between GSCM practices and performance Measures	Manufacturers in China	Questionnaire
Roehrich et al. (2017)	Green supply chain management performance	Suppliers' effects of GSCM to improve performance	Aerospace sector	Semi-structured interviews and data collection from secondary.
Rao (2007)	Green supply chain management performance	Constructs of GSCM and performance	SMEs in the Philippines	Questionnaire
Rao & Holt (2005)	GSCM and economic performance	GSCM, competition and financial performance	Philippines firms	Conceptual framework and survey/ structural equation modelling
Susanty et al. (2017)	Environmental performance	Investigates the connection between GSC and environmental performances	SMEs in the Wooden Furniture industry in Indonesia	Questionnaire
Bergeron and Rekik (2017)	Environmental performance and economic performance	Analyses motive in SME's GSCM practices and performances measures	Various SMEs in Tunisia, Canada, and Morocco	Semi-structured interviews Qualitative comparative analysis/ Multiple case study

Cai et al. (2008)	GSCM is focused on institutional theory, which is six main drivers.	Due to the multiple stresses from institutional theory, factors found would influence the company's GSCM Strategy	Singapore Logistic	Mail survey
Choi et al. (2017)	Effects of GSCM practices in business activities based on selected GSCM practices.	The GSCM is now the highly recommended CSRS for South Korea production. The advantages are known in the literature, but most companies have not adopted them.	South Korea Manufacturing	Survey
Chu et al. (2017)	The study analyzed the effect on the businesses of the three institutional pressures – consumer, government, and competitor.	Operational efficiency is greatly improved by reducing emissions by using green power.	Brazil Manufacturing	Questionnaire
Dubey et al. (2017)	The influence of suppliers and, among other things, suppliers and consumer relationships, including institutional pressures.	The study shows the advantages of implementing GSMC activities for Indian manufacturing firms.	India Mixed manufacturing industries	Questionnaire
Glover et al.(2014)	The study indicated that people in the dairy industry should consider policy and trade initiatives.	The study examined the behaviour of the dairy supply network stakeholders to improve the energy efficiency, its plans, and whether outside of the industry knows the activities	UK Dairy industry	Interviews

Liao Kwaramba, and Kros (2020)	The research was conducted via institutional theory on supply chain traceability.	It has been found that the impact of regulatory and corporate ownership pressure affects traceability implementation.	USA Different supply chain industries	Online survey
Lin and Sheu, (2012)	The study explores the role of institutional theory in the practice of the SMSCs and the delivery chain by analyzing whether companies often pursue economic efficiency and institutional constraints while adopting green practices.	The study showed that the GSCM practice affects various institutional pressures to improve organizational efficiency.	USA Electric and electronic Manufacturing	Online survey
Seles et al. (2016)	The study examined the impact of institutional pressures from the stakeholders and how the bullwhip effect is promoted after the green supply chain has been adopted.	The supply chain was discovered to impact environmental pressures	Brazil Automotive battery manufacturer	Survey
Gao et al. (2018)	The research aimed to assess the impact on green efficiency of institutional constraints, green external cooperation and Green internal activities.	The research has shown that institutional pressures have positive effects on green activities	Taiwan Shipping Industry	Survey

APPENDIX B: ETHICS APPROVAL

[RIMS] USQ HRE Application - H20REA247 - Expedited review outcome -Approved Inbox ×

human.Ethics@usq.edu.au
to [redacted]Shane.Zhang

Dear Anna

I am pleased to confirm your Human Research Ethics (HRE) application has now been reviewed by the University's Expedted Review process. As your research propose
in Human Research (2007).
ethical approval is granted as follows:

USQ HREC ID: H20REA247
Project title: Green supply chain management practices, pressures and performance measures in Australian dairy companies.
Approval date: 19/10/2020
Expiry date: 19/10/2023
USQ HREC status: Approved

The standard conditions of this approval are:

a) responsibly conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal;.

(b) advise the University (email:ResearchIntegrity@usq.edu.au) immediately of any complaint pertaining to the conduct of the research or any other issues in relation to

(c) promptly report any adverse events or unexpected outcomes to the University (email: ResearchIntegrity@usq.edu.au) and take prompt action to deal with any unexp

(d) make submission for any amendments to the project and obtain approval prior to implementing such changes;

(e) provide a progress 'milestone report' when requested and at least for every year of approval.

(f) provide a final 'milestone report' when the project is complete;

(g) promptly advise the University if the project has been discontinued, using a final 'milestone report'.

The additional conditionals of approval for this project are:

(a) Nil.

[RIMS] USQ HRE Amendment - H20REA247 (v1) - Expedited review outcome - Approved Inbox ×

human.ethics@usq.edu.au
to [redacted]hane.Zhang

Dear Anna

The revisions outlined in your HRE Amendment have been deemed by the USQ Human Research Ethics Expedited Review process to meet the requirements of the National Statement on Ethical
full ethical approval as follows.

USQ HREC ID: H20REA247 (v1)
Project title: Green supply chain management practices, pressures and performance measures in Australian dairy companies.
Approval date: 09/02/2021
Expiry date: 19/10/2023
Project status: Approved with conditions.

The standard conditions of this approval are:

(a) conduct the project strictly in accordance with the proposal submitted and ethics approval, including any amendments made to the proposal required by the USQ HREC, or affiliated University

(b) advise the USQ HREC (via human.ethics@usq.edu.au) immediately of any complaint or other issue in relation to the conduct of this project which may warrant review of the ethical approval of

(c) make submission for ethical review and approval of any amendments or revision to the approved project prior to implementing any changes;

(d) complete and submit a milestone (progress) report as requested, and at least for every year of approval; and

(e) complete and submit a milestone (final) report when the project does not commence within the first 12 months of approval, is abandoned at any stage, or is completed (whichever is sooner).

Additional conditions of this approval are:

(a) Nil.

APPENDIX C: RESEARCH PROJECT FORMS

University of Southern Queensland

Consent Form for USQ Research Project Interview

Project Details

Title of Project:	Sustainable (environmental) supply chain management practices, pressures, and performance measures in Australian dairy companies.
Human Research Ethics Approval Number:	H20REA247

Research Team Contact Details

Principal Investigator Details

Miss Anna Tsaparas
Email: [....]
Mobile: [....]

Principal supervisor details

Assoc. Prof Shane Zhang
Email: [....]
Mobile: [....]

Associate supervisor details

Dr. Paul Lee
Email: [....]
Mobile: [....]

Statement of Consent

By signing below, you are indicating that you:

• Have read and understood the information document regarding this project.	☐Yes / ☐No
• Have had any questions answered to your satisfaction.	☐Yes / ☐No
• Understand that if you have any additional questions you can contact the research team.	☐Yes / ☐No
• Understand that the interview will be audio recorded.	☐Yes / ☐No
• Understand that any data collected may be used in future research activities with no identifiers and strict confidently applied to the data.	☐Yes / ☐No
• Agree to participate in the project.	☐Yes / ☐No

Participant Name	
Participant Signature	
Date	

Please return this sheet to a Research Team member prior to undertaking the interview.

Page 1 of 1

University of Southern Queensland

Participant Information for USQ Research Project Interview

Project Details

Title of Project:	**Sustainable (environmental) supply chain management practices, pressures, and performance measures in Australian dairy companies.**
Human Research Ethics Approval Number:	**H20REA247**

Research Team Contact Details

Principal Investigator Details
Miss Anna Tsaparas
Email: [....]
Mobile: [....]

Principal supervisor details
Assoc. Prof Shane Zhang
Email: [....]
Mobile: [....]

Associate supervisor details
Dr. Paul Lee
Email: [....]
Mobile: [....]

Description

This project is being undertaken as part of a Doctor of Philosophy Program.

This research focuses on the space of Sustainable (environmental) supply chain management practices within Australian businesses, in the dairy sector.

The findings from this research will assist practitioners to apply a framework that can improve environmentally sustainable practices, by focusing on business pressures and drivers that impact environmental decisions.

The research team requests your assistance to gather information on current business pressures and drivers that impact businesses - and how these business pressures and drivers influence both environmental strategies and environmental performance.
Your assistance will help to create a framework and model to improve environmental excellence.

Participation

Your participation will involve participation in an interview that will take approximately 30 minutes of your time.

The interview will take place on Phone or Zoom, at a time that is convenient for you. The interview will be audio-recorded and remain confidential.

Your participation in this project is entirely voluntary. If you do not wish to take part, you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You may also request that any data collected about you be withdrawn and destroyed. If you do wish to withdraw from this project, please contact the Research Team (contact details at the top of this form).

Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland.

Expected Benefits

Environmental supply chain practices have been suggested to have a positive impact on both the environment and business. Therefore, it is expected that the findings from this project are expected to benefit the Australian dairy sector in several ways. For instance, it would be providing findings of current environmental drivers and pressures and a more in-depth understanding of how business drivers and pressures may impact environmental initiatives/performance. The research is expected to provide a framework that could be implemented to provide assistance and guidance in implementing environmental initiatives.

Risks

There are no anticipated risks beyond normal day-to-day living associated with your participation in this project.

Privacy and Confidentiality

All comments and responses will be treated confidentially. The conduct of this research involves the collection, use of your non-identified information. The information collected is confidential and will not be disclosed to anyone, all identifying information will be removed as part of the confidentiality process of the research. Audio recordings taken during the interviews will be stored securely as per University of Southern Queensland's Research Data Management policy and will securely remain for at least five years after the completion of the study. A copy of the findings can be requested as soon as data analysis is complete.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your interview.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project, you may contact the University of Southern Queensland Manager of Research Integrity and Ethics on +61 7 4631 1839 or email researchintegrity@usq.edu.au. The Manager of Research Integrity and Ethics is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

USQ Research Project Questionnaire - Sustainable (environmental) supply chain management practices in dairy companies.

The survey is an online questionnaire that will take a short ammount of time.

Your say is very valuable!

Project title:

Sustainable (environmental) supply chain management practices, pressures, and performance measures in Australian dairy companies.

Ethics approval:

Human Research Ethics Approval Number: H20REA247

Project Details

This research focuses on the space of sustainable (environmental) supply chain management practices within Australian businesses, in the dairy sector. The findings from this research will assist practitioners to apply a framework that can improve environmentally sustainable practices, by focusing on business pressures and drivers that impact environmental decisions.

This project is being undertaken as part of a Doctor of Philosophy Program.

The research team requests your assistance to gather information on current business pressures and drivers that impact companies - and how these business pressures and drivers influence both environmental strategies and environmental performance. Your assistance will be highly appreciated and will help to create a framework and model to improve environmental excellence.

Participation

This survey will take approximately 10 - 15 minutes to complete. Your participation in this project is entirely voluntary. If you do not wish to take part, you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You may also request that any data collected about you be withdrawn and destroyed. If you do wish to withdraw from this project, please contact the Research Team (contact details at the end of this form). Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland.

Expected Benefits

Environmental supply chain practices have been suggested to have a positive impact on both the environment and business. Therefore, it is expected that the findings from this project are expected to benefit the Australian dairy sector in several ways. For instance, it would be providing findings of current environmental drivers and pressures and a more in-depth understanding of how business drivers and pressures may impact environmental initiatives/performance. The research is expected to provide a framework that could be implemented to provide assistance and guidance in implementing environmental initiatives.

Risks

There are no anticipated risks beyond normal day-to-day living associated with your participation in this project.

Privacy and Confidentiality

All responses will be treated confidentially. The names of individual persons are not required in any of the responses. The data will be non-identifiable. The conduct of this research involves the collection, use of your non-identified information. The information collected is confidential and will not be disclosed to anyone, any identifying information will be removed as part of the confidentiality process of the research. The responses will be stored securely as per University of Southern Queensland's Research Data Management policy and will securely remain for at least five years after the completion of the study.

Consent to Participate

Clicking on the 'Submit' button at the conclusion of the questionnaire is accepted as an indication of your consent to participate in this project.

Research Team Contact Details

Please refer to the Research Team Contact Details if you have any questions answered or to request further information about this project.

APPENDIX D: EXAMPLE INTERVIEW QUESTIONS AND SURVEY

INTERVIEW GUIDE

Introduction and background questions (Introduction Questions)

- Tell me about yourself and your job responsibilities.
- What is your firm's current position in the supply chain?
- What product(s) do you manufacture in the firm?
- What type of experience do you have in supply chain and operations management?

Green (environmental) supply chain management activities (Research Question 1)

- Tell me about what type of environmental activities you currently adopt in the company?
- To what extent is environmental-labelling, environmental improvement of packaging, even remanufacturing important is implemented?
- Do you consider cleaner production such as in-plant defect rates and recyclable material use, use of non-toxic material, waste management?

Environmental performance (Research Question 2)

- What are your thoughts on measuring environmental practices? I.e., emissions environmental production, energy efficiency, business wastes for environmental pact?
- Does the company measure environmental performance on any green practices?

Institutional pressures for environmental (green) supply chain practices (Research Question 4)

- What type of environmental pressures do you face in your supply chain with the following points:
    - Customer pressure
    - Competitive pressure

    - Regulation pressure
- Can you please provide an example for each?
- Which regulations may impact the businesses environmental activities?

GSCM adoption (Research Question 3 and 5).

- To what extent are environmental strategies (drivers) pursued within the company?
- What do you think of adopting environmental practices, are there any reasons (barriers) you may or may not adopt green practices?
- Do you have a type of strategy or business model to implement green (environmental practices for the overall business)?

RESEARCH SURVEY

Introduction to the survey

What product(s) do you create in the business?

.....

What is the nature of the business?

.....

Which state is the business located in Australia?

.....

How many years of experience do you have working in the dairy industry?

- ❑ Up to 12 months
- ❑ 1-4 years
- ❑ 5-10 years
- ❑ 11-20 years
- ❑ 20+ years

What is the business size you manage or work for?

- ❑ Micro-business (1–4 employees)
- ❑ Small business (5–19 employees)
- ❑ Medium business (20–199 employees)
- ❑ Large business (200+ employees)

Please select one statement for each question.

Government initiatives and support

Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree

1. We receive environmental grants from the Australian government in the business.
2. Grants from the government are successfully communicated with us to adopt environmental practices.
3. There is enough information from the Australian government about environmental grants to decide to adopt an environmental grant.
4. We feel that applying for an environmental grant is accessible to the business.
5. There is a shortage of financial incentive for us to consider adopting environmental grants.
6. Economic benefit is important for us to consider environmental grants in the business.

1

External pressure on dairy businesses

Scale: Never, Rarely, Sometimes, Very often, All the time

7. In the business, we tend to face environmental pressure to adopt sustainable practices,
8. In the business, community pressure influences us to adopt environmental activities.
9. In the business environmental regulation pressure influences us to adopt environmental activities
10. In the business, organisational customers influence us to adopt environmental activities.
11. In the business, competitors may impact us to adopt sustainable dairy practices.
12. In the business, food quality and security impacts us to adopt sustainable dairy practices.

Overseas pressure

Scale: Never, Rarely, Sometimes, Very often, All the time

13. In the business, we look into New Zealand to get ideas on environment and dairy practices.
14. In the business, we look into Europe to get ideas on environment and dairy practices.
15. In the business, we investigate U.S to get ideas on environment and dairy practices.
16. In the business, we look into Asia to get ideas on environment and dairy practices.
17. The business exports products overseas.
18. In the business, exporting products play a part in whether we may adopt environmental dairy practices or not.

Cost and financial barriers

Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree

19. The cost price of our products makes it challenging to implement environmental dairy practices.
20. Return on investment for adopting sustainable initiatives is difficult to measure.
21. The business cost can be a barrier to adopt sustainable practices in the business.
22. There is an additional cost for environmentally friendly products and materials which can be a barrier.
23. Environmental revenue is difficult to measure in the business.
24. There is an absence of grants and financial incentives are a barrier to adopting environmental practices.

Performance and information barriers

Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree

25. Benchmarking sustainable practices can be a barrier in the business.
26. Sustainability in the business is challenging to quantify (measure).
27. More information is needed to know how-and-when to adopt sustainable practices.
28. Information from suppliers on environmental dairy practices is something our business would benefit greatly on.
29. The business monitors and measure sustainability as part of the dairy practices.
30. There is technology to measure sustainable environmental dairy practices.
31. The business requires more information on measuring sustainability as part of our dairy practices.

GSCM implementation and monitoring.

Scale: Not considering it, Planning to consider, Considering it currently, Initiating implementation, Implemented successfully.

32. We are currently considering in implementing a strategy to reduce waste generated by suppliers in our business.
33. We are currently considering in implementing a strategy to reduce wastewater in the business.
34. We are currently considering in implementing a strategy to reduce product material (i.e., silage or cardboard and plastic).
35. We are currently considering in implementing a strategy to recycle water in the business.
36. We are currently considering in implementing a strategy to minimize business waste in the business.
37. We are currently considering implementing a strategy to minimize chemicals (i.e., fertiliser) in the business.

38. The business measures energy in the operations as part of the dairy practices.
39. There is a method to monitor wastewater, as part of the dairy practices in the business.
40. There is a method to monitor supplier waste, as part of the dairy practices in the business.

41. There is a method to monitor recycling water, as part of the dairy practices in the business.
42. There is a method to monitor business waste, as part of the dairy practices in the business.
43. There is a method to monitor product material, as part of the dairy practices in the business.

Open-ended questions (Industry voice)

How do you think time has changed environmental sustainability within the business?

.....

What are your expectations in the future for implementing environmental sustainability?

.....

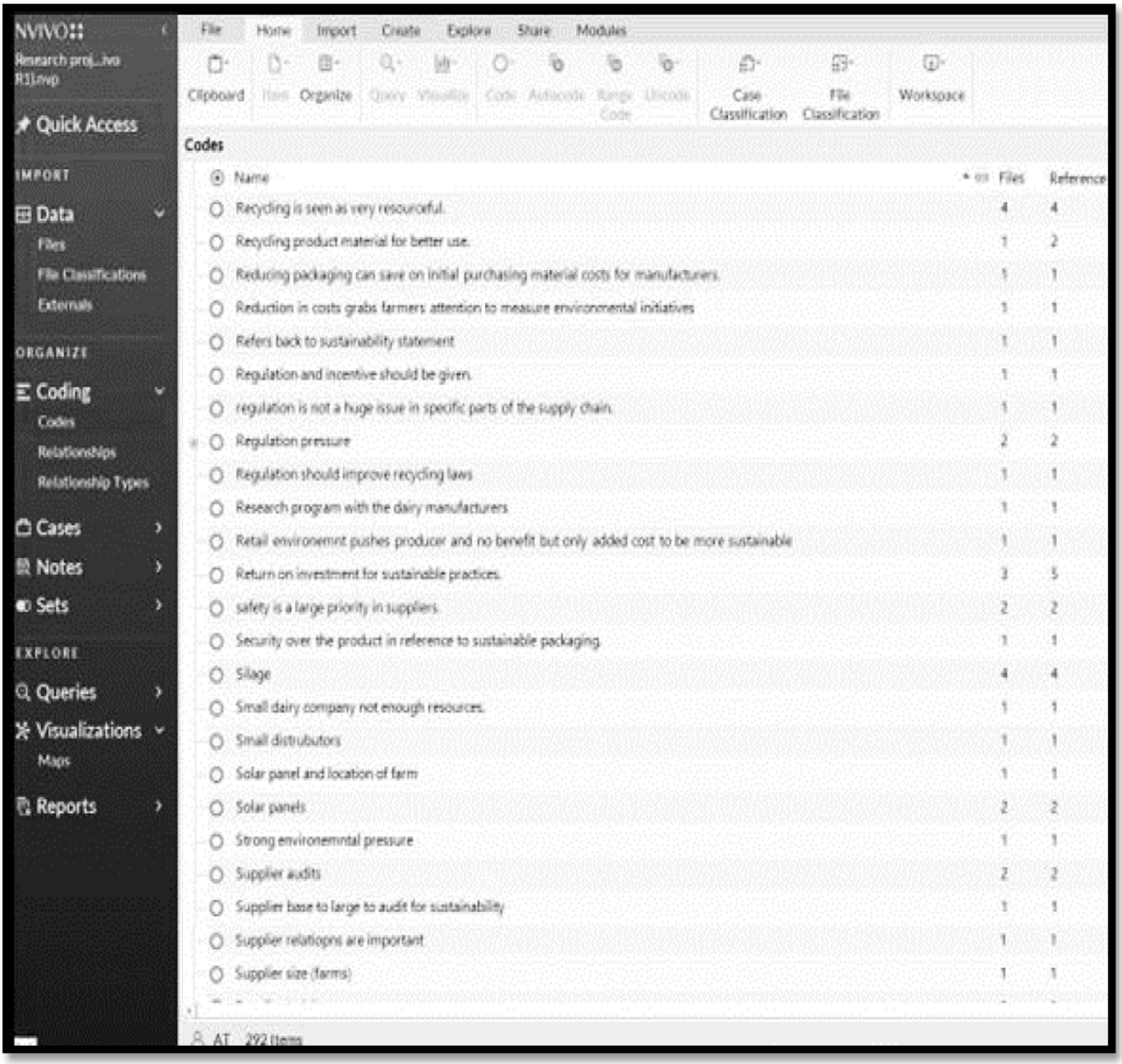
What types of changes can you see in the future for environmental sustainability and the business?

.....

Any other comments?

.....

APPENDIX E: QUALITATIVE ANALYSIS NVIVO CODING



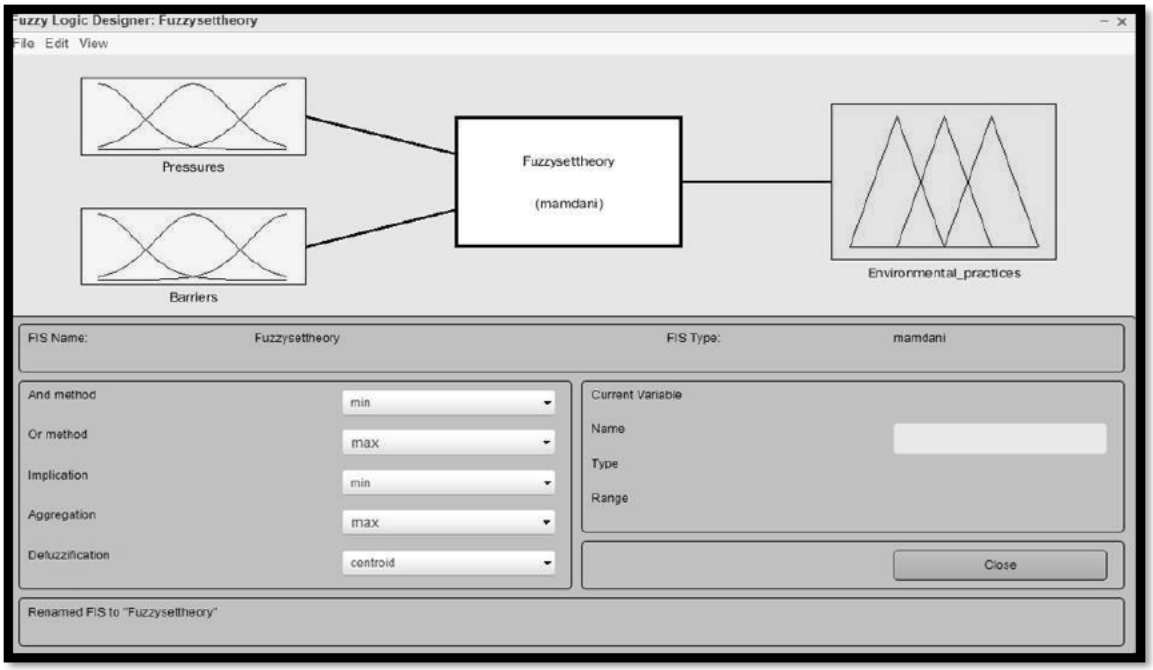
APPENDIX F: CORRELATIONS BEFORE THE THEME'S EVALUATION STAGE.

Correlations

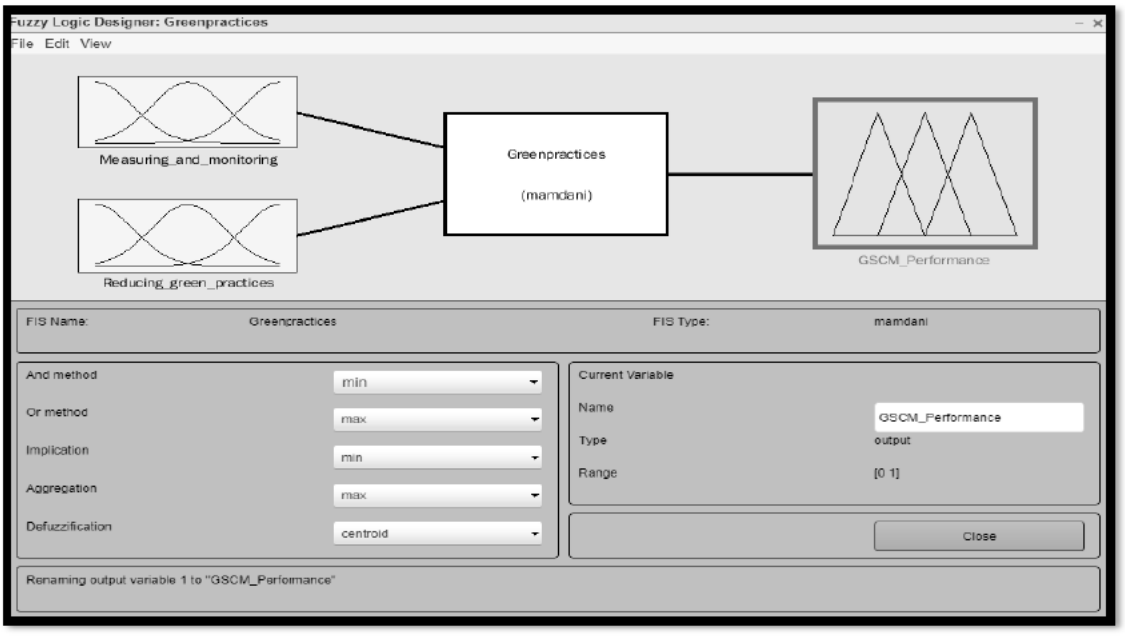
		Environmental Pressure	Environmental Strategies	Environmental Measuring	Government support	Environmental Barriers
Environmental Pressure	Correlation Coefficient	1				
	Sig. (2-tailed)					
	N	78				
Environmental Strategies	Correlation Coefficient	-0.006	1			
	Sig. (2-tailed)	0.957				
	N	78	78			
Environmental Measuring	Correlation Coefficient	.469**	.451**	1		
	Sig. (2-tailed)	0	0			
	N	78	78	78		
Government support	Correlation Coefficient	.361**	.352**	.585**	1	
	Sig. (2-tailed)	0.001	0.002	0		
	N	78	78	78	78	
Environmental Barriers	Correlation Coefficient	0.024	-.270*	-0.119	-.332**	1
	Sig. (2-tailed)	0.836	0.017	0.3	0.003	
	N	78	78	78	78	78

APPENDIX G: MATLAB WORKINGS

ISSUE 1:

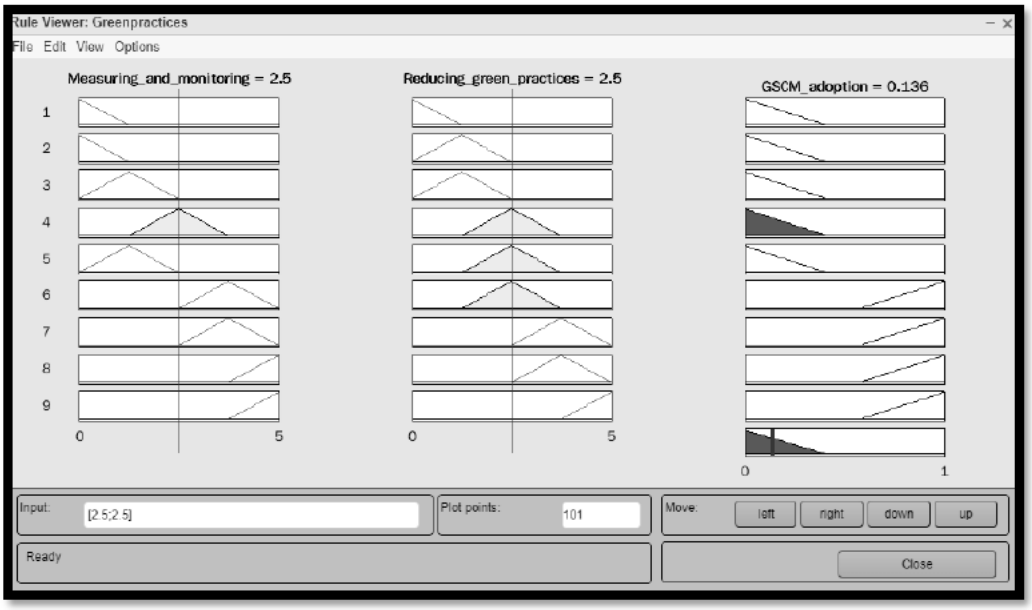


ISSUE 2:



APPENDIX H: MATLAB RULES

ISSUE 1:



ISSUE 2: