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A Scholarly Review of Supply Chain Integration within the New Zealand Wool Industry

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A Scholarly Review of Supply Chain Integration within the New Zealand Wool Industry

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Integration: the process of combining two or more things… into one.

Cambridge Dictionary (2020)

Table of Contents

Preface

Supply Chain Integration is a vast field of study, and a Google Scholar search will reveal more than 2.7 million publications in this space. This document captures some of the core concepts when the degree of integration of a primary industry supply chain, such as the wool industry, is evaluated. The book was developed after final year students in Massey University's Logistics and Supply Chain Management Programme conducted an in-depth review as part of a formal assessment. The content of the book is of a scholarly nature and caution should be practiced before any guidelines are implemented. The students studied the literature, reports, newspaper articles and accessed information on the internet. However, the most valuable source of information was through interviews with industry representatives, most noteworthy, an interactive question and answer session with wool exporter, Mr Ryan Cosgrove.

Acknowledgements

Ryan Cosgrove from Carrfields and Phillippa Wright from Wright Wool provided valuable contacts and information concerning the NZ Wool industry. We also would like to thank the following individuals for providing short soundbites concerning the wool industry; Peter Whiteman (CEO Segard Masurel), Peter Christensen (Chairman of Wool Exporters and GM of Schneider NZ), Craig Smith (Chairman of the National Council), Grant Edwards (Chairman of the NZ Wool Brokers Association and GM Wool PGG Wrightson) and Dean Harrison (Chairman of the Merchant Association). The views published in this scholarly document do not necessarily reflect the opinions of the individuals mentioned above.

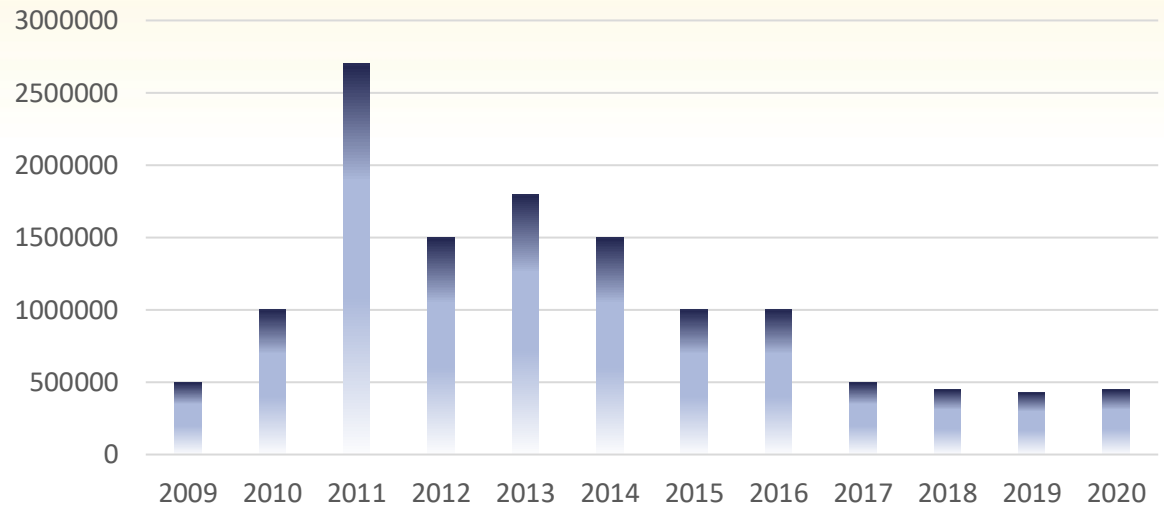
Introduction to the New Zealand Wool Industry

Sheep arrived in New Zealand in 1773 and 1777 by British navigator James Cook. Samuel Marsden, a Missionary, moved sheep to the Bay of Islands from New South Wales in 1814 and John Bell brought sheep to Mana Island in 1834 to be used as food for whalers (McLintock, 1966). During the same period sheep from Australia were also brought to Wellington and Wairarapa by Charles Bidwill, Charles Clifford, William Vavasour and Henry Petre. Wool was ideal for export, because it was easy to store and transport, and there was strong overseas demand due to an expanding textile industry (Science Learning Hub, 2010). During the 1850's, sheep farming expanded to the South Island. In 1858 there were approximately 1.5 million sheep in New Zealand, which by 1867, increased to 8.5 million (Te Papa's on floor multimedia database, 1998). Taunton (2019) points out that by 1982, the sheep population in New Zealand hit a peak of more than 70 million, however, this dramatically dropped to 27.4 million by 2000. As of June 2020, there has been an estimated count of 26.1 million sheep in New Zealand (Granwal, 2021). Sheep numbers have been declining by approximately 800,000 per annum.

The New Zealand wool industry is the world's largest supplier of strong wool. New Zealand's economy was built on sheep with wool being the most valuable export from 1856 to 1967. At its peak during the great New Zealand wool boom in 1951, wool exports increased by over 70% and wool accounted for nearly 52% of the country's export revenue ("The Price of Wool and Economic Growth", 2021). According to the Food and Agriculture Organization (FAO; Donald, 2020), in 2018 New Zealand ranked eighth in the world with approximately 27.3 million sheep within its borders. The country produces approximately 128,000 metric ton of wool annually. The most common breeds kept for wool in New Zealand are Romney, Merino, Polwarth, Corriedale, and English Leicester. Interests in breeds, such as Arapawa and Gotland have been steadily increasing. Romney sheep as it is dual purpose making up approximately 52% of the national flock.

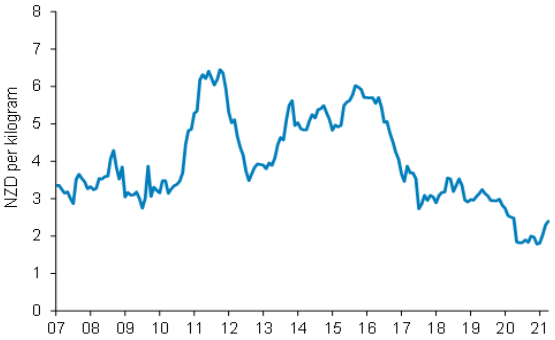
While Australia leads in producing fine wool used in the apparel industry, New Zealand produces 90% of the world's cross-bred coarse wool. New Zealand exported 41,752 ton of wool in 2018, used primarily in the carpet, upholstery, and blanket industries. However, wool exports have nearly halved since 2012. Fine Merino wool is highly valuable as it is soft and can be dyed and manufactured into fine yarns destined for the high-end fashion clothing markets. Merino only makes up 3% of New Zealand's total wool production ("Wool production and processing", 2021), and unfortunately, growing competition from

synthetic fibres have lower the demand for strong wool.



Wool exports of NZ from 2009 to 2020 (Marshall, 2021)

Wool prices have steadily declined, and in 2020 wool was selling for a third of the price compared to five years earlier. For many farmers the cost of shearing has exceeded earnings. But many farmers strongly believe in the value of their product and foresee better opportunities in the future. The concern arises whether declines in exports would reach a point at which farmers would be only sheering sheep for animal health purposes and not for earning additional revenue.

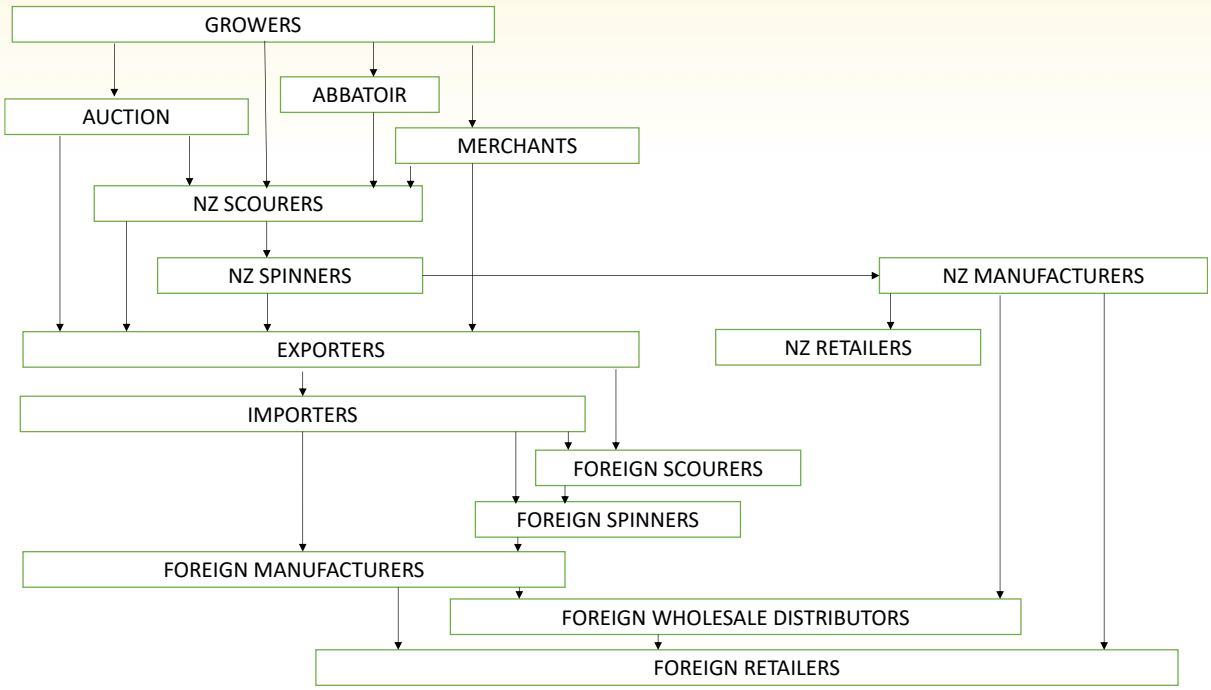


Wool Prices, Wool Services International, PGG Wrightson, ANZ Research

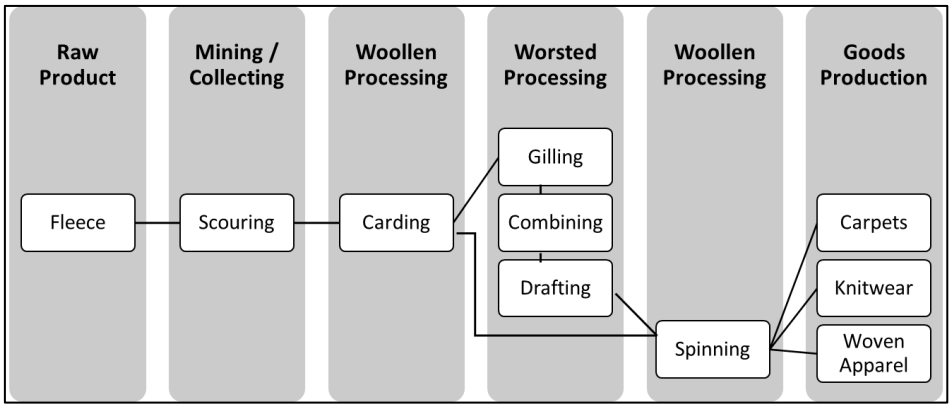
There is currently increasing consumer demand for natural and sustainable products, and along with the anti-plastic movements, this provides the New Zealand wool sector a significant opportunity for re-growth. New and innovative products for wool using fine merino for activewear have caused a recent boom in demand. Wool is a versatile commodity with a range of benefits over its synthetic competitors. Wool is 100% natural, biodegradable, renewable, fire-resistant, and can be manufactured into a wide variety of products. ("Vision and Action for New Zealand's Wool Sector", 2020). New Zealand has some of the most highly prized wool in the world and continues to be a significant player in the global market.

The wool supply chain constitutes different stages and can be divided into local consumption and export. Value chain partners may include a combination of growers, brokers, merchants, local processors, domestic retailers, exporters, global manufacturers and/or global retailers. Large organisations include, amongst others, PGG Wrightson Wool, Primary Wool Cooperative, Cavalier Bremworth and the NZ Merino Company (Ministry of Primary Industries, 2020). Wool is classified before typically sold at auctions to wool brokers, this classification is based on several factors: including, its fibre diameter, length, tensile strength, yield (the proportion of clean washed wool from the original greasy state), colour, and bulk. Wool brokers will typically on-sell their

wool to the exporters who will supply to overseas yarn manufacturers.



The flow of wool through the New Zealand strong wool value chain; Conforte et al. (n.d.)



Wool Processing stages: Fleece to Fabric (International Wool Textile Organisation, n.d.)

As wool is produced into different products like insulation, clothing and carpets, different breeds produce different types of wool (Flaws, 2020). The National Library of New Zealand (2008) defines the following:

Raw wool - "*Wool fibre together with variable amounts of vegetable matter and extraneous alkali-insoluble substances, mineral matter, wool waxes, suint and moisture*".

Greasy wool – "*Wool from the sheep's back or sheepskins which has not been scoured, solvent degreased, carbonised or otherwise processed*".

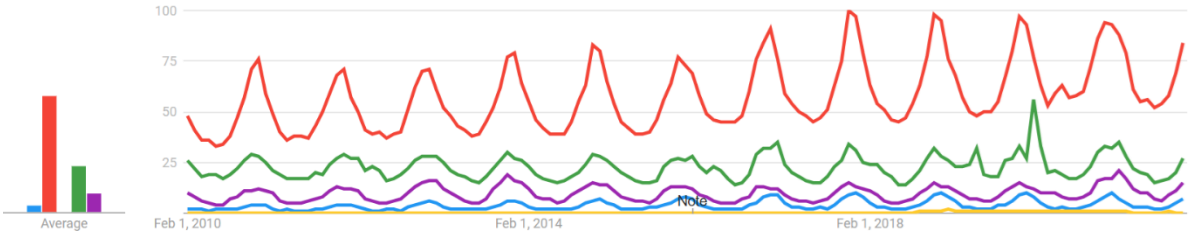
Wool which has been scoured, carbonised, washed, or solvent degreased – "*Greasy or slipe wools that have been commercially scoured, carbonised or solvent*

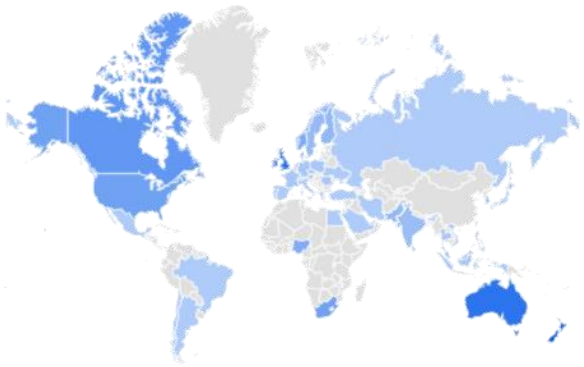
degreased, excluding washed and partly washed wools".

Slipe wool – "*Slipe wool is wool removed from skins produced by meat processors. It may contain residues from the slipping process, such as "lime" and skin pieces. Additionally, there is evidence to suggest that the slipping process may alter the way wool initially absorbs moisture. This may affect the measurement of wool base*".

Wood (2014) indicates that in the early 2000's over half of the exported raw wool in NZ went to Asian countries, while a third went to western countries. The flow of wool from Australia has been similar. Wool is a product with intrinsic variability that cannot be readily adapted to change in manufacturers' needs. As a result, it faces stiff competition from synthetic textiles made from petrochemicals in a segment of the worldwide textile market. By 2010 competition by the synthetic fibres market led to significant declines in demands for wool. China is the largest market for New Zealand's wool and COVID-19 has also affected the market demand due to reduced manufacturing capabilities. Data from Stats New Zealand show that by January 2021 total wool exports have fallen by 30.2%. At that stage New Zealand was earning more from live animal exports than from wool clip (Marshall, J., 2021). Lamb constituted 4.1% of all New Zealand exports in 2019, while wool was only responsible for 0.56% (Atlas of economic complexity, 2019).

The following information was produced using the Google Trends (2021) tool and shows the comparative nature of web-based searches for wool in different languages (blue on the graph, depicts Google searches for "ウール", which is Japanese for wool). The map presents the regional intensity on searches for "wool" in English. Interest in wool is cyclical and peaks during the northern hemisphere winter.





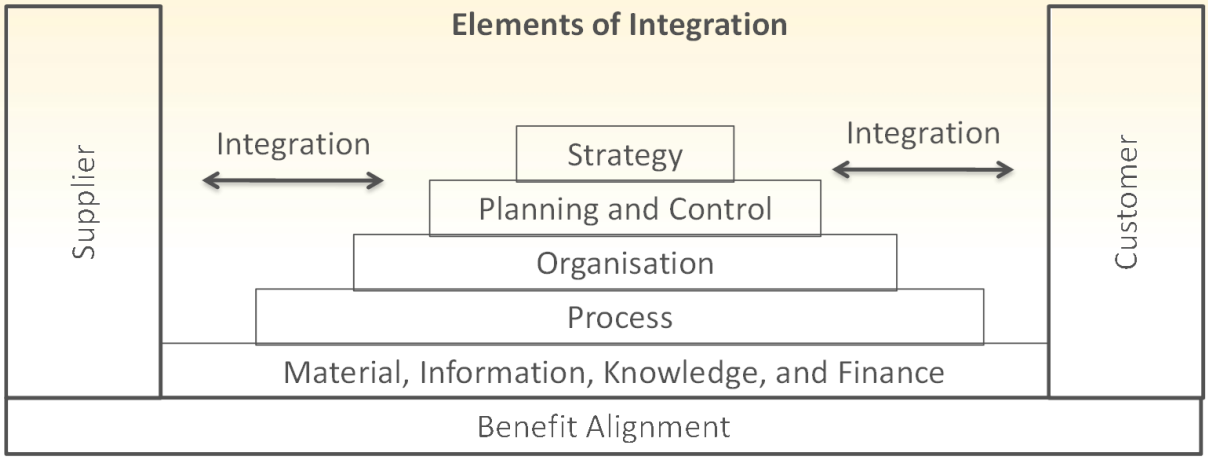
Integrated Supply Chain Thinking

Supply chain management (SCM) is about "integrating all key operational processes at any level between the final users and original suppliers to create added value for customers and other stakeholders'' (Lambert & Cooper, 2000). Supply chain integration is founded on a systems perspective which asserts that the optimisation of the whole entity attains better performance compared to a string of optimised sub-systems (Parnaby, 1979; Christopher, 2005 as cited by Childerhouse & Towill, 2011).

The practice is seen as an overarching redesign that refines traditional approaches and connects entities through information sharing and coordination (Katunzi, 2011). According to Flynn et al. (2010), supply chain competitiveness and success are built upon a robustly integrated supply chain, including collaboration, shared vision, high level of coordination, shared information, and technical infrastructure between producers and distributors.

Integration offers short and long term benefits such as the firm's financial performance, while long-term benefits translate to customer value creation (Annan et al., 2016 as cited by Feyissa, Sharma & Lai, 2019). Furthermore, supply chain integration provides the effectiveness of balancing supply and demand. Every organisation requires four major business components to be effective and profitable, namely, strategic product innovation, a resilient supply chain, agile operational and financial planning, and streamlined transportation. According to Prajogo & Olhager (2012), developing an integrated supply chain will deliver benefits such as, increased visibility and collaboration that helps organisations to reduce costs, production time, response time and wastage. However, the blanket assumption that a more integrated supply chain is always more profitable can be challenged since a fully integrated supply chain may be too costly to achieve.

Businesses strategically coordinate with their supply chain partners to manage internal and external processes in order to attain a seamless flow of goods and services, as well as to provide end consumers with maximum value at the lowest possible cost and highest efficiency (Yi-nan & Zhaofang, 2009). Understanding the links between internal and external parties and developing organisational strategies are of paramount importance to the effective implementation of a more integrated supply chain (Feyissa, Sharma & Lai, 2019). Integration ranges from supplier to consumer and stresses the principles of shared decision making, collaboration, shared vision, high levels of trust and open communication between producers and their respective customers (Flynn, Huo, & Zhao, 2010). Research reveals that enterprises utilizing technological innovations, such as cloud applications, for more open communication and visibility have increased their customer satisfaction by considerable margins. Zhang et al. (2013) derived the model below using the analogy of a computer network and a layered approach in describing the levels for supply chain integration.



Elements of integration, Zhang et al. (2013)

VERTICAL AND HORIZONTAL INTEGRATION IN THE WOOL INDUSTRY

In New Zealand more wool supply chains are becoming vertically integrated, however, this is still a relatively small percentage within the sector. Product flow is smooth and well organised throughout New Zealand, but little business integration across the wool sector appear to exist. The uptake of digital systems, for example, appears to be slow with some parties still relying on traditional pen and notebooks in 2021. In order to achieve supply chain integration as per the definitions stated above, each participating stakeholder first needs to achieve internal integration amongst all departments.

The industry may also benefit from more horizontal integration. Horizontal integration refers to integration between competitors as opposed to those who have a buyer-seller relationship (Gaughan, 2013). This will give the industry more buying and selling power within the market. Also, horizontal integration may allow for new product development and business innovation within the industry due to the larger capital available and economies of scale.

There are probably five key types of integration needed to achieve competent supply chain integration in the wool industry, namely;

- Relationship integration
- Measurement integration
- Planning integration
- Internal operational integration, and
- Customer integration (Huo, 2012).

INFORMATION SHARING IN THE WOOL INDUSTRY

Information sharing is an essential element of coordination in a supply chain and allows firms to access data across different groups along the chain to collaborate in various activities (Kumar & Pugazhendhi, 2012). In New Zealand's wool industry there is often a perception that shared information within the sector will inform competitors and may disadvantage the business. Despite being able to synthesise information from wool auctions and export tariff data, members of the wool industry do not necessarily allow others to easily access their data. Contrary to some assumptions that information sharing may create mutually beneficial outcomes, the wool industry views this as an avenue for some contenders to gain a competitive advantage. This probably contributes to the inhibition of supply chain integration in the sector.

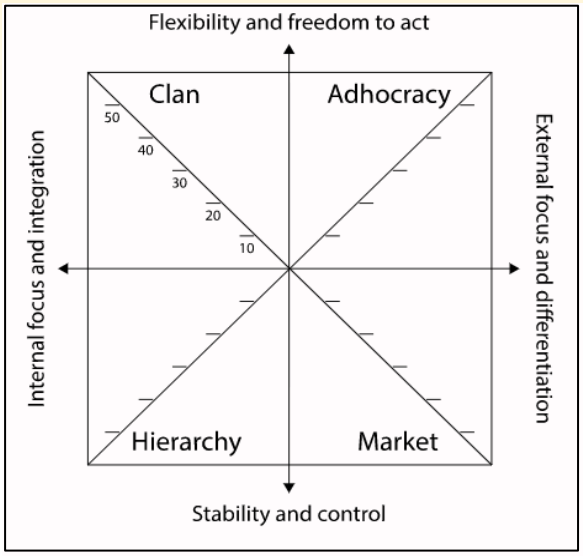
Supply Chain Culture

According to Deshpande & Webster, 1989 "A corporate culture involves shared beliefs, values, and norms throughout an organization". It is also important to note that culture is not limited to only a certain group of people, such as management. Smircich (2017) states that "organizations do not have cultures, they are cultures; culture is a kind of social glue that connects the organization within itself." Essentially culture is like the "personality" of the business; it is simply "the way things are done around here" (Deal & Kennedy, 2000). Business leaders play an important role in creating and communicating culture across the business and ensuring culture is in line with the organisation's business strategy. Organisational culture becomes a firm's source of competitive advantage which could lead to increased innovation (Barney, 1986 as cited by Sung & Kim, 2019), efficient operations and enhanced performance (Denison & Mishra, 1995 as cited by Sung & Kim, 2019).

If collaborating organisations have different organisational practices, it will result in poor performance, commitment issues and conflicting communication. "A supply chain should be results-based, employee-focused, flexible, pragmatic, externally-focused and able to thrive on constructive criticism. Conversely, where the supply chain's culture is rule-driven, job focused, defensive, inflexible, and internally- focused, this appears to have a direct correlation with poor performance" (Cadden, T., Marshall, D., & Cao, G., 2013). One of the most widely accepted frameworks for assessing organisational culture is the Competing Values Framework (CVF) (Quinn & Rohrbaugh, 1981). These authors argue that every organization will have some part of each of the four culture types, rather than one or the other. A culture type works best in the activities domain that aligns with its values. The four culture types are listed below and illustrated in the following figure.

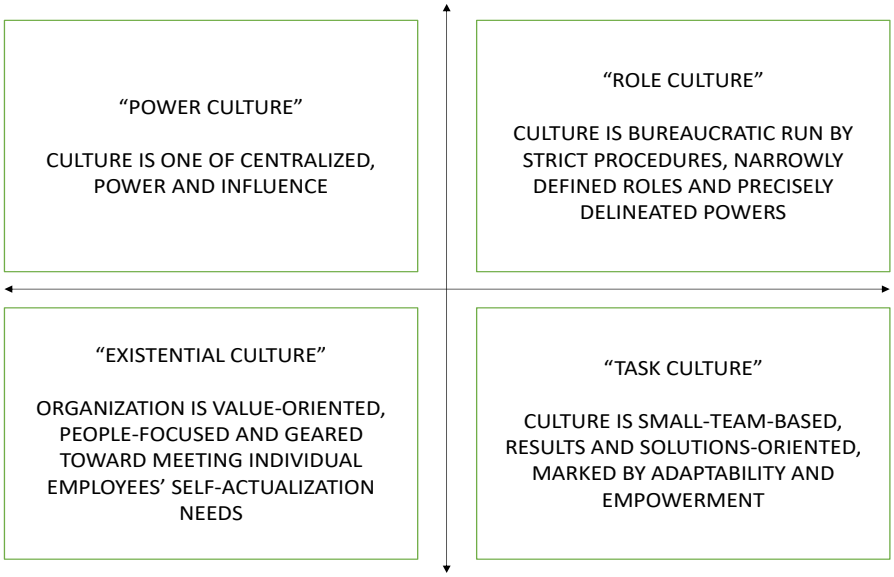
ORGANISATIONAL CULTURE TYPES:

- **Collaborative** (CLAN): Doing things together.
- **Create** (ADHOCRACY): Do new things.
- **Control** (HIERARCHY): Do things right.
- **Compete** (MARKET): Do things fast.



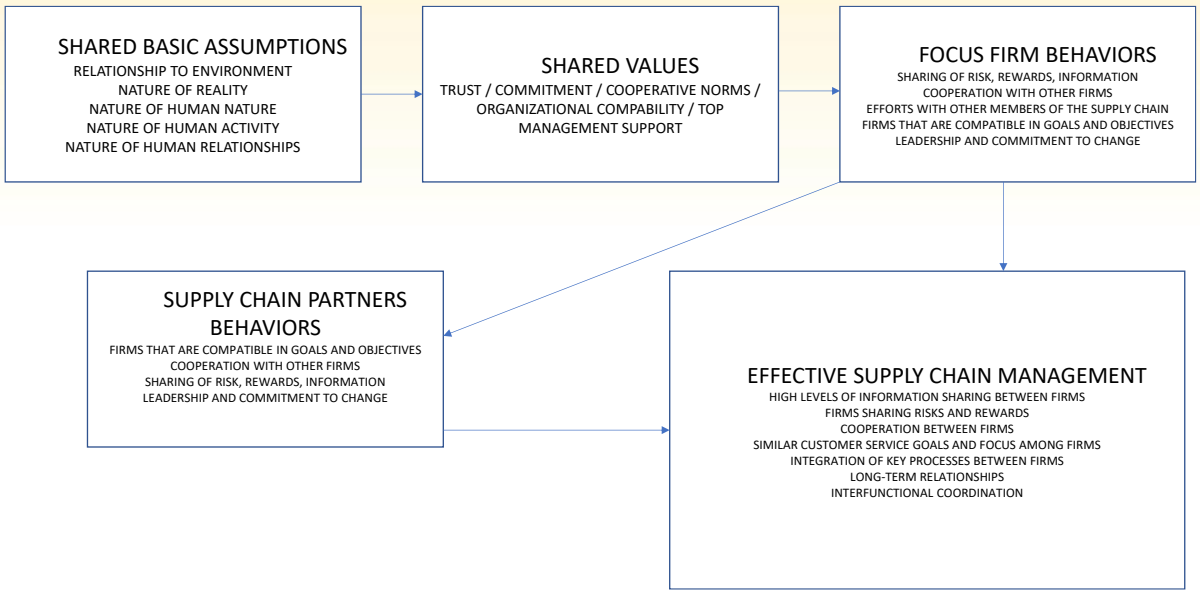
Competing Values Framework (Quinn & Rohrbaugh, 1981)

Handy (2016) identifies four types of cultures that may exist in an organisation (first figure below), while Mello and Stank (2005) unpack the activities that develop culture in a supply chain (figure on next page).



Handy's four organizational culture types (2016)

In 2008, James Parsons referred to the wool industry culture as that of independence, mistrust, and poor communication that is caused by dysfunctional supply chain structures and hindering the transformation of New Zealand's wool industry. The wool industry in New Zealand is relatively old, well stablished and recalls an era when business was better compared to today. This promotes a predominantly traditional culture where supply chain members operate in a way similar to past decades, sharing many of the same beliefs, values and norms. Traditional cultures make it more difficult to collaborate with new partners and to develop new opportunities. However, there is a New Zealand phrase referring to the "Number Eight Wire", which originates out of rural fencing (Motovated, 2019). Some operators refer to this saying when they describe a culture in the wool industry, signifying strength and toughness.



Development and outcomes of supply chain orientation as a strong corporate culture (Mello, J. E., & Stank, T. P.,2005).

Quality relationships between partners are crucial for effective supply chain management. These relationships are built on common values and trust. Fairness is an important attribute between supply chain partners, especially when business is constrained. Trust between supply chain partners is hard to achieve and arguably even harder to measure, making this a complex supply chain attribute to understand and manage. The fairness perception can affect the trust perception and will damage the quality of a relationship. Sun, Y., Zhu, Z., & Yang, H. (2021) confirm that price satisfaction significantly affects the fairness perception. This creates a delicate balance between price, trust and fairness that needs to be nurtured between supply chain partners.

In 2015 the wool industry was significantly challenged in a short space of time and, to the opinion of some, initiated a shift towards a more transformational culture. In a transformational stage of the wool industry, the supply chain culture is expected to be more collaborative. Parsons stated already in 2008 that innovative leadership and visionary governance are of great importance to make necessary changes that will create a shift in culture and transform the industry.

Credence Attributes and Value Add

Purchasing decisions of consumers are based on various product attributes. These attributes can be categorised into three groups: Search Attributes, Experience Attributes, and Credence Attributes (Nelson, 1970, Darby & Karni, 1973 as cited by Peterson, Hustvedt & Chen, 2012). Search Attributes are observable product characteristics such as price and brand, while experience attributes are those that involve sensory contact. Credence attributes, on the other hand, refer to features of a product that cannot be directly perceived or determined through product experience (Wirth et al., 2011 as cited by Miller, Driver, Velasquez & Saunders, 2014) and are usually conveyed on a label or a type of certification (Miller, Driver, Velasquez & Saunders, 2014).

Examples of credence attributes include product safety, country of origin, organic production processes, animal welfare, and impact on and protection of the environment (Miller, Driver, Velasquez & Saunders, 2014). These attributes influence how consumers perceive value and quality of a product and their willingness-to-pay, which in turn can lead to increased purchasing intentions. From a supply chain perspective, the drive towards increased credence attributes typically goes hand in hand with capability development, skills training, research and development, accreditation and standards, as well as sector connection and coordination.

Most of the credence attributes in the wool industry could be related to animal welfare, environmental impact, social welfare and cultural benefits. New Zealand has strict regulations with regards to animal welfare (Wilcox, 2019). This is probably not fully exploited by the wool industry. The New Zealand sheep and beef market also include policies concerning free range and grass feed welfare (Beef and Lamb New Zealand, 2017), while other countries may require the use of grain and growth hormones to meet supply chain demands (Food Print, 2019).

Farmers and advocates of the wool industry are continuously aiming to repurpose and innovate products to bring wool back in trend. Stakeholders have a strong believe in an emerging future for wool due to, amongst others, its environmental-friendly credence attributes (Marshall, 2021). In 2012, Peterson et al. found that most US consumers prefer wool to acrylic, and they also distinguished between domestic and imported wool products. They valued organic certification less in comparison to credence attributes that

combined environmental sustainability and animal welfare as a whole. Wool is receiving increasing attention due to the growing demand of millennials for sustainable products (Poala, 2018 as cited by Morrison, 2018). The chief executive of Italian textile mill Successori Reda, confirmed this by stating:

"This moment for sure is a good moment for the wool growers… The millennial consumer doesn't just want to buy a product or a brand, they want to buy a story and an experience that respects their environmental philosophy."
- Erole Botto Poala

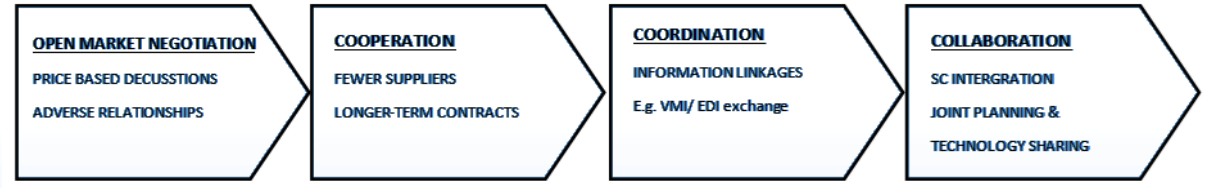
The local processing of wool products potentially generates favourable credence attributes in the form of a reduced carbon footprint and an opportunity for "made in New Zealand" branding. Big Save Furniture, for example, is a New Zealand business choosing wool over polyester for its upholstery of sofas. Kilsby (2021) states that Big Save Furniture has also committed itself to paying farmers a 'fair price' for their wool, which is part of its sustainability efforts. Several other new products are emerging in the industry. For example, the product design company Woolkin, has been exploring innovative new uses for wool. The company derived a new material, Naturesclip, which is designed to be machine processed like timber, mouldable like plastic and foldable like metal while retaining the inherent properties of wool (Marshall, 2021). Woolkin has a vision to replace plastic products and is working on Bubble Wool, an alternative for bubble wrap and other synthetic packaging solutions (Marshall, 2021). Sam and Sophie Hurley, who are third-generation farmers based in Papanui, have created a reusable bag out of wool when plastic bags in supermarkets were phased out. This invention also paved the way for the innovation of higher-value products, such as felt hats and bags that are now produced under the Honest Wolf brand.

New Zealand firms, however, can encounter difficulties when they choose domestic processing. The local market is small, and businesses are often forced to start exporting to other countries (Saunders et al., 2011). Market positioning abroad may be challenging due to distance from the market and other more general concerns, like access to finance.

Supply Chain Collaboration

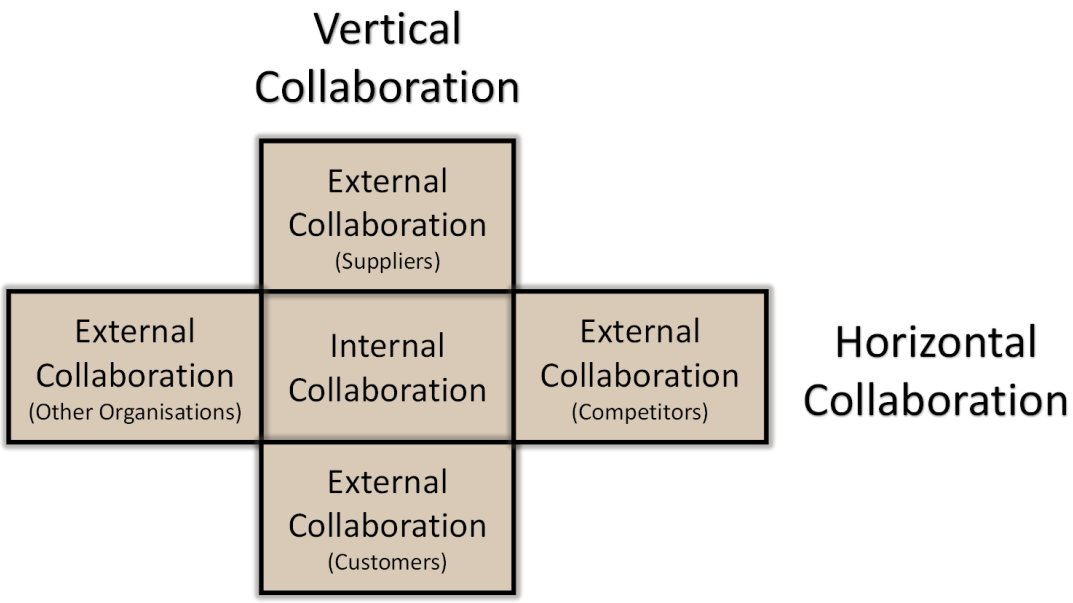
Simatupang and Sridharan (2004) define collaboration as "two or more chain members working together to create a competitive advantage through sharing information, making joint decisions, and sharing benefits which result from greater profitability of satisfying end customer needs than acting alone". Supply chain integration is heavily reliant on the collaboration with other supply chain partners and significant time and effort are needed to build these long-term relationships. In a competitive supply chain market, the alignment of two organisations can be hard to achieve, as players need to navigate many differences in organizational structure, culture, and strategies. This is especially the case when collaborating with supply chain players who traditionally would have been seen as competitors. Trust quickly becomes a key element in the formation of collaborative partnerships. Mangan & Lalwani (2016) define a collaborative partnership as a step-by-step journey that takes trust and time to be formed.

Four broad stages of collaboration can be identified as per the figure below. Cohen & Roussel (2005) argue that not all relationships need to be collaborative to its full extent and organizations will sometimes benefit more from having fewer, but stronger and longer-lasting relationships.



Gattorna (2003) provides a simple stepwise framework on how a collaborative supply chain strategy can be rolled out within an organisation:

- **Step 1:** Integrate the internal functioning of the supply chain (Internal collaboration)
- **Step 2:** Improve collaboration with customers and suppliers (Vertical collaboration)
- **Step 3:** Synchronize the supply chain and sector into one logical enterprise (Horizontal integration)



Scope of collaboration (Barrett, 2004)

Almost all supply chain businesses begin their collaboration journey by firstly addressing internal collaboration. Internal collaboration means unifying business unit functions and processes within the firm by breaking down the traditional business unit silos, such as marketing, planning, logistics, finance, and improving communication and information sharing across these business activities. (Soosay, Ferrer, Santa, & Hyland). An example of internal collaboration is the development of highly efficient, cross-functional teams.

Over recent years the wool industry has put significant time and resources into how it can better operate and gain value for the industry. According to a statement by Primary Wool Cooperative chair Janette Osborne, "forward focus needs to be on collaboration, innovation, promotion, advocacy, and good governance", and "Under collaboration shareholders want to see a broken industry work towards becoming whole".

Horizontal collaboration seems to be appearing at auction houses and exporting markets, with data becoming more available as technology becomes integrated (Wool Online, 2020). However, it is not yet clear on how many local businesses and farmers are taking advantage of this information and implementing new techniques. In 2019 a strategic collaboration agreement was announced between Cavalier Corporation Limited and the New Zealand Merino Company. This alignment aimed at implementing a transformative and design-led business model targeted at connecting consumers with the company's wool product.

For farmers to increase their returns, many wool growers have also joined forces in establishing wool co-operatives. This enables farmers to participate further down the supply

chain in scouring, spinning, and exporting when compared to a traditional supply chain model. The most recent merger between the Primary Wool Cooperative and Wools of New Zealand has been significant. Primary Wool Cooperative (PWC) chairman Hamish de Lautour said; "*The collaboration would increase the scale and clout of the growers, to better represent their interests*''. Together the shareholders of WONZ and PWC produce over one third of New Zealand's entire strong wool clip.

Benefits of the New Zealand Wool Co-Ops merger include:

- Increased economies of scale,
- Increased influence and power within the industry,
- Building a stronger entity to represent farmer interests,
- Offer the combined scale and vision required to make a difference for New Zealand's sheep industry,
- Building stronger more direct relationships with customers and consumers, and
- Re-inventing the supply chain and improve efficiencies.

Collaboration can achieve lower inventory levels and higher inventory turns. It is also possible to achieve lower wool transportation and warehousing costs. Shorter lead times and lower out-of-stock levels can be anticipated. Players in the wool supply chain can collaboratively improve customer service metrics and achieve visibility into customer demand and supplier performance. Good data forms the backbone for strong collaboration and facilitates aligned performance improvements across organizations. It can also be argued that collaborative benefits would enable the industry to focus on supply chain partner and staff retention, which would further help in reducing long-term costs and may even improve wool quality.

Supply Chain Leadership

TWO LEADERSHIP STYLES

Transactional Leadership	Transformational Leadership
	
Rewards effort	Inspires and motivates
Tells what to do	Future conscious and dynamic
Task and result driven - evaluates performance	Engaging and influencing subordinates
Works within existing boundaries, think inside the box	Aligns to the vision and values to the overall company strategy
Works for set and established goals	Inspires the team to drive change to achieve a common goal
Clear structure/ hierarchy	Lead by example

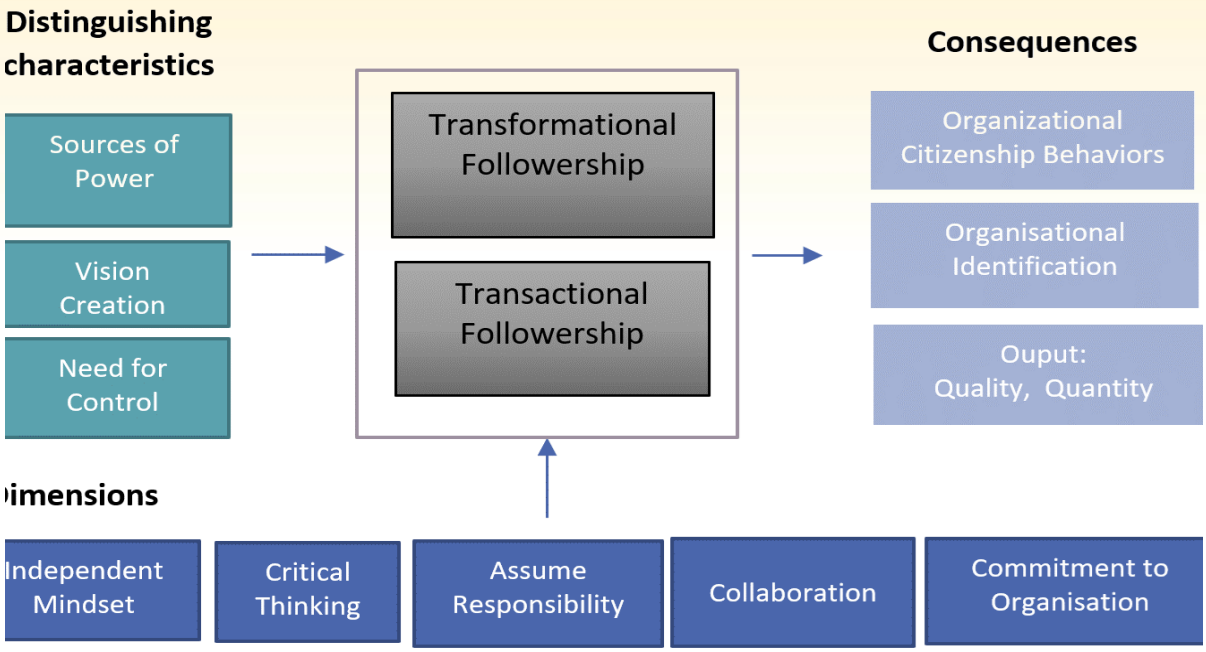
In 2010, Junqueria presented his governance theory for enhanced supply chain management. He asserted that for integration to impact the supply chain management practices, it must be built on high levels of mutual collaboration and trust between the organization, suppliers, and distributors. Perceiving themselves as enterprises in an integrated supply chain model and no longer claiming to be autonomous entities. Still, intricately woven polygenic structures, it is critical to have leaders that can manage the entire supply chain as if it is one, without each component losing its character. As pointed out by Li et al. (2006), increased attention is placed on crafting appropriate leadership styles that can sustain whole supply chains while managing their performance for improvement.

Twin (2020) outlines business leadership as "*the capacity of a company's management to set and achieve challenging goals, take fast and decisive action when needed, outperform the competition, and inspire others to perform at the highest level they can*". Supply chain leadership is referred to as the sound integration amongst management of people as well as logistic systems that allows companies to continually analyse and respond to recent market trends (Sharif & Irani, 2012). It is important to note that supply chain leadership may comprise an individual, a group, or even a business.

Transformational supply chain leadership focusses on the premise that leaders encourage others and create relationships that motivate those involved in production, distribution, and the supply of goods. The transformational supply chain leadership style is characterised by attributes such as intellectual stimulation, inspiration, and individualised consideration. In this context, it seems that transformational supply chain leaders are mainly responsible for articulating the vision for the supply chain environment. Their communication of the mission and values are considered to be important and capable of influencing behaviour internally and amongst supply chain partners. Supply chain participants may possess different skills and will probably have different organisational goals. Effective transformational supply chain leaders will understand each member's perspectives and will influence them to improve overall supply chain performance.

Not all aspects of supply chain leadership require a transformational approach. Some leaders need to model transactional behaviours, where the focus is on contingent rewards and management by exception. Contracts (either verbal or written) are the governance devices between supply chain members and exist in all kinds of inter organisational relationships. Transactional supply chain leaders promote contingent reward behaviour amongst supply chain members governed by the contracts that describe the nature of exchange between parties (Mokhtar et al., 2019). Transactional leaders will also encourage supply chain partners to implement management-by-exception systems, which focus on formal reporting and the systematic identification of issues that need further attention. These systems are supported by interconnected information systems that provide visibility for supply chain members and supply chain leaders prefer to manage their inter-organisational relations mainly through exception reporting.

The figure below illustrates the Followership Theoretical Model by Defee (2007). The model includes the attributes that necessitate leadership (on the left), the requirements of leadership (in the bottom) and the outcomes of good supply chain leadership (on the right).



With a need for innovation and improvement in systems, collaboration and communication between supply chain partners, there is scope for the wool industry's leaders to adopt transformational leadership characteristics. However, transactional leadership will simultaneously allow the industry to increase efficiencies, stick to goals and contracts, and focus on operational excellence to help survive the competitive business environment.

The Wool Industry Project Action Group (PAG) urges the development of a strong wool sector governance and coordination group composed of representatives from PAG, the wool industry, value chains and government, including farmers, researchers, merchants, and manufacturers that can facilitate activities across work programmes. This group should also provide leadership and cultivate trust within the sector through the identification of areas where members can collaborate and build cohesive relationships necessary for the industry's advancement. These efforts, combined with other initiatives, could in turn make New Zealand "an ethical, sustainable, and a producer of high-quality natural fibre that is fit for a better world" (PAG, n.d.).

The wool industry, however, has multiple leaders within every branch. This enables all leaders to present information through multiple channels, such as websites, blogs, newspaper articles and in the boardroom. However, the Australian Wool International Limited (n.d) present evidence of too many leaders and too little diversity within their industry. Although each leader has responsibilities, there is little partnership and unity within the wool supply chain in Australia (Long, Becker & Field, 2019). Similar issues can be identified in the New Zealand industry and there is difficulty within the NZ wool industry to adapt to a new market due to the lack of recruitment in diversity as the industry remains stringent and traditional (Stuff, 2021). Despite each section of the wool supply chain remaining crucial to the continuation of the industry, there are probably many entities who advocate their values and beliefs, which, in turn, could easily cause conflicting discussions and thereby stagnating the progression of the wool supply chain.

Supply Chain Power

Culture, Trust and Power are three important drivers for supply chain integration. According to Zelbst et al. (2009), there is typically a focal firm within most supply chains which coordinates their business with less established companies. Li et al. (2018) define power as, the ability to control decision factors of other entities within a supply chain. This definition is complimented by Webber (1922) who describes power as "*the probability that one actor within a social relationship will be in a position to carry out their own will even against resistance, regardless of the basis on which this probability rests.*" Krikke (2010) distinguishes five different types of power used within supply chain integration: reward power, coercive power, expert power, referent power and legitimate power and suggests a sixth power, being information power.

- Reward power can be defined as, the capacity to motivate others based on the promise to deliver returns. The power of the reward improves with the value of the bonus as well as the degree to which the person/organisation is dependent for the incentive.
- Coercive power is the ability to influencing others with the use of intimidation in order to gain compliance. Coercive power relies on the fear from others to drive compliance.
- Expert power is the perception that an individual has an extensive knowledge or skill that others do not have. This view gives the individual greater influence within the area of dialogue or work.
- Referent power can be described as the desire to identify with others for recognition by association. Referent power is based around trust on a case-by-case bases and is be considered the most important but also the most volatile power.
- Legitimate power is the formal authority that a person/organisation has which assigns the right to require and demand compliance. The target from

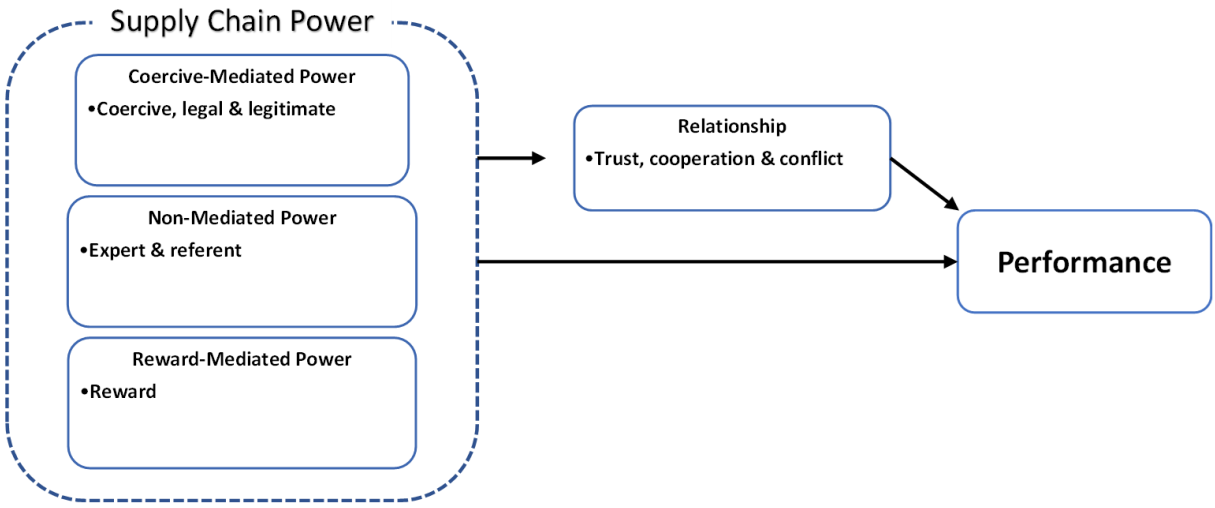
this power is defenceless and must comply with the authoritative figure.

Information power is defined as the ability to influence based on your control of information and your control over the dissemination process. This would also suggest that information power can impact the results of an outcome by providing information not previously made available.

Ke et al. (2009) group the six power types into the following two broad categories. Research has shown that in the supply chain, non-mediated power is good at strengthening relationships between players.

- **Mediated Power:** Coercive, Legitimate and Reward
- **Non-mediated Power:** Expert, Referent, and Information

Lee & Woo (2019) elaborate on how different types of power can be integrated to increase supply chain performance (see figure below). In a similar way, however, power can also impact supply chain performance negatively. Organisations must be aware of sources and consequences of supply chain power to ensure that supply chain power improves the supply chain and that cooperation between other supply chains can be established or avoided.



Supply chain power that can affect performance (Lee & Woo, 2019)

It is not known who holds the power within the wool industry, especially in an industry where every player is often self-interested and protecting their own business. When an industry stakeholder was asked "who appears to have the most power and influence?", they answered: "Ultimately it is the consumer." However, the merger and collaboration between two co-ops seek to enhance their legitimate power. By combining, they have improved their industry market positioning, enabling them to scale their operations, gain cost advantages, influence, and negotiation power.

In the wool industry reward power is demonstrated widely at auctions or in negotiations where price is used to reward a certain product. It can be argued that wool brokers have some degree of coercive and expert power within the supply chain. Although technology has allowed accessibility for farmers to gather information on the internet and go to auctions, wool brokers are considered the subject matter experts (Ville, 2007). A broker is trusted with important information that can directly affect the sale of wool (Wool Online, 2020). In addition, according to Gill (2021), China has significant coercive power over the wool industry due to the volume they purchase.

The wool industry may be able to exploit some inherit referent power that is possess as a result of the favourable properties of its product. Wool is a natural product, it is recyclable, fire resistant and UV resistant, making it a premium material across the apparel industry (Woolmark Company, n.d).

Negotiation in the Supply Chain

Partners in a supply chain achieve long-term objectives by combining resources, including capabilities, knowledge, and assets, to deliver superior performance and attain competitive advantage (Mintu-Wimsatt & Calantone, 1996; Atkins & Rinehart, 2006; Fang, 2006). The players negotiate the supply chain practices concerning a number of fundamental pillars (Zachariassen, 2008), namely (1) collaboration, (2) information sharing, (3) logistics design, (4) IT infrastructure and, (5) organizational culture. Negotiation requires a need for trust, mutual understanding, openness and empathy and can create joint opportunities for the parties involved (Pruitt, 1981 as cited by Zachariassen, 2008).

Negotiation is often a confidential matter because it can influence future negotiations (Malhotra, 2019). When negotiating there are four possible outcomes (Financial negotiations communicate with confidence, n.d):

1) Win-Win is where it is considered that all participants within the negotiation are receiving something they desire or require. If all parties have a positive experience, they will be more inclined to negotiate again.
2) Lose-Lose is where no party involved with the negotiation gets what they want.
3) Lose-Win & Win-Lose is considered when one participant gets more than the other parties involved. The losing participants will often be less likely to negotiate with the winning party again.
4) No Outcome is when a party or all parties involved with negotiations are unable to reach a consensuses and negotiations cease.

Cutcher-Gershenfed et al. (1995) describe two negotiation approaches, namely, Distributive Bargaining Strategies and Integrative Bargaining Strategies. They caution against

using these two approaches together during a single negotiation exercise. The Distributive Negotiation Strategy is implemented when the negotiating entities are convinced that their interests are diverse from each other and a win for one of the parties means a loss to the other (Zachariassen, 2008). This strategy is popularly compared to one-off relationships. Each party must argue feverously to get the other to agree to their terms (Zachariassen, 2008).

Distributive negotiation is best applied when:

- The bargaining resource is limited,
- There is no relationship or it's a one-off scenario, and
- You are in a strong bargaining position.

On the other hand, Integrative Bargaining Strategies aim to reconcile the divergent entities into a mutually beneficial outcome. For this approach to work, the involved parties must trust each other, keep an open mind, have mutual understanding, and adopt a sense of empathy (Adair et al., 2001). The integrative negotiating strategy attempts to achieve a win-win scenario for all the parties involved by seeking synergistic advantages (Zachariassen, 2008).

Integrative negotiation is best applied when:

- The bargaining resource is unlimited,
- You are in a weaker bargaining position but still wish to gain some value from the negotiations, and
- maintaining a good relationship with those involved.

Due to a lack of coordination and decentralized supply chain coordination mechanisms, trading and negotiations in the New Zealand wool industry can be argued to align with distributive bargaining approaches. Any attempt to unite the industry must include conversations on how supply chain partners plan to reach agreements in the future. Some primary industries, for example, follow a formula-based payment scheme. While heated negotiations can be anticipated when the payment formula is derived, operations become more seamless and integrated once the formula is in place. Formula negotiations are often repeated in a cyclical manner.

The NZ wool industry negotiates with countries all over the world. Connelly et al. (2013) indicate that the industry is versed in negotiations with businesses in South Africa, China, United Kingdom, Italy and Japan for exporting raw wool. The process is important since companies examine how expenses might be reduced in relation to purchasing power (Connelly et al., 2013). In line with the negotiation processes, a theoretical background, focusing on two major theories, distinguishes the strategic, structural, behaviour, integrative and process analyses within a supply chain. These two theories are (1) Negotiation Analysis and (2) Game Theory.

Negotiations Analysis provides a framework for organizations to focus on the interests of parties instead of their positions. Hysson (2014) reflected on the New Zealand Wool industry negotiations that was caused by demand disruptions in 2011. The industry encountered losses of almost five million pounds, driven by the world stock levels in apparel and liquidations. This caused significant carry-over wool, which affected the industry and markets. In early 2012 the industry participated in negotiations in Australia to help curb these issues. This involved attempts to minimize costs and provide a basis of pricing support for domestic raw wool (Connelly et al., 2013). The negotiations also involved trade agreements that focused on tariff concessions, the realignment of opportunities for both foreign and domestic trade, products used during manufacturing processes, and enhancing a trade-free economy among the 50 countries who participated in the processes (Connelly et al., 2013). These frameworks facilitated a collaborative environment for the NZ wool industry and its customers.

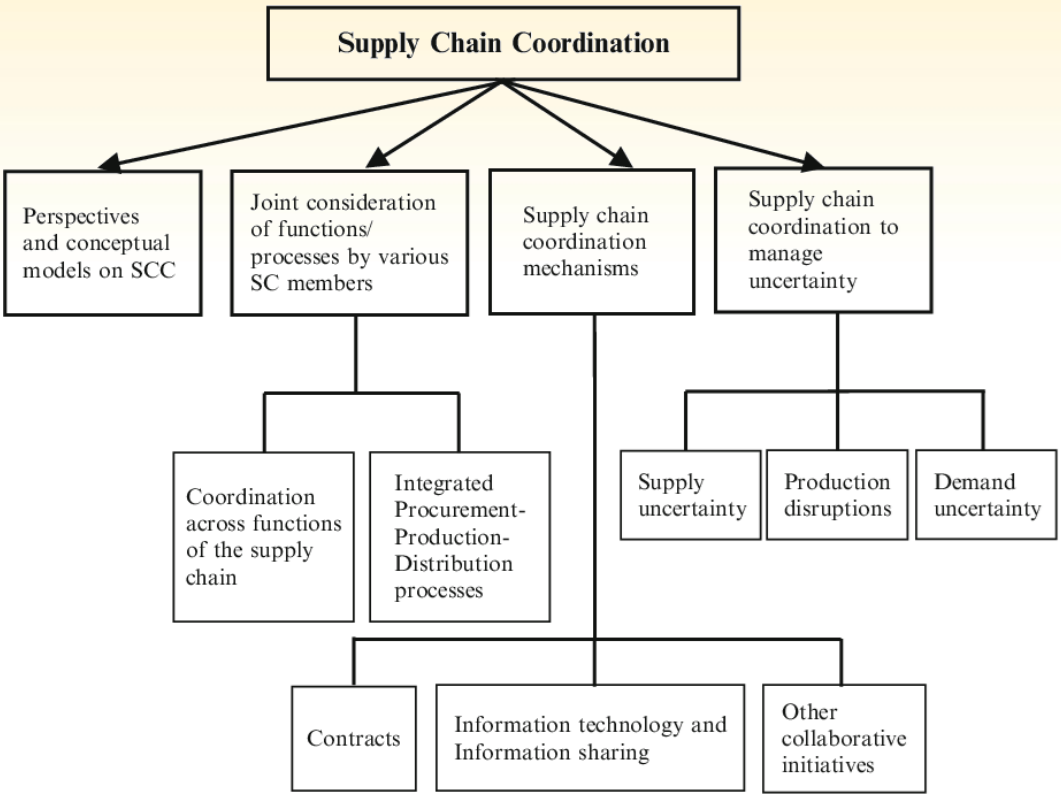
Game Theory is a form of mathematical interaction that focuses on developing a cohesive environment between organizations through the settlement of conflicts. The theory is commonly applied in the procurement negotiations to achieve favourable outcomes and better decision-making. Stiff competition exists between rival companies and negotiations are important to enhance a cohesive environment for operations. Game Theory can be applied in the New Zealand wool industry. The sector is exposed to significant market competition within the region, especially from Australia. The New Zealand Wool Board (NZWB) explored strategies to streamline negotiations with competitors between Australia and New Zealand. According to Mitchell et al. (2019), The New Zealand Merino Company (TNZMC), negotiated on the different approaches to competition with Wool Industries Australia Inc. in May 2015 with the aim of promoting a cohesive trading environment in the region.

Supply Chain Coordination

Supply chain coordination is defined as the mutual synchronization of supply chain activities to harmonize and share the operative risks and benefits while achieving higher operational efficacy levels and enhancing the overall supply chain competitiveness that generates more value to the consumer (Yuen & Thai, 2016). The agents of the supply chain agree upon a contract to plan and implement their autonomous activities together to optimize the paybacks of information sharing and minimize disruptions. Coordination of the supply chain relies on establishing collaborative and cooperative relationships. Cooperative relationships are defined by Power (2005) as associations between organizations that focus on information and asset sharing within areas of common interest and mutual competitive advantage. Shown in the figure on the next page, the supply chain coordination model developed by Arshinder et al. (2011) elaborates on the synchronization and working mechanisms required to successfully implement supply chain coordination.

According to this model, supply chain coordination is established on four pillars, namely (1) perspectives and conceptual models on supply chain coordination, (2) joint consideration of functions and processes by the independent supply chain members, (3) supply chain coordination mechanisms, and (4) management of uncertainties.

The first pillar provides the structure or model to be agreed upon and embraced by the supply chain entities coming together. Members share their perspectives and motivations for wanting to work together in a coordinated supply chain. An example of a scenario from New Zealand's wool industry would be to fetch better wool prices at the local and global market, minimize logistical costs, and interact with consumers to produce the preferred wool in demand.

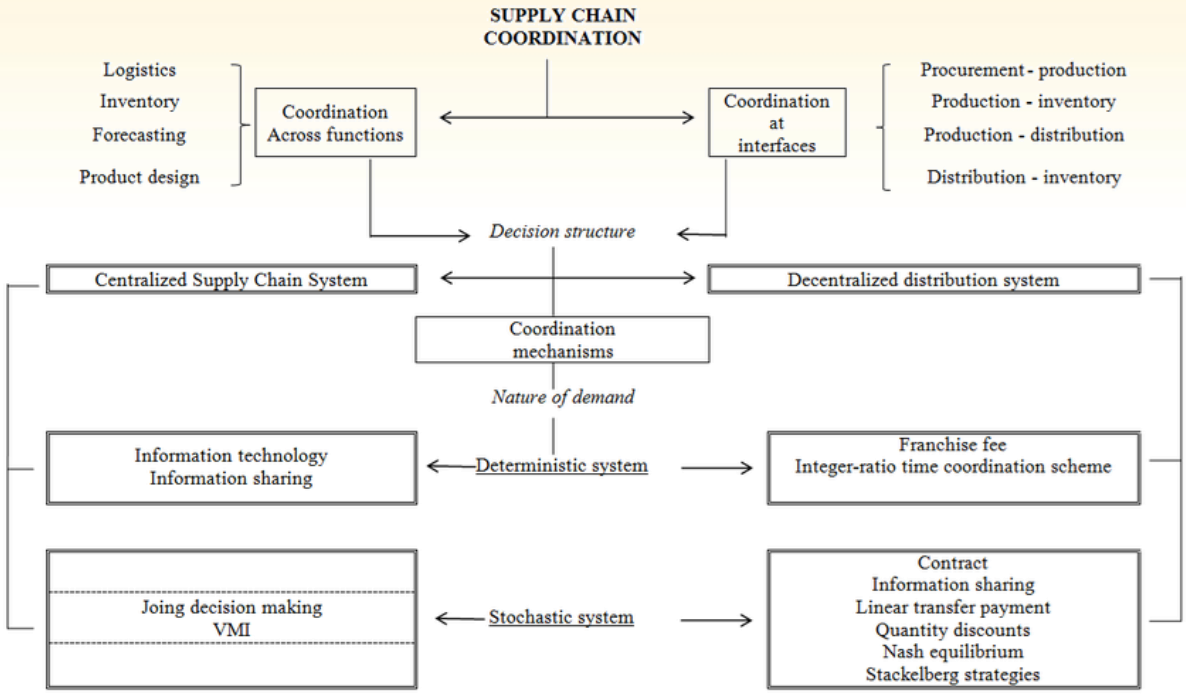


Supply Chain Coordination Model by Arshinder et al. (2011)

The second pillar of joint consideration of functions and processes is achieved through negotiations and leadership. In this pillar, the various supply chain members must agree upon the coordination of functions across the supply chain and discuss the interlinking and integration of the procurement-production-distribution process. In the wool industry, supply chain parties collaborate and negotiate on their functions, roles, and responsibilities to ensure the supply chain is successful. Each party gains substantial benefits by collaborating compared to working independently.

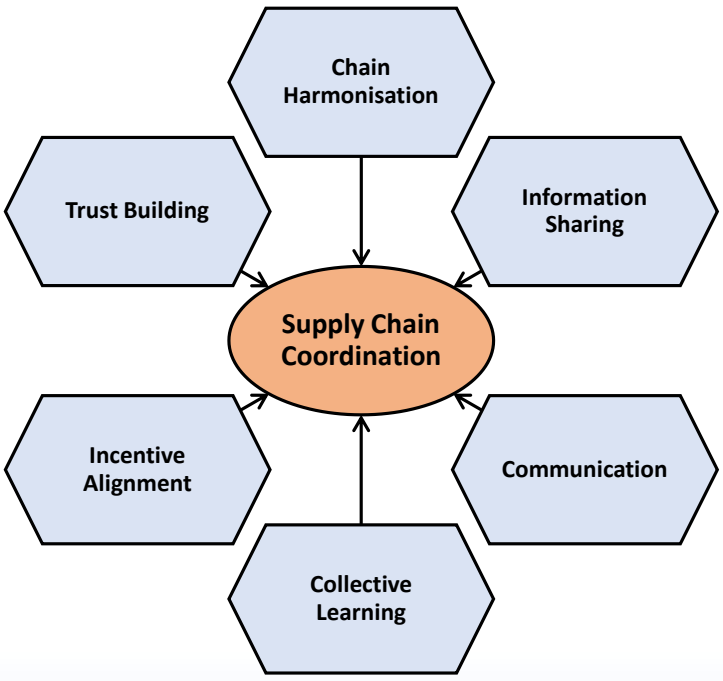
Thirdly, supply chain partners strive toward structures and instruments that will facilitate and guarantee the success of their collaboration. The primary instruments often used include contracts, information sharing, and information technology. The figure on the next page presents a number of attributes and options that need to be considered in order to improve supply chain coordination.

The wool industry employs a decentralized supply chain coordination strategy. A decentralized supply chain can be defined as a system in which the individual entities make decisions informed by local information and decision making approaches (Usuga et al., 2012). The decision structure allows entities in the supply chain to adapt better and faster to market demands since they can be easily incentivized to cooperate with others making the supply chain more agile. This also works because wool growers are dispersed across rural regions. Having centralized logistics would be impractical, especially considering there is no leader to make decisions for the entire supply chain. However, it can often be argued that the coordination among sellers and buyers can be improved in a decentralized system. Conforte et al. (2011) argue that supply chain parties, but especially farmers, miss out on the true value of their wool.



Supply Chain Coordination Conceptual Model adapted from Usuga et al. (2012)

Bahlmann & Spiller (2009) define the following supply chain coordination dimensions:



Dimensions of supply chain coordination (Bahlmann & Spiller, 2009)

Chain harmonisation, involves multiple functions, group aligning systems and processes together to achieve a common goal. This suggests that standardisation is a key technique of chain harmonisation that can lead to efficiency and lowering of costs. For example, the International Organisation for Standardisation (ISO) lays down general nonspecific requirements for quality management systems.

IT integration is the process of creating an information system that includes a customized programming or application and integrating it with new or existing hardware. Most organisations require an external contractor for the implementation phase of system development, due to the technical expertise required.

Communication is the act of conveying information from one entity to another. Every communication involves a source, a communicator and a receiver. However, it should be considered that with globalisation, communication has become more difficult due to language barriers, time zones and culture differences.

Collective learning is necessary to detect vulnerabilities and manage critical processes within the supply chain. Organizations achieve this by appropriately sharing, storing, accumulating and benchmarking information across the supply chain.

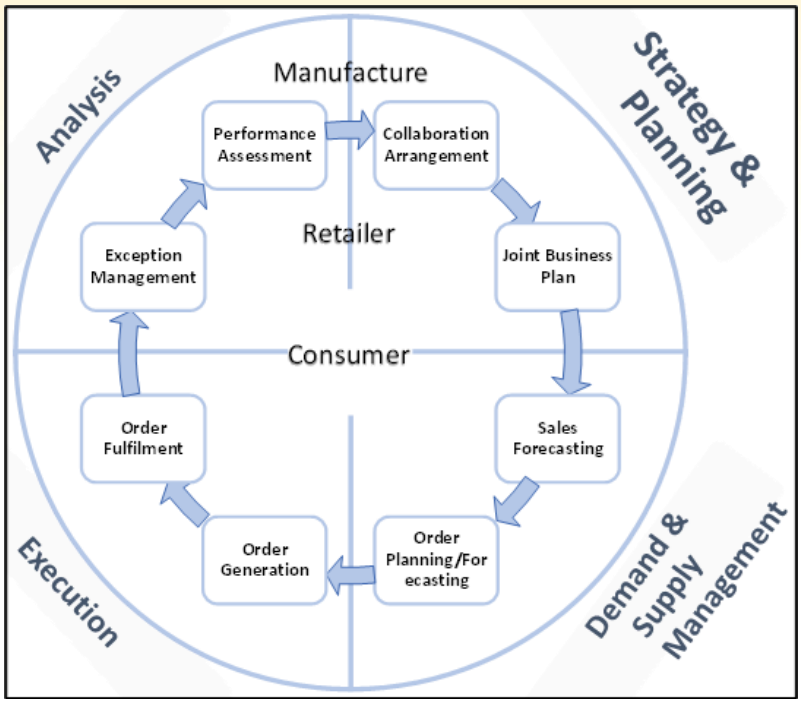
Trust building is a difficult task, since in a highly competitive environment, organisations may have multiple competitors within their sector. However, if openness through data sharing across supply chains is desired, then a degree of trust will be required between the business partners.

Incentives can be defined as an objective that incites or tends to incite determination or action. Therefore, incentives and sanctions are important instruments of supply chain coordination.

Collaborative Supply Chain Planning

Collaborative Supply chain planning is a broad concept with several definitions. Simatupang and Sridharan (2002) define collaborative supply chain planning as relationships developed by supply chain members to accomplish organization and supply chain goals and other mutual benefits. These benefits include lowering costs and risks as major factors of effective supply chain integration. The definition entails a network of organizations that agree to work together mutually, creating an efficient value of goods and services provided. Barratt (2014) defines collaborative supply chain planning as an inter-firm partnership established to enhance a collaborative environment to obtain organizational benefits such as pooling and spreading risks, cost-sharing activities, access to resource distribution and specialization of resources. The definition intertwines with a collaborative supply management approach that focusses on coordination and strategic practices within and outside the organization. The goal of collaborative supply chain management is to enhance long-term performance within the supply chain.

Researchers agree that in supply chains knowledge is power, sharing of information within a supply chain enhances knowledge and improves effective management, hence lowering the levels of inventory and costs for warehousing and transportation. The processes of collaborative planning, forecasting and replenishment (as shown in the figure on the next page) has been identified as a productive management concept that provides supply chain collaboration and visibility (Attaran & Attaran, 2007).



Collaborative activities within supply chain management (Attaran & Attaran, 2007)

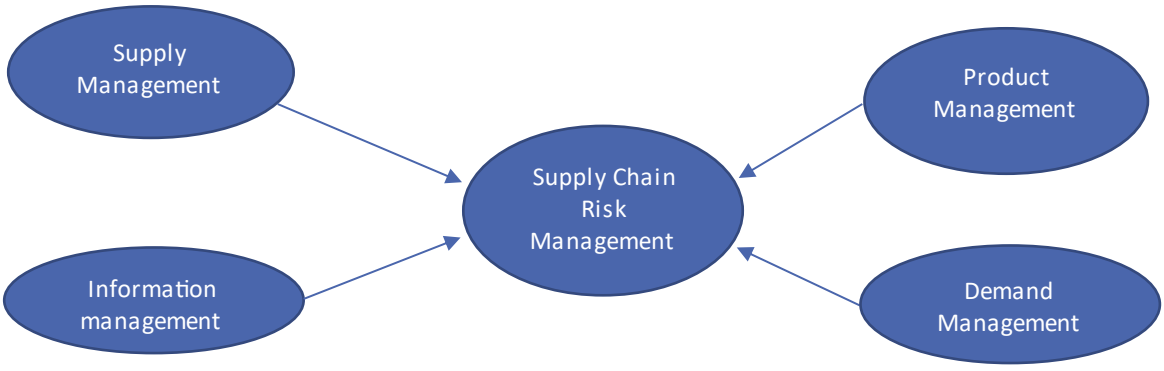
There are six models used in supply chain planning, namely, (1) the continuous flow model, (2) the efficient chain model, (3) the agile model, (4) the flexible model, (5) the fast chain model and (6) the custom-configured model. Regardless of which model is pursued, they are all supported by three underlying principles. First, collaboration should exist in areas with a solid footing and synergising on strengths. Second, partners should be selected based on strategic goals, capabilities and potential in value. Third, organizations should invest in people and infrastructure. People, in this case, include employees, investors, suppliers and stakeholders who indirectly impact an organization. Likewise, without infrastructure there is no supply chain. Infrastructure acts as a common means for the distribution of goods and services to end-users for customer satisfaction. Infrastructure also involves advancement in technology which enhances a collaborative supply chain integration.

A recent case study by Cheng (2018) indicates that the NZ wool industry lacks an efficient real-time information sharing system. For collaborative supply chain planning, an organization needs to keep parties in the supply chain well informed.

Closely related, the industry also lacks end-to-end visibility. This introduces risks when the industry lacks adequate information on overseas companies who might face financial challenges or mismatches in relation to capacity and forecasting (Cheng, 2018). A document from Lincoln University (2016) states that farmers are trading directly with exporters and manufacturers. It has been recorded that, due to the cost of wool, some merino farmers, who supply superfine wool direct to apparel businesses, are stockpiling wool until the prices rise (Marshall, 2020). However, once the wool enters the supply chain, it has a smooth transition from supplier to consumer. This suggests that parts of the New Zealand wool industry do carry out collaborative planning and demand forecasting. However, apart from export and sale price data, it can be argued that there is little analysis of data that could help to streamline the wool supply chain.

Integrated Supply Chain Risk Management

Supply chain risk management is a collaborative effort to reduces total supply chain vulnerability (Goh, Lim & Meng, 2007 as cited by Ho, Zheng, Yildiz & Talluri, 2015). In order for supply chain risk management to be efficient, the industry needs to have collaboration and coordination between all partners inside the chain. Ho et al define supply chain risk management quite well as "*an inter-organisational collaborative endeavour utilising quantitative and qualitative risk management methodologies to identify, evaluate, mitigate and monitor unexpected macro and micro level events or conditions, which might adversely impact any part of supply chain*". Craighead et al. (2007) found that organisations with good risk management routines can swiftly recover from hurdles and generate understanding to further mitigate future disruptions.



Approaches for managing risks in a supply chain (Mokhtar, Shah, & Puan, 2016)

Following the 2009 framework provided by the Organisation for Economic Co-operation and Development (OECD), risk management strategies can be categorised into three classes:

 **Risk Reduction**: Strategies that reduce the probability of a risk from occurring,

 **Risk Mitigation**: Strategies that reduce the extent of the existing damage/s, and

 **Risk Coping**: Reduces the effects while living with the eventualities of a risk.

Aside from the identification of risks and the institutional level where the risk takes place, the mapping of risk strategies is also dependent on three layers of risks — Normal, Market and Catastrophic (Melyukhina, 2011).

The **Normal Layer** of risk is managed at the Farm Household/Community Level, having a high probability of occurring with low damage. At this level, farmers are able to control risks through on-farm techniques or general financial mechanisms like credit, tax and security systems. The **Market Layer** involves economic risk transactions that are managed through market insurance, input and output market contracting, vertical integration, or risk pooling among co-operatives. Finally, **Catastrophic Level** risks include biosecurity risks and risks that are brought about by natural calamities. Risks at this level necessitate action from the public and entails government policies (Melyukhina, 2011). Bandaly et al. (2014) argue that a risk can either be transferred to another party, shared with another party or it can simply be accepted as it is.

New Zealand farmers, specifically those in the meat and wool sectors, encounter diverse agricultural supply chain risks that stem from the occurrence of natural and climatic risks (i.e. drought, floods, storms, hail, frosts and heavy snowfalls), health of animals, presence of pests and diseases, shifting market conditions, government policies, and social or personal affairs (Melyukhina, 2011). Also, market risks, output and input price changes and the global economic conditions are major sources of risk in the agricultural industry (Melyukhina, 2011). Two additional risks include accidents and health problems of workers, and financial risks associated with credit and land market conditions. A study conducted in 2005 shows interest rate risks to be one of the top five risks that farmers may face (Melyukhina, 2011). To provide solutions to these issues, understanding the concept of risk management and the ability to effectively apply risk management strategies in New Zealand's wool industry is critical to supply chain improvement.

Measuring Supply Chain Performance and Benchmarking

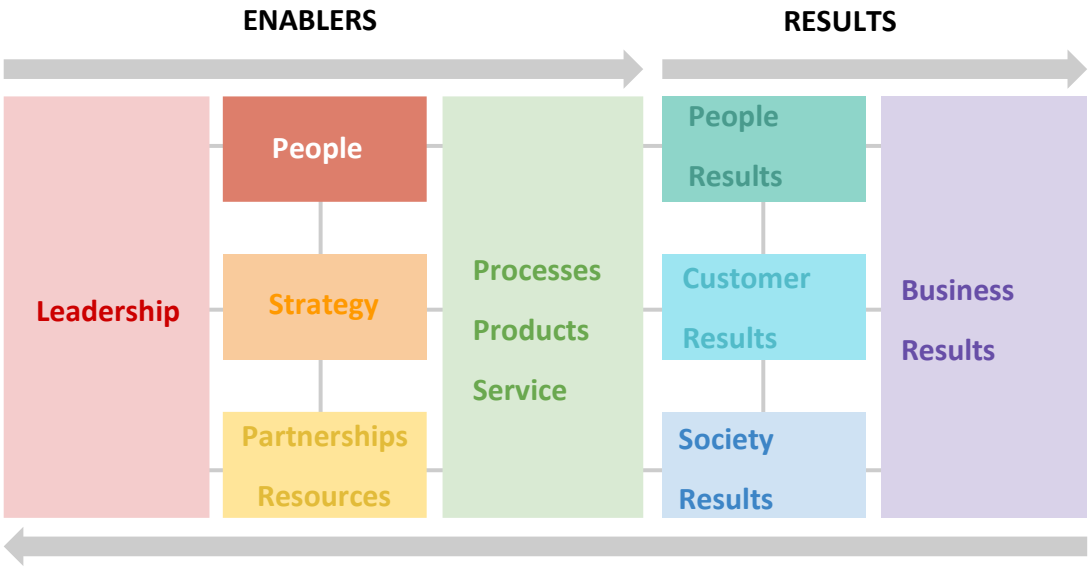
Companies and business organizations are in search of integrated systems that will lead to overall improvements in their operations and management through identifying issues and opportunities, monitoring actual performance alongside plans, and allocating essential resources to fulfil their goals (Schreurs & Moreau, 2007). Supply chain performance includes all extended activities that meet the requirements of end-customers which includes product availability, on-time delivery, as well as the essential inventory and capacity along the supply chain to be able to deliver that performance in a responsive manner (Harrison, Lee & Neale, 2004). In order to manage supply chain activities, a measurement process is needed to define and track the performance of each occurring component and examine how they are interrelated to each other. Supply chain performance measurement is a system that is able to holistically assess the degree, quality, value, or effect of a supply chain performance (Putri, Huda & Sinulingga, 2019).

To aid the performance measurement process in supply chains, performance assessment models are needed to clarify the boundaries of performance measurement, specify performance dimensions, and describe the correlations among these dimensions (Rouse & Putterill, 2003 as cited by Folan & Browne, 2005). Frameworks of performance measurement, specifically the European Foundation for Quality Management (EFQM) and Balanced Score Card (BSC), are two examples of business models that strive to assess performance dimensions in supply chains.

The EFQM model shown in the figure below was developed with the aim of understanding performance management through a systems perspective (Nalwoga & Dijk, 2016). It is a non-prescriptive framework that strives for continuous quality improvement which may be utilised by any organisation, regardless of its size, industry, maturity or structure (Vallejo et

al., 2006). The EFQM theoretical framework entails nine criteria that an organisation should measure itself against as they assess their development for continuous improvement (Schreurs & Moreau, 2007). These criteria are divided into two groups, Enablers and Results. The Enabler group is concerned with the organisation's key activities and what it can manage: Leadership, People Management, Policy and Strategy, Resources, and Processes. The Result group, on the other hand, represents the results that an organisation will achieve, namely: People Results, Customer Satisfaction, Impact on Society, and Key Performance Results (Vallejo et al., 2006). Moreover, spanning across these groups are People (employees), Customer and Society Satisfaction, which are the ultimate operational measures of excellence of any organisation. Such results could be attained through the Leadership ability of the organisation to implement sound policies and strategies coupled with effective management of people (i.e. labour force), and utilise resources (financial and material) into appropriate processes (Nalwoga & Dijk, 2016)

European Foundation for Quality Management (EFQM) Model



Similarly, the term "benchmark" alludes to measurements and a systematic method of finding the best practices, innovative ideas and efficiencies that bring about continuous improvement (McNair & Leibfried, 1992, Spendolini, 1992, , Bhutta & Faizul,1999, Bogan & Callahan, 2001 as cited by Peng Wong & Yew Wong, 2008).

The performance and activities along the wool supply chain can be evaluated in terms of the following aspects: Logistics, Pricing, Inventory Levels, Product Design, Procurement and Purchasing, Production, Distribution, Demand, and Competitive Positioning. However, information on the various activities along the wool supply chain are fragmented and may be difficult to collate and analyse effectively.

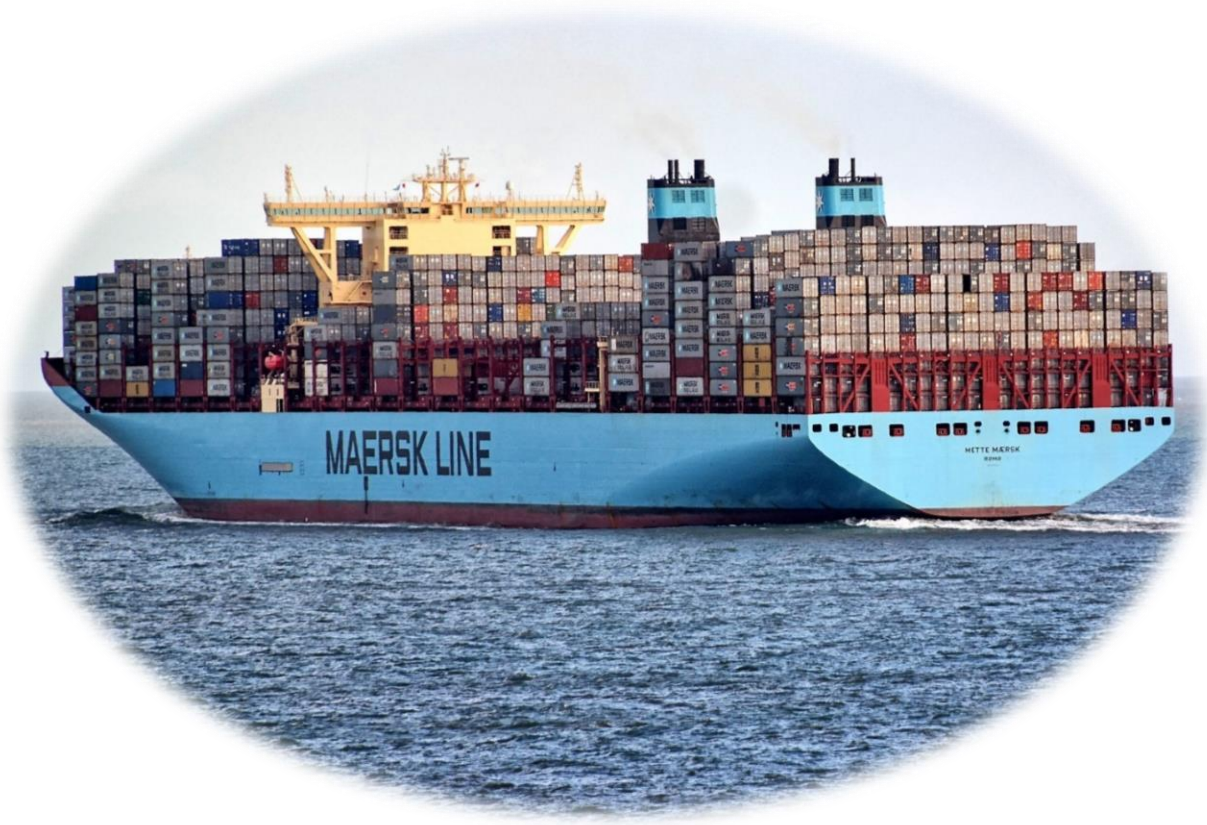
Supply chain benchmarking will allow the NZ wool Industry to assess performance and modify processes to remain competitive. While the benchmarking procedure might take some time, effort and resources, it offers a sector with unique knowledge about business activities, views, possibilities and weaknesses.

Different levels of Benchmarking are:

Internal: tactical benchmarking with an emphasis on operations. This makes it possible to compare and contrast how processes operate in firms with various facilities, divisions, or branches. In one organization, for instance, compare three distinct warehouses.

External: A purposeful degree of benchmarking, which exposes an enterprise to other approaches and procedures outside its own industry. Such benchmarking typically needs an advisory company to do adequate research.

Competitor: Compares the operating performance of a firm with that of competitors. Rivals are unlikely to share their knowledge of best industry practices, therefore making the use of industry-standard measures a possibility.



Conclusion

Supply chain integration is an extremely complex concept that poses numerous challenges to supply chains; *so* numerous that many do not even consider it as an option. Integration involves many aspects such as coordination, collaboration and planning in order to align processes and functions between all supply chain participants. It is evident that in today's highly competitive and globalized marketplace, businesses are continuously seeking strategies to optimize their benefits while keeping their costs minimal. As a strategy, supply chain integration provides companies with the ability to achieve product innovations, streamlined transportation structure, a resilient and robust supply chain, and agile operational planning.

The New Zealand wool industry has a long and rich history. It has developed a rich culture and credence that will support the supply chain in the future. The industry has reasonably well established supply chain collaboration and coordination, nonetheless, reliable data within the supply chain is seldom shared to allow for broader analytics and system improvement. It is recommended that information power is better understood within the wool industry. It is also recommended that the wool supply chain becomes more transparent to enable good data collection for collaboration. This could reduce waste and allow for external parties to invest or inovate with more confidence.

The wool industry remains vulnerable to future risks, some of these risks are worsened due to a lack of teamwork, sharing of information and a lack of leadership that spans across the supply chain. Supply chain risk management is seen as a collaborative and coordinated management between partners with the aim of promoting profitability to the members along the chain. It can be assumed that a supply chain is well integrated when the chain partners have the ability to collectively deal with risks. To deal effectively with supply chain risks, organizations need to collectively forecast and identify these risks, collaborate, negotiate, synchronise, measure performance, and share common values and goals.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