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Assessing Relationship Quality as a Driver of Innovation in a Western Australian Lamb Production Network¹

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Abstract

The Western Australian sheep meat industry has been in steady decline for the past three decades, with sheep numbers in the state halving since 1990. There are many causes of this decline, but innovations in product and marketing have also presented new opportunities for the industry. In a single organisation case study, novel assessment methods were used to generate quantitative and qualitative data to measure supply chain relationship quality and its determining factors. Results indicated an imbalance between processor and producer perceptions of relationship quality, where processing staff recognised the potential for improvement from the current quality of relationships while producers were content in their relationships. Across several on-going innovations, evidence for cohesion of supply chain actors in the innovations' implementation was scarce. Results suggest that the processor's staff and producers are willing to improve supply chain relationships, but their action is constrained by opposing perceptions of supply chain performance. Improved communication channels and direct contact from the processor will see producers more satisfied and willing to increase commitment. Further, it is suggested that livestock agents will need to act in a manner beneficial to others in the supply chain to improve the quality of relationships with processors and producers. The processor proposes actions to achieve these ends, essentially by paying personalised attention to individual producers' needs.

Keywords: Relationship quality; innovation; supply chain; sheep meat; case study.

Introduction

Relationship quality is a term used to measure the value of an exchange relationship between two or more actors in a chain or network. Relationship quality is associated with supply chain partners' productivity and profitability (Athanasopoulou, 2009), however there has been little research into links between relationship quality and the development of innovative solutions along the supply chain. Hervani, Helms & Sarkis (2005) suggested businesses in supply chains with strong internal structures have more success in implementing innovative solutions to enhance the supply chain compared to businesses with a poor internal design. These authors propose a correlation between relationship

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quality and innovative solutions. The presence of innovation in a supply chain then fosters a high level of value creation and increased competitive advantage within an industry. More generally, innovation is vital to the continuity and growth of a supply chain to ensure processes remain current to enable end consumer requirements to be met. Innovation inspires actors to form close alliances within their supply chain through engaging in long-term commitments, which secures supplier and consumer bases and delivers a product of increased value and profitability. The current study identifies and measures relationship quality within a selected agricultural product supply chain, and determines the level of contribution of supply chain actors to the implementation of innovative solutions.

The supply chain investigated in this research includes a rural sheep meat processing company in Western Australia. Referred to here as Company X, it delivers an export product widely recognised to be of high and consistent quality. It works collaboratively with producers, and its lamb purchases are influenced by domestic and international market conditions, as well as trade policies. Company X has achieved, and continues to promote, innovation in its delivery through to export markets. Company X is thus concerned to ensure a secure network of supply chain relationships.

The aim of this research is to identify and understand the level achieved, and drivers of, relationship quality in this selected sheep meat supply chain. Identification of relationship quality will assist in determining whether recent innovative solutions are a result of positive relationship quality in the supply chain. A further aim is to inform a commercial sheep meat processor and other stakeholders in that company's supply chain about approaches to enhancing relationship quality. The term 'new value' rather than 'innovation' is used in discussions with stakeholders to ease respondents' interpretation.

To understand the association between relationship quality and innovation in the context of the Western Australian sheep meat industry, three principal research questions were developed:

1. Of what quality are current relationships in the Western Australian lamb production and marketing network?
2. How does relationship quality affect innovation in the Western Australian lamb production network?
3. What can be done to improve relationship quality so as to boost innovation?

Industry Setting

Many Australian sheep meat producers run mixed enterprise farms, featuring one or more crops and/or cattle. For the past three decades, Australian sheep flock numbers have been in steady decline, notwithstanding fluctuations associated with drought (MLA, 2021). Conditions in the supply chain have assisted the decline in the industry due to volatile market specifications and prices, difficult climatic conditions, and resource management issues. These trends particularly apply to Western Australia's sheep flock, which constitutes some 20 per cent of Australia's sheep numbers. Most of these sheep are located in the south-west region of Western Australia where pastures and climatic conditions are favourable for sheep (Alexander, 2017).

Australian sheep meat retains a prominent export market profile and makes significant contributions to farm incomes and communities. Consumer demand from China for differentiated sheep meat products, with a stronger focus on offal and off-cuts as opposed to prime cuts, is continuously growing and now includes both chilled and frozen exports (MLA, 2020). Against a background of market volatility, this growing market needs to be served by a co-ordinated supply chain. Western Australia's small domestic population, well developed export infrastructure and institutions, and proximity to the Asian markets, all pre-dispose to the success of export initiatives, including that by Company X.

A 2015 study on Western Australian sheep meat supply chains found little evidence of long-term relationships: rather it was characterised as being opportunistic on the part of producers (MLA, 2015). The study highlighted the absence of relationship quality - that is, a relationship that both parties value and are prepared to continue with in the long-term - between supply chain actors in the industry. It found that producers were more responsive to monetary incentives when selling their stock, than to establishing a relationship with processors. Additionally, the Western Australian Government's Department of Primary Industries and Regional Development (DPIRD) concluded that actors in the Western Australian sheep meat market primarily utilised spot market transactions when buying or selling stock, causing discontinuity in supply volume and quality, and that this disrupts attempts to tailor supply chain incentives to demand (DPIRD, 2018).

Attributed to the limited presence of vertical coordination in the Western Australian industry, the structure of the sheep meat market currently follows a supply/demand model, where prices constantly fluctuate as volumes adjust. In contrast, there is an increased presence of forward contracts in sheep meat supply chains in Australia's eastern states, which mitigates risks for both producers and processors while enabling future indications of the market to be developed (DPIRD, 2018). The lack of coordination within Western Australian supply chains has resulted in processors' and producers' becoming reliant on over-the-hook sales of livestock rather than instigating supply contracts with producers. Therefore, the security of access to stock for processors and access to markets for producers have become significant factors when buying and selling livestock. Further investigation of the Western Australian lamb industry concluded that 87 per cent of the 194 producers interviewed used an agent to sell their stock, with approximately 139 respondents using agents for 100 per cent of their livestock sales (MLA, 2015). Owing to the significant presence of livestock agents in the industry, an accurate measure of relationship quality within the supply chain must consider the quality of relationships supply chain actors have with livestock agents.

Additionally, the seasonal timing of purchase or sale of livestock must be taken into consideration, as the lack of forward contracts or long-term commitments makes it difficult for meat processing companies to meet fluctuating, time bound, demand in its export markets. Market conditions influencing the price paid or received for livestock has been recognised as a key driver in processor and producer decisions to buy and sell stock. MLA (2015) identified three types of producers in the Western Australian lamb industry:

- *collaborative* producers were identified as those seeking a longer-term relationship with processors, who value loyalty and commitment and are willing to trade off high prices for long-term benefits;
- *transactional* producers have a primary focus on profit, however they value predictability and knowledge of and access to sheep markets; and
- *opportunistic* producers had no interest in developing a long-term relationship, they look for convenience and flexibility in sales and have little loyalty to processors.

There is the ever-present opportunity for the development of relationships within supply chains to encourage growth throughout the Western Australian sheep and lamb industry. The MLA (2015) report identified a high level of confidence in the future of the lamb and sheep meat industry, indicating the strength of the industry and highlighting the importance of developing collaborative relationships within the supply chain.

Contributors to Relationship Quality

The effect of relationship quality on success and profitability within supply chains has been broadly investigated across industries, with generally consistent conclusions drawn. Scholars have suggested that transitioning away from opportunistic and transactional sales, in favour of long-term

commitments, will ultimately enhance the quality of relationships between actors in a supply chain². An extensive literature review surrounding relationship quality conducted by Athanasopoulou (2009) recognized the three most significantly influential measures in determining the quality of a relationship within a supply chain are trust, commitment and satisfaction.

Lees & Nuthall (2015) acknowledged the necessity for greater trust amongst partners in exchange relationships to address the lack of coordination that is commonly seen in supply chains. Trust is measured from both producer and processor perspectives of the exchange relationship and is viewed as a relational asset that increases competitive advantage and reduces risks. People desire a relationship with a partner they can trust, which incorporates reliability, competence and integrity (Hunt, Arnett & Madhavaram, 2006).

The level of commitment asserted by partners to an exchange relationship is another influential factor when determining the quality of a relationship. A high level of commitment in an exchange relationship involves both emotional tethers and benefits to both partners in the exchange (Hennig-Thurau & Klee, 1997). Previous studies of marketing relationships identified a 'commitment-trust' theory, which infers that an exchange relationship will achieve success only if both trust and commitment are present (Morgan & Hunt, 1994). Furthermore, there is the notion that commitment in a relationship fosters increased cooperation between exchange partners, engaging collaborative exchange relationships.

Satisfaction of both parties in the exchange is seen as an instrumental factor in determining the quality of an exchange relationship. Satisfaction in a relationship is developed from prior experiences with transactions involving the exchange partner (Bolton, 1998) and when mutual satisfaction is present in an exchange relationship, there is an implicit reduced level of risk in the relationship and an enhancement in the performance of products (Morgan & Hunt, 1994). Thus, satisfaction is somewhat subjective and has a dynamic effect on future relationships.

Literature Review

It is important to recognise the distinction between the terms 'value chain' and 'supply chain'. Value chains are centred on the end consumers to ensure technical requirements are achieved while maintaining consumer satisfaction with the final product (Feller, Shunk & Callarman, 2006). Alternatively, the term supply chain is used to describe all stages in a distinct set of processes which develop and deliver the final product. The relationships within supply and value chains are not individual business-to-business relationships, but rather a system incorporating several relationships and businesses (Lambert, Cooper & Pagh, 1998).

Relationship quality is a term used to describe the strength of a relationship between two or more exchange partners (Aug & Shih, 2005). Literature surrounding relationship quality identified several interlocking dimensions that determine the quality of an exchange relationship. Lees and Nuthall (2015) recognised a strong correlation between the presence of trust in a relationship to the exchange partner's willingness to commit long-term. The 'commitment-trust' theory was earlier developed by Morgan and Hunt (1994) and is frequently implemented across various industries to attract collaborative relationships as opposed to opportunistic relationships. Satisfaction was acknowledged

² In this context, a referee has pointed out that the nature of price formation in the WA lamb market, essentially 'opportunistic and transactional sales', has a significant adverse influence on relationship development. The evidence reported by MLA (2015) and DPIRD (2018) certainly supports this. We agree, but our focus here was on how lamb businesses saw the nature of their relationships with others in the value chain within this operating environment and what could be done to improve these relationships.

as another highly influential dimension of relationship quality, as it encompasses both producer and processor perceptions of satisfaction. The presence of satisfaction is vital to understand the quality of a relationship, as parties in an exchange relationship will reflect on prior satisfaction with the exchange partner to determine if the exchange relationship will continue. A relationship with mutual satisfaction would consequently see a higher level of relationship quality (Seines, 1998) and is likely to endure long-term. A comprehensive review of relationship quality literature concluded the three main dimensions observed as most influential to relationship quality are trust, commitment and satisfaction (Athanasopoulou, 2009; Naudé & Buttle, 2000; Cannon & Homburg, 2001).

Trust

There are numerous definitions of trust. In the current context it is generally acknowledged that trust is the confidence one party has in the actions of an exchange partner. This explanation parallels Moorman, Deshpandé and Zaltman's (1993) understanding of the term, that "trust is defined as a willingness to rely on an exchange partner in whom one has confidence." Hennig-Thurau & Klee (1997) argued trust is the confidence one party has in the relationship to willingly rely on an exchange partner, corroborating the prior work of Moorman et al (1993). Mayer, David and Schoorman (1995) discerned trust as the willingness of one party to be vulnerable to the activities of another party. Similarly, the interpretation of trust acknowledged by Juan Ding, Jie, Parton & Matanda (2014) is the general expectation that a promise from an exchange partner is reliable. In developing trust in a relationship, the predominant objective is to minimise risks associated with both opportunistic behaviours (Lees & Nuthall, 2015) and overall relational exchanges (Hunt et al, 2006). The development of trust occurs over time, where parties in an exchange grow to confidently rely on the actions and abilities of an exchange partner due to the success of preceding exchanges. The influence of trust on relationship quality has been widely investigated within various supply chains in different industries.

Dwyer & Oh (1987) identified the major determinants of relationship quality in the US automobile manufacturing and retailing industry and concluded that the existence of trust in both the salesperson and the customer was a key factor in the level of relationship quality in that industry. In later work, Crosby, Evans & Cowles (1990) directed a similar research project focused on the insurance industry, with their findings corroborating the conclusions drawn by Dwyer & Oh, that trust is an influential factor in relationship quality. Athanasopoulou (2009) completed an extensive literature review to determine the major factors attributed to the quality of relationships throughout different industries. From this reading it can be deduced that trust in relationships is expressed through the confidence, integrity and dependability of partners in relational exchanges. In the sheep meat industry, trust is developed in relationships between producers and processors when the performance of both parties is reliable, and expectations are met effectively.

Morgan and Hunt (1994) examined the correlation between trust and commitment in relationships, stating the presence of both factors is "central to successful relationship marketing." The combination of these two factors in a relationship indicates the potential for a high level of relationship quality and success. Xiao, Zheng, Pan & Xie (2010) identified a direct association between the presence of trust and the quality of commitment in a relationship. When trust and commitment are together present in an exchange relationship, cooperation between the exchange partners will grow, enhancing relationship quality.

Commitment

Commitment is the willingness to enter a long-term relationship with an exchange partner, which develops when there is a distinct presence of trust between exchange partners. Also seen as "an

enduring desire to maintain a valued relationship” (Morgan & Hunt, 1994), commitment is an influential factor in relationship quality and is largely associated with trust (Hennig-Thurau & Klee, 1997). The ‘commitment-trust’ theory suggests parties enter long-term relationships primarily due to the benefits associated with the relationship. It is widely accepted that commitment occurs as a result of the presence of trust in a relationship, as a trustworthy partner reduces the risk that comes with relational exchanges and opportunistic market behaviours (Hunt et al, 2006; Morgan & Hunt, 1994; Lees & Nuthall, 2015; Xiao et al, 2010).

A high level of commitment in an exchange relationship not only promotes cooperation and increases motivation (Morgan & Hunt, 1994; Xiao et al, 2010), but allows for the flexibility for both parties to adapt to meet requirements (Lees & Nuthall, 2015). A party in an exchange that is committed to the relationship will make decisions to benefit all exchange partners and improve overall productivity within the supply chain. Kwon & Suh (2004) argued success in the supply chain is not achievable without the existence of commitment in exchange relationships. This requires parties to move away from spot market transactions, which are also referred to as opportunistic transactions, to long-term relationships where both parties are committed to the relationship and the level of cooperation is high (Lees & Nuthall, 2015).

Research on successful long-term relationships identified the importance of collaboration, a concept identified through the presence of trust, commitment and communication working in conjunction to achieve improved results. Juan Ding et al (2014) found a direct link between trust and commitment to the willingness of exchange partners to collaborate in the long-term. Soosay, Hyland & Ferrer (2008) corroborated the findings of Juan Ding et al, stating trust, commitment and information sharing are critical factors for collaboration to successfully occur in an exchange relationship. Collaboration as a result of trust and commitment to an exchange relationship has shown to reduce transaction costs (Juan Ding et al, 2014) as well as increase satisfaction in the relationship. The existence of both trust and commitment in a relationship encourages outcomes that improve productivity, innovation and effectiveness in the supply chain (Morgan & Hunt, 1994).

Satisfaction

In the current context of exchange relationships, satisfaction includes both producer and processor satisfaction and is achieved when the set requirements of the relationship are fulfilled successfully (Seines, 1998). Several scholars have concluded that satisfaction, alongside trust and commitment, has a large influence on the level of relationship quality (Athanasopoulou, 2009; Aug & Shih, 2005).

Producer satisfaction has a direct effect on the continuation of an exchange relationship with a processor within a supply chain and is seen as a key determinant of the processors’ success and market competitiveness (Hennig-Thurau & Klee, 1997). Cooperation between exchange partners emerges following the development of trust and satisfaction in the relationship, and the existence of these factors fosters long-term commitments to exchange relationships (Aug & Shih, 2005). Researchers Aug & Shih (2005) investigated relationship quality and satisfaction in the technology industry and determined the level of satisfaction in a relationship has a considerable impact on the loyalty of exchange partners. Seines (1998) put forward the notion of satisfaction being a driver of trust and continuity in exchange relationships, which Bolton (1998) substantiated, drawing the conclusion that commitment to long-term relationships is directly affected by prior satisfaction of parties in exchange relationships.

The presence of satisfaction in a relationship brings benefits to both parties. The perceived risk to all parties is lower (Seines, 1998), product performance is enhanced (Morgan & Hunt, 1994), buyer and

seller retention rates are increased (Aug & Shih, 2005), trust between exchange partners is maintained (Doney & Cannon, 1997) and there is an increase in loyalty to the relationship.

Satisfaction in an exchange partner transpires primarily from preceding experiences in the exchange relationship. A positive association with prior satisfaction and the succeeding behaviour of a party was identified by Bolton (1998), where producers with “higher prior cumulative satisfaction have longer relationships with the organisation” (Bolton, 1998). A company that does not deliver products or services to specified requirements will struggle to satisfy potential customers, which will reduce trust and commitment with exchange partners, diminishing the quality of the relationship.

Aug & Shih (2005) conceptualised relationship quality as a higher-order construct encompassing diverse yet related dimensions of trust, commitment and satisfaction. Incorporated and validated throughout various studies and contexts, trust, commitment and satisfaction together encompass the key dimensions of relationship quality (Athansopoulou, 2009), hence the importance of examining the presence of all three concepts to gain a firm understanding of the quality of relationships. Hunt, Arnett and Madhavaram (2006) further researched the notion of the ‘commitment-trust theory’ developed by Morgan and Hunt (1994), suggesting that the presence of trust results in a higher level of commitment to relationships, while other studies identified positive satisfaction in a relationship leads to trust in the exchange partner, emphasising the significance these key attributes have on relationship quality.

Innovation

In supply chains, innovation is desirable as it assists businesses to deliver value and satisfaction for end consumers (Mentzer, DeWitt, Keebler, Min, Nix & Zacharia, 2001), while maximising productivity and reducing costs throughout the chain. Gambetta (1988) identified the presence of a “*trust-full*” cohesive relationship that had a positive impact on innovation in a supply chain, encouraging a higher degree of collaboration between actors at the different stages. The findings of Gambetta (1988) are corroborated by Soosay, Hyland and Ferrer (2008), who identified links between collaboration and innovation in a supply chain network and recognised that positive relationships between supply chain actors leads to enhanced innovation. Additional research investigating the influence that relationship quality has on innovation concluded that a higher perceived quality of the relationship by one partner in the exchange leads to a larger capacity for innovation throughout the supply chain alongside reduced risks (Gellynck, Kühne and Weaver, 2011). Relationship quality is therefore considered to be a good precursor for innovation.

Relationship quality and innovation

Relationship quality and innovation have been largely investigated as separate topics, however there is a lack of research that investigates the correlation between relationship quality and innovation throughout industries. Supporting the findings of Kühne et al (2013), further research into the association between relationship quality and innovation produced comparable results. A positive relationship was identified between product innovation and the dimensions of relationship quality; trust, commitment and satisfaction (Hanaysha & Hilman, 2015). Furthermore, a study investigating the impacts on buyer-supplier relationships within supply chains found that dispersing these relationships along the supply chain sequentially leads to improved innovation and performance of suppliers (Kim, Seung Lee & Lee, 2017). The findings from current literature assessing the connection between relationship quality and innovation provide an insight for managers to direct their businesses to develop and maintain relationship capabilities to increase the level of relationship quality with industry partners’ and ultimately encourage greater innovation within the chain.

Morgan & Hunt (1994) emphasised the need for trust and commitment to ensure a successful supply chain, and Seines' (1998) study on buyer-seller relationships highlighted the importance of satisfaction in the continuation of an exchange relationship. Morgan & Hunt (1994) briefly mentioned that the presence of trust and commitment in a relationship will lead to increased cooperation and thus inspire innovation, however it has not been extensively researched. Hence, this research aims to fill the gap in knowledge of the association between the level of relationship quality and levels of innovation in a supply chain, using a lamb production and marketing network in Western Australia as a case study.

Conceptual Framework

Successive to the review of literature, it is postulated that trust, commitment and satisfaction have the largest effect on the quality of an exchange relationship within a supply chain. Further, received literature leads us to propose that good relationships within a supply chain will encourage members to pursue innovative solutions throughout the supply chain. We maintain trust is apparent as the confidence one partner has in the actions of the other partner in an exchange relationship (Hennig-Thurau & Klee, 1997). We recognise the correlation between trust and commitment, an attest a higher level of trust leads to increased commitment in exchange relationships. Commitment is defined here as the willingness of one partner in an exchange to enter a long-term relationship. We also assert that the quality of a relationship within a supply chain is largely influenced by satisfaction of both partners in an exchange and is demonstrated as the successful achievement of requirements within an exchange. Based on the foregoing, and extant research into relationships in the Western Australian sheepmeat industry, the following hypotheses will be tested:

H1: Current relationships in the Western Australian sheep industry are primarily focused on satisfaction.

H2: Overall, there is a positive level of relationship quality in the Western Australian sheep industry.

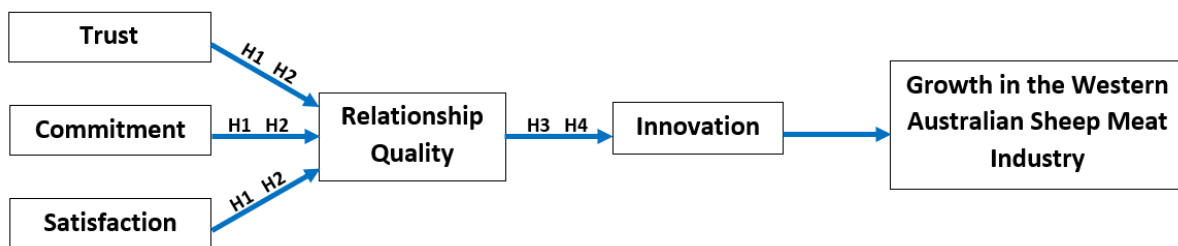
H3: Exchange partners (producers and processors) are willing to facilitate changes in relationships to boost longer-term commitments.

The second major theme investigated is innovation in the supply chain, seen through improvements in products or processes that result in overall higher quality. Literature suggests that a well-managed supply chain will feature innovative solutions, recognising the correlation between relationship quality and innovation within a supply chain. There is an increasing trend of higher quality supply chain relationships implementing innovative solutions, thus improving overall productivity and profitability of actors within the chain. A German based case study investigating supply chain relationships of a traditional food chain (Schulze et al., 2006) observed a high level of relationship quality instinctively resulted in an increase in innovative products and procedures employed. We then hypothesise:

H4: There is a mediocre presence of innovation due to the current levels of relationship quality in the Western Australian sheep industry.

The first stage of the conceptual framework shown in Figure 1 outlines the leading influential factors of relationship quality; trust, commitment and satisfaction. Once these concepts are present in an exchange, relationship quality develops. The framework follows the notion that the presence of relationship quality will lead to further innovation, which will in turn assist the growth of the Western Australian sheep meat industry.

Figure 1. Conceptual framework for the research



Method

The research to test the conceptual framework was completed through a case study approach. A single organisation case study design (Yin, 2009) was carried out on Western Australian lamb processing company, Company X. The case study approach was chosen because the export supply chain of sheep meat is operated by a small number of companies and the opportunity arose to examine one of them. Company X's principal enterprise is processing sheep meat, with additional capability to process beef cattle. Its current facilities can process up to 5,000 lambs and 400 cows each day, with a high demand for Company X's branded products from both supermarkets and butchers throughout Australia, as well as on international markets. Company X currently exports frozen beef and sheep meat products to China and has acquired a licence to export chilled meat products, opening a new market segment for sheep meat in China. Furthermore, skins and by-products are exported to China, where there is a higher demand for the brisket and flap sections of the carcass than for its prime cuts (MLA, 2018). The export of non-prime cuts of sheep meat to China suits Company X's product mix and minimises waste.

To evaluate the perceived level of relationship quality and innovative measures in Company X, a mixed methods design was followed (Cooksey & McDonald, 2011) incorporating both qualitative and quantitative approaches. Two separate surveys were prepared, for the processing staff and producers, aimed at testing the hypotheses developed in the conceptual framework. Processing staff, who are employees at Company X, completed the first survey, with the responses analysed and used in constructing questions for the producers in the second survey. In both surveys, the section measuring relationship quality contained questions to be answered on a five-point Likert Scale where 1 indicated 'Strongly Disagree' and 5 indicated 'Strongly Agree'. Additionally, an open-ended question elicited participants' opinions and suggestions for improving relationship quality throughout the supply chain.

The innovation section of the surveys involved both quantitative and qualitative responses. Once Company X's staff completed the initial survey to identify relevant innovative products and procedures, producers identified their contribution to them. The final section of the processor survey was comprised of three sets of importance triangles developed to identify and illustrate the balance between key characteristics in relationships with livestock agents and producers, as well as decisions made when buying stock for Company X. Importance triangles were developed to provide respondents with a visual cue to elicit individuals' perceptions of importance. This is not to say that participants cannot obtain all three characteristics – indeed the centre of the triangle represents a balance amongst all three – it merely prompts the respondent for deeper thinking into the importance of each factor in the relationship in question.

The first set of importance triangles addressed factors taken into consideration when buying or selling stock. It requires the processor's staff to identify elements of a trade-off between seasonal timing of purchase, security of access to stock and the price paid for lambs. Subsequently, participants were asked to express an opinion on what producers look for when selling their stock, specifically their trade-off between seasonal timing of sale, sales outlet and price received for lambs.

The remaining two sets of importance triangles addressed processor perceptions of the preferred and current positions of relationship quality for both livestock agents and producers. These then provide for a measurable gap between preferred and actual outcomes. The position within the triangles represents trade-offs between trust, commitment and satisfaction.

The producer survey was completed online using Qualtrics, so importance triangles were unsuitable, and a set of rank-ordered questions of the same nature was used. Producers were asked to rank-order the same factors from 1 to 3, where 1 indicated 'most important' and 3 indicated 'least important'. The producer survey included an additional demographic section at the start of the survey, where a series of both qualitative and quantitative questions generated an (anonymous) profile of each producer.

Participants in the processor survey were chosen from employees within Company X with relevant knowledge and experience to answer the questions about producers and livestock agents. Company X employees were notified that the survey is voluntary. Participants in the producer survey had conducted business with Company X within the preceding 12-month period. A Company X staff member contacted all such producers via email with an invitation to participate in the survey. All contact to producers occurred through staff at Company X to comply with research ethics, and producers were informed of the voluntary and anonymous nature of the survey, as well as the potential benefits to them as producers from the findings of the research.

Responses from the processor and producer surveys were collated and analysed using both Microsoft Excel and IBM SPSS Statistics Software (SPSS). The responses from the online producer survey were exported from the Qualtrics website to an Excel spreadsheet where the data was cleaned and formatted to an appropriate layout for analysis.

Within Microsoft Excel, t-tests were completed on disaggregated subsamples of the producer survey data to identify any associations between control variables such as the age of farmers and size of their land holdings, to the responses provided for the Likert Scale questions. Additionally, a program within Excel was utilised to visually represent the combined responses from the triangular data questions presented in the processor survey, with a subsequent gap analysis performed to determine the differences between preferred and current positions of relationships.

The SPSS crosstabs function was used to conduct a series of tests to measure the significance of associations and correlations between variables of interest. The four key tests conducted on the data included a Chi-Square test, Spearman Correlation Coefficient, Kendall's tau-b test and Fisher's exact test. Chi-square tests, also known as 'goodness of fit' statistics, were conducted on different arrangements of variables to determine the level of significance of relationships between the two variables by identifying how well the array of observed data fit with the expected data. The chi-square test assisted the analysis of the ranked questions in the producer survey, where the expected data measured the preferred level of relationship quality while the observed data included the responses of current relationship levels.

The Spearman Correlation Coefficient is commonly used in the analysis of rank ordered questions, as it provides a measure of a positive or negative association between ranks assigned to the two variables. Here, the Spearman Correlation Coefficient was used to identify the strength of associations in the rank ordered questions included in the producer survey. An additional measure commonly used for rank ordered responses is the Kendall's tau-b test, which was used to identify the positive or negative associations between two rank-ordered variables and assess the strength of the association. The fourth test run using crosstab analysis within SPSS was the Fisher's exact test, which was included

in the analysis of the Likert Scale responses. The Fisher's exact test is similar to the chi-square test as it is a measure of statistical significance, but used in the analysis of small sample sizes.

Data

Descriptive statistics

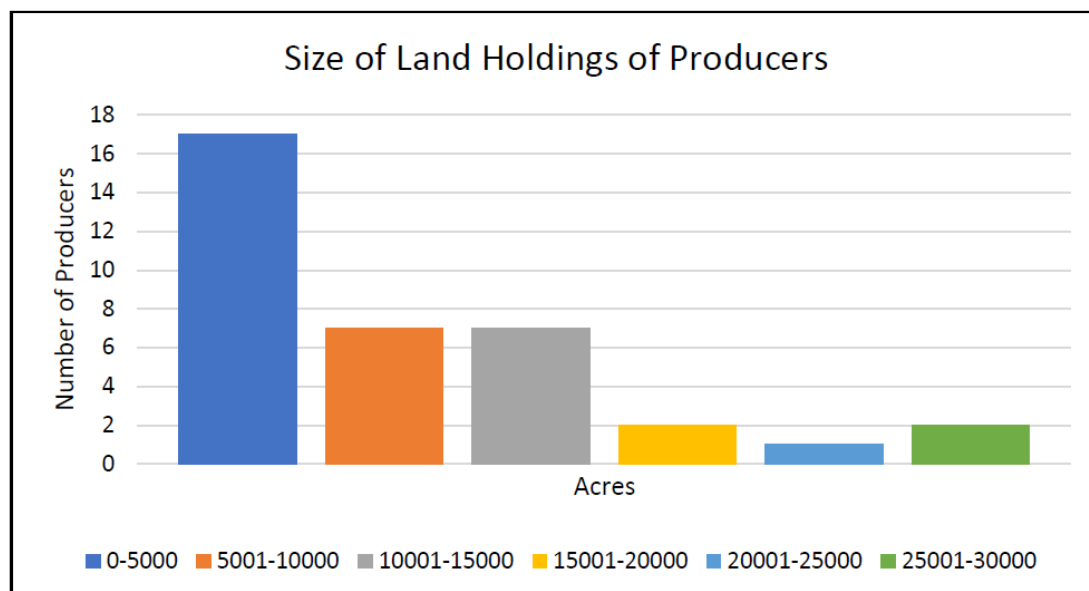
Processor

Potential participants were identified and categorised into one of four groups: "buy", "make", "sell" or "digital", according to their roles at Company X. Of the 14 respondents for the processor survey, the majority of participants came from the digital or buy groups. The digital group were engaged with the implementation of digital technology in the supply chain to help create new value; whereas the buy group had direct interaction/contact with producers and livestock agents (Greenleaf Enterprises, 2018). Make and sell groups were associated with processing and sales, respectively.

Producers

Approximately 160 producers were contacted via email by Company X. Of the 36 resulting respondents, 32 were male, three were female and one was unspecified. Their average age was 47 years, ranging from 30-74 years. Background information provided included their enterprise size and mix: the average property size was 8,453 acres (range 200-30,000 acres) and the majority of producers farm less than 5,000 acres with just five in the 15,000-30,000 acre category (Figure 2). Sheep farming averages 49 per cent of the farming enterprise, followed by cropping (41 per cent) and cattle (10 per cent). Other enterprises were insignificant. Smaller farms dedicated a higher percentage of their land to sheep.

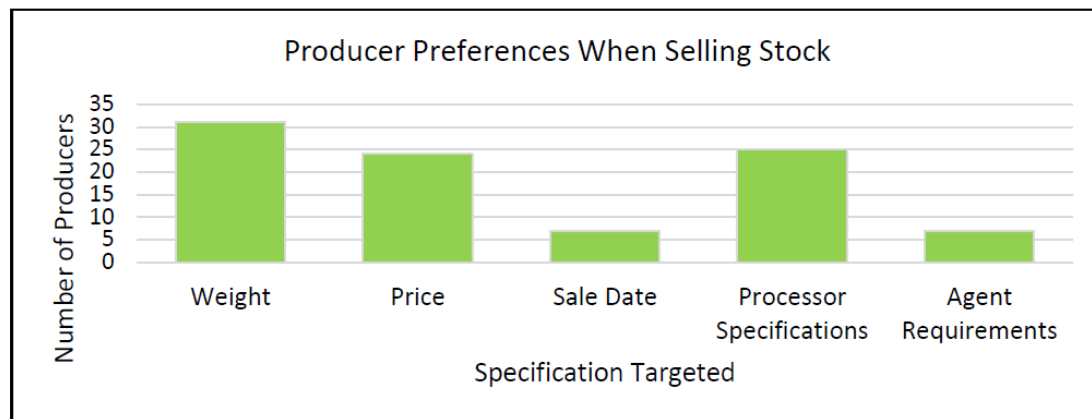
Figure 2. Sample distribution of land holdings



When selling stock, the main attribute producers reported targeting was weight (31 of 36 respondents). Some 25 producers recognised other attributes and processor specifications to be of importance; 24 producers acknowledged price as a target; while for some, agents' requirements and

sale date were important (Figure 3). T-tests revealed that the reported targets were not associated with either of producers' age or property size.

Figure 3. Producer preferences for attributes when selling



Importance in relationship quality and buying and selling

The survey completed by processors used importance triangles to identify the ideal mix in specialised relationships, as well as to illustrate where current relationship quality is situated, using trust, commitment and satisfaction as the three key characteristics. Figures 4 and 6 illustrate the perceived nature of relationships and factors affecting quality, for employees of Company X, both between producers and livestock agents, and with regard to their perception of an ideal relationship with the processor.

Relationship between producers and the processor

Figure 4 indicates the relationship between processing staff at Company X and producers.

Most Company X employees view an ideal relationship (red circles) with producers as one in which trust, commitment and satisfaction are valued equally. Two responses indicate a heavy emphasis on commitment and two participants view trust and commitment as important, but not satisfaction. A comparison of the preferred (red) and current (blue circles) relationship positions as identified by Company X provides measurable gaps, for which arbitrary measurement units are presented in Figure 5. Negative values indicate a lack of the element, and a positive gap suggests over-emphasis. The processor's employees believe trust is missing (indicated by negative values in Figure 5) in current relationships with producers, and that commitment also requires improvement. However, the focus on satisfaction is substantial and might be reduced.

Relationships with livestock agents

Figure 6 illustrates the choice made by processor staff in identifying the ideal and actual representation of trust, commitment and satisfaction, with livestock agents.

There is again a majority preference (red circles) for a balance amongst all three factors, in Figure 6. A minority of processing staff regarded commitment and trust more heavily than satisfaction, while an outlier was identified which focused on trust as the most important factor. The perceived current position (blue circles) reveals a pattern of gaps. There appears to be a heavy emphasis on satisfaction

and commitment in current relationships, signifying both the lack of trust between the processor and livestock agents and the level of attention paid to satisfaction and commitment. Figure 7 recognizes the absence of trust and satisfaction in current relationships while a large emphasis is placed on commitment.

Figure 4. Processor survey: relationship between the processor and producers

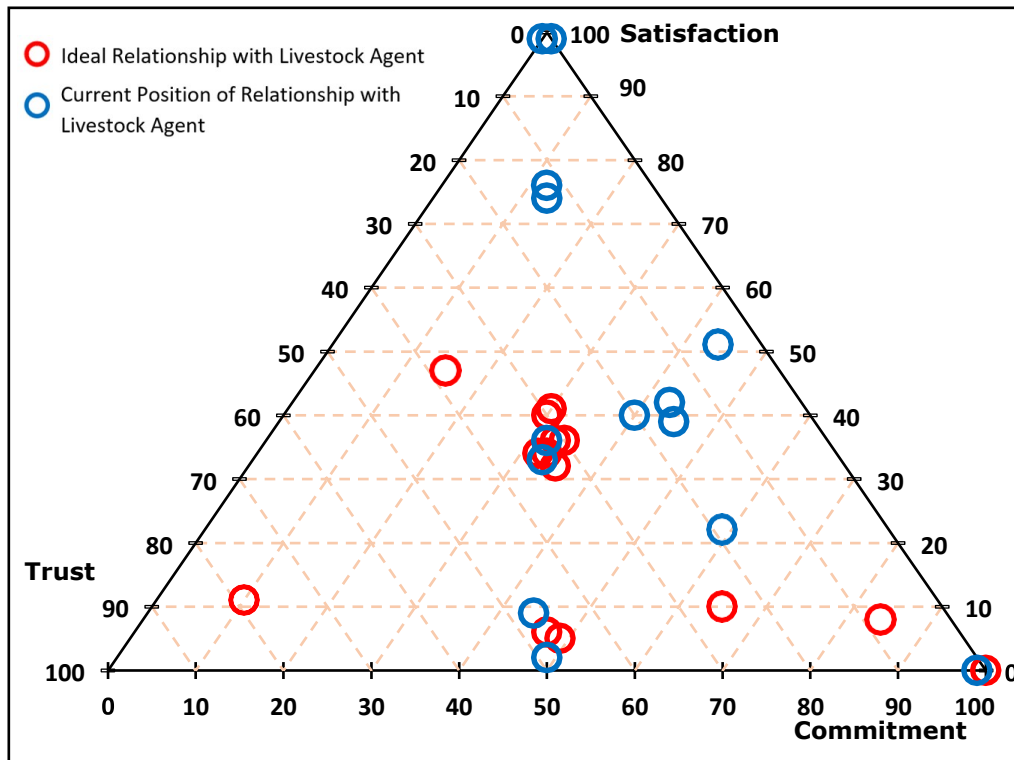


Figure 5. Processor survey: gap analysis for satisfaction, commitment and trust in the relationship between processors and producers

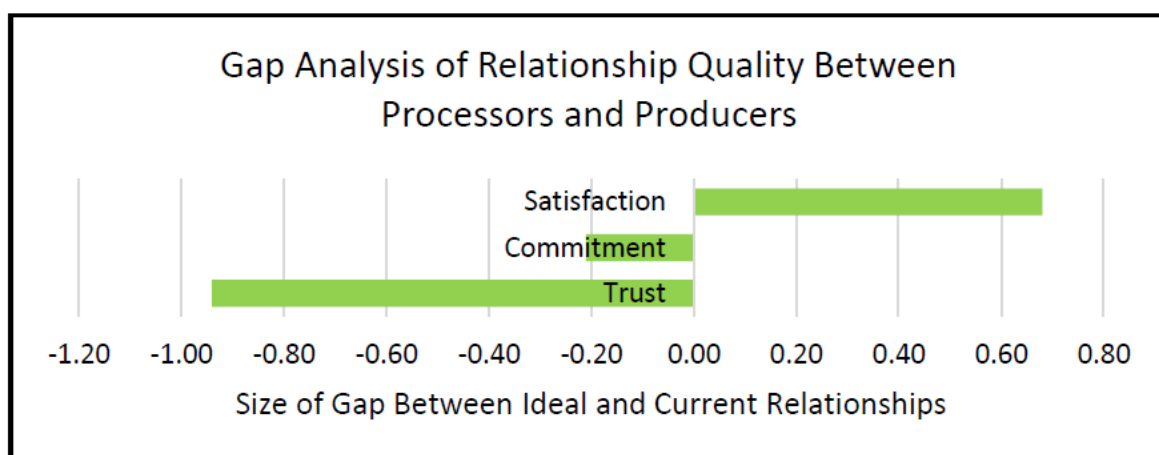


Figure 6. Processor survey: relationship between the processor and livestock agents

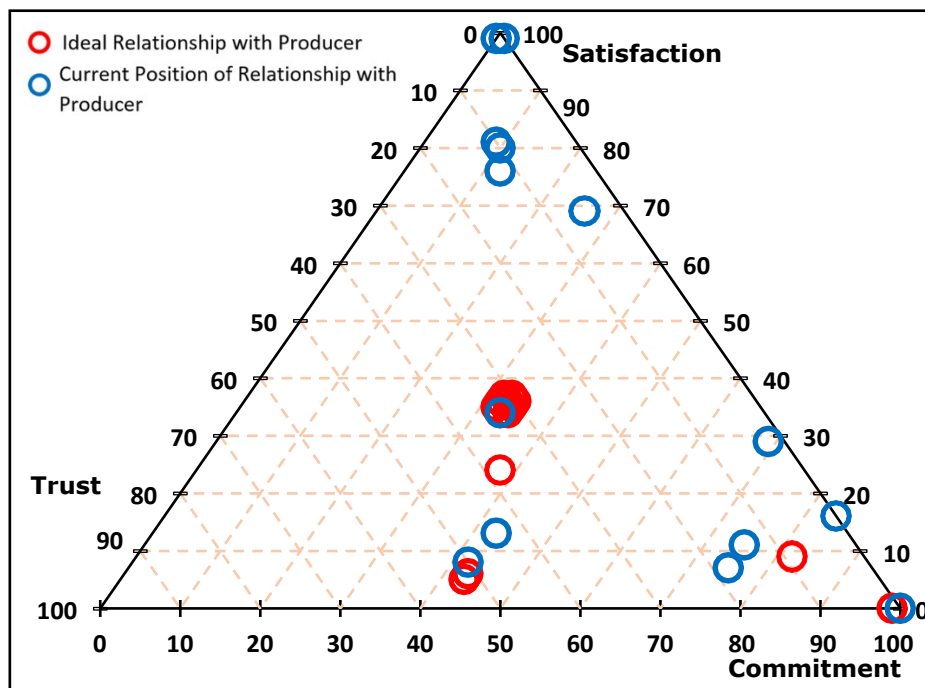
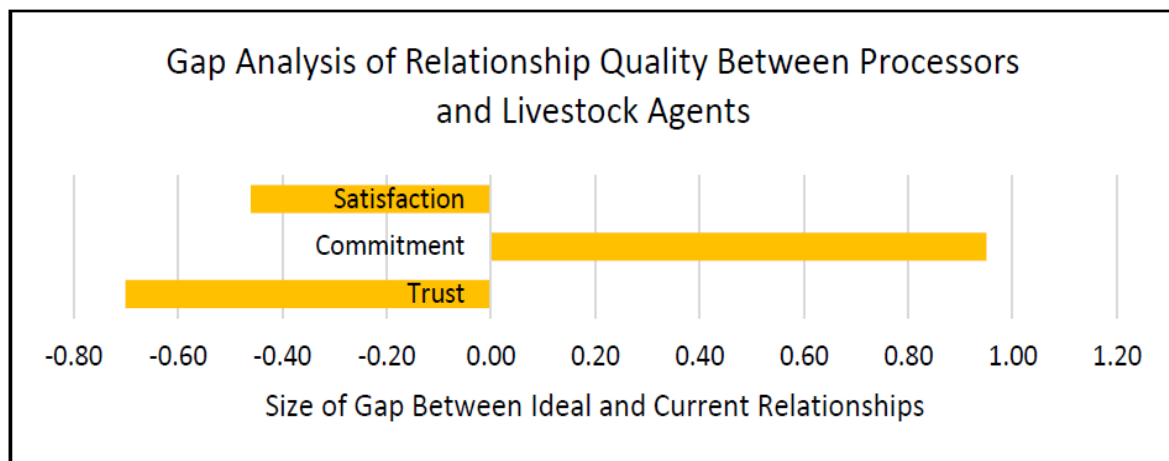
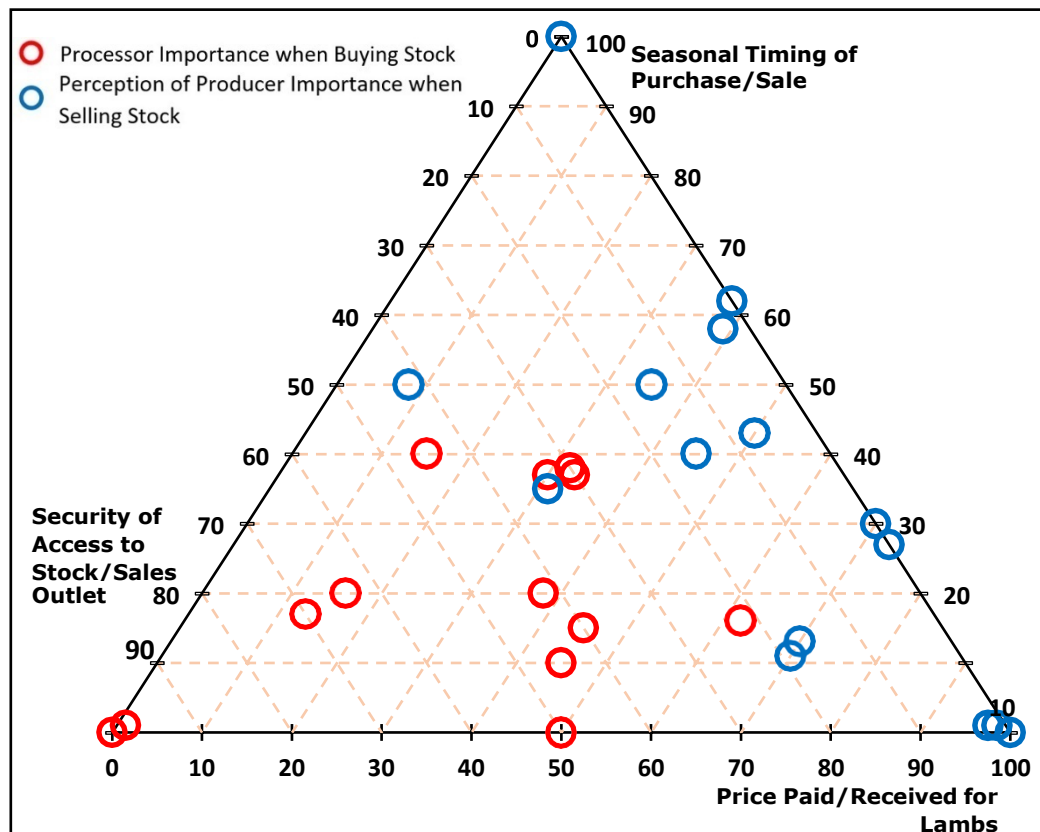


Figure 7. Processor survey: gap analysis for satisfaction, commitment and trust in the relationship between processors and livestock agents



Importance in buying and selling stock

The third set of importance triangles presented to processing staff at Company X addressed processor attitudes to buying stock, and their opinion of what producers look for when selling their stock (see Figure 8). The three items of importance were the seasonal timing of purchase, security of access to stock, and the price paid for lambs. Results centred on security of access to stock and price paid for lambs, with little data to suggest a significance in the seasonal timing of purchase. Three respondents determined all three factors to be of equal importance, while two responses emphasised only security of access to stock: this suggests a lack of stability in the Western Australian sheep industry for the processor included in this research project.

Figure 8. Processor survey: importance in buying and selling stock as perceived by the processor

In stating their opinion about what producers saw as important when selling their stock to Company X, the answers are almost diametrically opposed to the processor's perspective on the same question. The majority state that producer importance was led by price received for lambs, followed by seasonal timing of sale, and no regard paid to the sales outlet. Multiple responses suggested producers are interested only in the price they receive for their stock, while one individual respondent identified seasonal timing of sale as the sole factor considered by producers when selling stock. The remaining respondents hover between seasonal timing of sales and price received for lambs, with one respondent considering all three factors of equal importance and one outlier occurring between sales outlet and seasonal timing of sale. The responses also indicate a strongly divergent set of management objectives and preferences toward relationship quality, and this has implications for achieving innovation throughout the supply chain.

Identification of innovative solutions and improvements to relationship quality

Processor employees were required to identify innovative solutions in the supply chain implemented at Company X within the past three years. The three most common responses were distribution of a price grid to producers and livestock agents, forward contracts for store lambs, and regular feedback (including photos of carcass damage) sent to producers and livestock agents. The open-ended responses provided by processing staff for the improvement of relationship quality with producers suggested importance for developing a 'producer club', where a preferred supplier base is supported by Company X, to progress and preserve relationships with producers.

Both processor and producer surveys included a section measuring relationship quality, to be answered on a five-point Likert Scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Table 1 displays

the average responses from processors regarding relationship quality with both producers and livestock agents, while Table 2 shows the average associated producer responses.

The producer survey's open-ended section called for opinions and suggestions to improve supply chain relationships. Multiple respondents stated that they preferred a closer relationship to Company X, but that this was not possible. One producer stated a preference for a relationship with multiple employees at Company X and for Company X buyers conducting on-farm inspections. The need for greater communication and information sharing channels specifically relating to market prices was also identified by several producers.

Table 1. Average Likert Scale responses from the processor survey

Processor Relationship Quality with Producers		Processor Relationship Quality with Livestock Agents	
Characteristic	Average	Characteristic	Average
Long-Term Marketing Arrangement	3.14	Long-Term Marketing Arrangement	3.07
Added Value to Final Product	2.93	Added Value to Final Product	2.86
Trust to see Mutual Benefits	2.86	Trust to see Mutual Benefits	2.86
Willingness to Commit Supply of Stock	2.14	Willingness to Commit Supply of Stock	2.07
Ease Challenges in the Relationship	4.14	Ease Challenges in the Relationship	3.79

Table 2. Average Likert Scale responses from producer survey

Producer Relationship Quality with Processor		Producer Relationship Quality with Livestock Agents	
Characteristic	Average	Characteristic	Average
Long-Term Marketing Arrangement	3.57	Long-Term Marketing Arrangement	3.76
Added Value to Final Product	3.50	Added Value to Final Product	3.31
Trust to see Mutual Benefits	3.53	Trust to see Mutual Benefits	3.45
Willingness to Commit Supply of Stock	3.13	Willingness to Commit Supply of Stock	3.69
Ease Challenges in the Relationship	3.70	Ease Challenges in the Relationship	3.55

Added value

Responses from the Likert Scale questions in the producer survey indicate an overall positive view on added value from both the processor and livestock agents. Figure 9 illustrates the producer responses from the Likert Scale questions, with responses of 'Strongly Disagree', 'Disagree' or 'Neither Disagree nor Agree' categorised as NONPOS and 'Agree' and 'Strongly Agree' responses marked POS.

A majority of producers believe that both processors and livestock agents add value to their product. The average Likert Scale results (3.5 and 3.3 respectively) confirm this. The results imply some mutual appreciation amongst supply chain participants, of the benefits of collaboration.

The crosstabulation of the Likert Scale results (Table 3) detects a significant difference in these perceptions (Fisher's Exact Test at 10 per cent level of the test). However, from Table 3 it can be seen that a large portion of the responses from both Likert questions fall in the 'Agree' column, so the Fisher's Exact Test is somewhat inconclusive. Further crosstabulation between producers' perceptions of added value at the processing level, and the trust producers have in the processor to act in a mutually beneficial manner, indicated no significant association. Kendall's tau-b and Spearman Correlation Coefficients indicated a small level of positive association between these two variables, which for small sample size provides some assurance that the Likert Scale statements are consistent in these cases.

Figure 9. Producer perceptions of added value from the processor and livestock agents

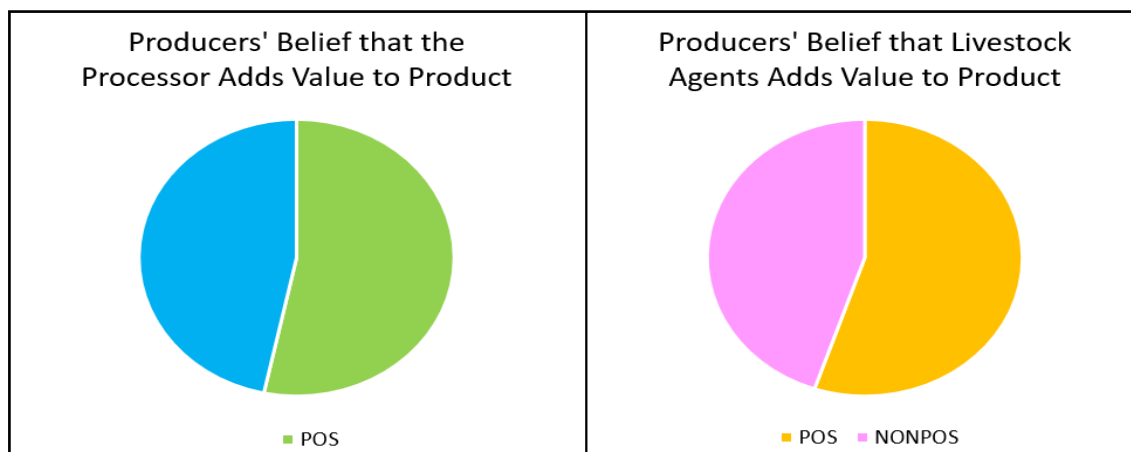


Table 3. Cross tabulation of producer perceptions of added value

Count		Crosstab					Total
		Believe that Livestock Agent Adds Value to the Product					
		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	
Believe that Processor Adds Value to the Product	Strongly Disagree	1	0	0	0	0	1
	Disagree	0	1	0	1	0	2
	Neither Agree nor Disagree	2	2	1	6	0	11
	Agree	0	2	4	5	2	13
	Strongly Agree	0	0	0	0	2	2
Total		3	5	5	12	4	29

Processing staff did not share the producers’ view regarding the level of added value in the supply chain. The majority of processor staff responded NONPOS when asked their opinion of whether either or both of producers and livestock agents believe the processor adds value to the product. This outcome was not unexpected as many of the procedures that add value to products occur at the final stage of the supply chain and after the lamb has been processed.

The crosstab analysis performed on processor opinions of both producers and livestock agents’ belief that the processor adds value indicated a largely neutral response in both relationships (Table 4). The majority of responses fall in the ‘Neither Disagree nor Agree’ category which makes it difficult to draw conclusions on processor perceptions surrounding added value in the supply chain. No significant associations between these beliefs was detected.

The overall rankings of the three sets of questions are illustrated in Figures 10 and 11. These are the counterparts to the importance triangles used in the processor surveys. Results show a clear divergence: producers rate sales outlet most highly, while producers’ perception of Company X’s preference is centred on seasonal timing of purchase and purchase price. This pattern of response reinforces the results from the importance triangles: there are opposing perceptions amongst supply chain participants about the importance attached to aspects of transactions. These are likely to affect trust, satisfaction and commitment.

Table 4. Cross tabulation of processor perceptions of added value

Count		Crosstab			
		Livestock Agents Believe the Processor Adds Value to the Product			Total
		Disagree	neither Agree nor Disagree	Agree	
Producers Believe the Processor Adds Value to the Product	Disagree	2	1	0	3
	Neither Agree nor Disagree	2	6	1	9
	Agree	0	1	1	2
Total		4	8	2	14

Figure 11 suggests that producers consistently rate commitment, satisfaction, and trust (in that order) as most important in their supply chain relationships. For producers, results were examined to determine if there were patterns amongst the rankings of the characteristics, in particular to identify if respondents who rank one characteristic strongly, rank a different characteristic a certain way.

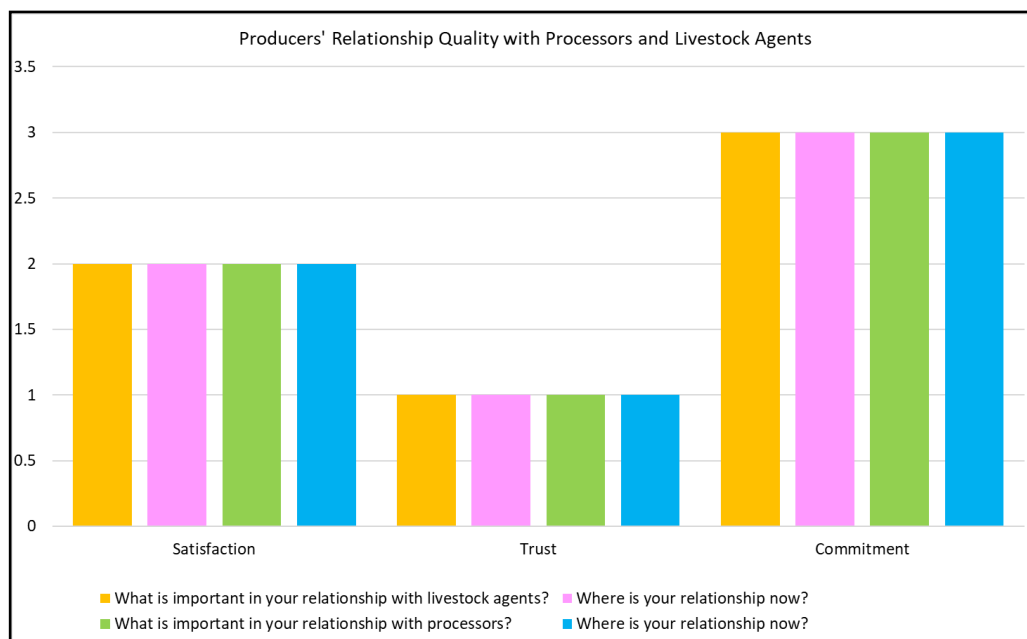
Figure 10. Likert Scale scores of producer importance when selling stock



Table 5. Summary table of cross tabulations

Variable 1	Variable 2	Chi-Square Test		Kendall's tau-b		Spearman Correlation Coefficient	
		Value	Significance	Value	Significance	Value	Significance
Current Satisfaction with Livestock Agent	Current Satisfaction with Processor	6.073	0.194	0.000	1.000	0.000	1.000
Current Commitment with Livestock Agent	Current Commitment with Processor	4.421	0.352	-0.012	0.954	-0.013	0.953
Preferred Trust with Processor	Current Trust with Processor	19.515	0.001	0.740	0.000	0.771	0.000
Preferred Trust with Livestock Agent	Current Trust with Livestock Agent	9.523	0.049	0.519	0.001	0.561	0.005

The four main associations investigated (Table 5) were current level of satisfaction with the processor and livestock agents, current level of commitment with the processor and livestock agents, preferred and current levels of trust with the processor, and preferred and current levels of trust with livestock agents. Significant correlations are found for preferred and current levels of trust with both supply chain partners. No correlations were found regarding current levels of satisfaction and commitment. This suggests that producers hold diverse views on satisfaction and commitment when comparing supply chain partners.

Figure 11. Producers are content with their current supply chain relationships

Discussion

Based on research literature on supply chain relationship quality, its contributing components and its linkage to innovation, a measurement method was developed and applied to actors in a Western Australian sheep meat supply chain.

A variety of both quantitative and qualitative measures were used to gain an understanding of the actors' various perceptions of relationship quality and to identify contributions to innovation. Trust, commitment and satisfaction constitute the main measures of relationship quality used, and desired and attained levels of these were assessed using importance triangles and Likert Scales. Divergence between desired and attained levels was addressed as a gap analysis. Data represents agents' perceptions, including perceptions of other agents' preferences and priorities.

For producers' relationship quality with supply chain partners (both processors and livestock agents), the largest gap detected was for trust, followed by commitment. Results suggest that satisfaction is overestimated in its importance to producers, highlighting the need to shift the focus from satisfaction onto the development of trust and commitment. For processors' relationship quality with both livestock agents and producers, the largest gap was also for trust.

A comparison of processor and producer perceptions of relationship quality factors identified a discontinuity between supply actors:

- processing staff regard commitment as the key factor of importance in relationships, while the average producer ranked commitment as least important;
- trust was deemed to be of primary importance by producers, while processors ranked trust below commitment; and
- satisfaction, which is perceived by processors to be the driving force of current relationships, was ranked lowest by processors, and second by producers.

In contrast, the questions on buying and selling characteristics saw a complete and consistent understanding of both processor and producer perceptions of the other partner's priorities.

Processor relationships with producers

Processing staff at Company X desire a relationship with producers that encompasses trust, commitment and satisfaction equally. Their assessment of the actual relationship varies between satisfaction and commitment, but with no acknowledgement of the presence of trust. Analysis reveals that satisfaction is the perceived driving force of current relationships, followed by commitment. Trust is clearly still to be developed.

Processing staff favour development of a 'producer club', where Company X supports a preferred supplier base, to progress and preserve supply chain relations. A spotlight was placed on the need for increased transparency of information between chain actors involving prices, market conditions, current specifications and general feedback to producers. Further, events facilitating communication along the entire supply chain including consumers, are proposed.

Company X employees mostly believe that producers do not participate in value addition in the supply chain. They acknowledge a minor role for livestock agents in value addition. Producers acknowledge a substantial value adding role played by Company X.

Processor relationships with livestock agents

Relationships between employees at Company X and livestock agents are found to be based on satisfaction, with an infrequent presence of trust. Processing staff do not perceive the quality of relationships with livestock agents to be high. There is however a positive impression of long-term marketing arrangements with livestock agents and confidence about overcoming issues in the relationship, representing a willingness to develop key relationships to increase integration in the supply chain.

Producer relationships with processors

Producers expressed an overall positive view of their relationship with the processor. Moreover, producers perceive that the current status of the relationship with processors is equal to the desired one. Regarding practical aspects of the relationship, producers are positive about joint problem solving with processors.

Producer relationships with livestock agents

Producers perceive that their actual relationship with livestock agents is equivalent to their desired one. Trust is viewed as the most important element in the relationship. It is clear that producers value a long-term marketing arrangement with their livestock agent, and are confident that challenges in the relationship can be overcome.

Innovation in the supply chain

The three key supply chain innovations identified by Company X were the communication of a price grid to producers and livestock agents, forward contracts for store lambs, and regular feedback to producers and livestock agents. The processor survey suggests minimal co-design with producers or downstream buyers, which supports the impressions of a low quality of supply chain relationship as expressed by processors.

Conclusions

This research identified processor and producer perceptions of the quality of relationships and the degree of cohesion between stakeholders in the implementation of innovative procedures to be generally positive. A conceptual framework was developed to rationalise the research questions into hypotheses that were testable in the context of the data available. The results identified some disparities in processor and producer perceptions of relationship quality, as processing staff described a generally poor relationship quality with producers and livestock agents, while producers were positive and optimistic concerning supply chain relationships.

Company X staff identified commitment to be the most important factor in their relationships; while producers valued trust above commitment or satisfaction. Although it was difficult to identify indicators of innovation within the supply chain, the observed strong recognition of the importance of value added is fundamental to the further development of relationships between the processor, producers and livestock agents. This is likely to assist the enhanced integration of the supply chain, and ultimately promote growth in production and flock numbers in the Western Australian sheep industry.

The study identifies perceptions of minor contributions by producers and livestock agents to innovation. As acknowledged by survey participants, improved communication channels and direct contact from Company X will see producers more satisfied and willing to increase commitment. It is suggested that livestock agents will need to act in a manner beneficial to others in the supply chain to improve the quality of relationships with processors and producers. Company X proposes actions to achieve these ends, essentially by paying personalised attention to individual producers' needs.

The questions asked of the market participants in this study were framed at quite an aggregate level – overall ratings for trust, satisfaction and commitment. An interesting area for further study would be to explore the more disaggregated factors or drivers of these overall ratings, and which of these were the relatively more or less important. This information could then be used to develop more targeted approaches to improving relationship quality.

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