

*Proceedings of the 7th Asia Pacific Industrial Engineering and Management Systems Conference 2006
17-20 December 2006, Bangkok, Thailand*

Collaborative Commerce in Meat Supply Chain

Latif Al-Hakim

Faculty of Business, University of Southern Queensland
Queensland, 4350, AUSTRALIA, Email: hakim@usq.edu.au

Abstract. This research considers two main conditions of collaborative commerce; information technology and trust. It aims to configure the effect of these conditions on a specific type of industry, that is, the red meat industry which involves mainly lamb and beef products. The research employs multi- case study methodology and uses importance-performance approach. It considers the perspectives of meat processors (abattoirs). Nine abattoirs have been participated in this research. The research finds information technology considerably reduces letters, faxes, telephone calls and face-to-face communication but does not facilitate transactions with government or contribute in the organisational growth. Though knowledge and skills play a considerable role in selection of partners, the interviewed firms rely more on the advice of their suppliers rather than their customers. The firms show that suppliers commit to maintain the relationships with them more than their expectation. The research concludes that factors related to opportunism, behaviour and adaptability are significantly affecting partnerships, and then collaborative commerce among the meat organisations.

Keywords: Collaborative research, factor, information technology, partnership, trust.

1. INTRODUCTION

Competing successfully in any business environment today requires companies to become much more involved in how their suppliers and customers do business (Wisner et. al, 2005, p. 4). As a result, individual businesses no longer compete as autonomous entities, but rather as supply chains (Lambert and Copper, 2000). Managing the supply chain has become a means of improving competitiveness (Chantra and Kumar, 2000; Lee, 2000). Proactive supply chain managers begin to view the supply chain as a whole, and promote a more harmonious view of relationships emphasising customer-focus, information sharing, partnerships and trust (Jayaram et al., 2000). Today, the effectiveness of an organisation's response to rapidly changing market conditions will be determined by the capability of trading partners (Power and Sohal, 2001). Members within the supply chain should "seamlessly" work together to serve the end consumer (Towill 1997). In addition, the explosion of the Internet and other telecommunication technology has also made real-time, on-line communication throughout the entire supply chain a reality. The Internet allows companies to interact with suppliers and customers and collect enormous volumes of data and manipulate it in many different ways to bring out otherwise unforeseen areas of knowledge (Abbott, 2001). Organisations are transforming themselves to electronic business (e-business) by reinventing the way they carry out their business processes to take advantage of the capabilities of Internet (El Sawy, 2001). OECD defines e-

business as "automated business processes (both intra-and inter-firm) over computer mediated networks (European Commission, 2004). Collaborative commerce (c-commerce) is one more advanced form of e-business in that:

1. It links a firm electronically to its stakeholders; customers, suppliers and business partners within the scope of OECD definition of e-business;
2. It also enables firms to collaborate with their stakeholders (Ratnasingam, 2004).

The term 'stakeholder' refers to downstream, upstream and same level firms within a supply chain and accordingly stakeholder's collaboration is associated with the supply chain. Supply chain collaboration is often defined as two or more firms working together to create competitive advantages through joint decisions and sharing benefits and risks (Simatupang and Sridharam, 2005). Information sharing is considered as an important component of collaboration in the supply chain management (Li et. al, 2005). Information sharing is a challenging task that requires a high degree of trust among and between supply chain partners (Kwon and Suh, 2005). Effective collaboration also requires effective information technology and communication (ICT) systems. This paper considers the main conditions of c-commerce: trust and ICT.

This research deals with a specific type of supply chain, that is, the red meat supply chain which involves mainly lamb and beef products. Similar to other industries, red meat firms realise the importance of managing their supply chain

(Fearne, 2002; Taylor, 2006), the need to establish an adequate level of trust (Batt, 2003; Yee and Yeung, 2002) and the introduction of high information technology to achieve real-time communication along the supply chain (Al-Hakim, 2006). Partnerships between various meat supply chain entities have been encouraged and sponsored by governments and national associations in Europe (NUTRA, 2006), South America (Meatnews, 2006), USA (Cheek, 2006), as well as Australia (MLA, 2006). Although it is often suggested that trust is an important construct of successful meat supply chain management (Lindgreen, 2006; Taylor, 2006), little empirical evidence of the trust level between various interfaces of meat supply chain stages and the effect of ICT on trust levels is available. This paper employs multiple case study approach in an attempt to fill this gap in the literature. This paper considers only two interfaces of the meat supply chain: (1) interface between meat processors (abattoirs) and their customer partners (wholesalers and retailers) and (2) the abattoirs with their supplier partners (farmers, producers).

2. UNIQUE FEATURES OF MEAT SUPPLY CHAIN

A meat supply chain has some unique features that make it different from other supply chains. One important feature is the nature of its products. There is a high degree of variability between one animal and another and between one portion of meat and another (Bowler and Nufer, 2001). Accordingly, meat supply chain produces a large number of unique traded items.

Customer demand and regulations enforce the delivery of high quality and safe meat products. Concerns about animal health, potential bio-terrorism, and consumer demand for credence attributes have made animal and meat traceability along the meat supply chain essential (Becker, 2006; Folinas et al., 2006; Mousavi et al., 2002; Tonsor and Schroeder, 2004)

Basically, traceability systems are record-keeping systems designed to track the flow of product or product attributes through the production process or supply chain. The idea of setting up traceability systems is to create and maintain an information trail that closely follows the path taken by the physical product being monitored (Becker, 2006; Tonsor and Schroeder, 2004). Real-time traceability of the biological attributes and variability of traded items (livestock, carcasses, carcase portions, cartons, etc.) along the entire meat supply chain is highly required during the discovery of safety hazards, or mad cow disease - bovine spongiform encephalopathy (BSE). Accordingly, extra precautions and control actions are required when producing a product that contains meat from different sources. This adds additional constraint that forms another unique feature of meat supply

chain.

Rogers (1995) asserts that technology diffusion may vary with differing cultures of urban and rural environments. Red meat supply chain entities include farmers, producers, abattoirs, distributors and such, are located in rural areas, while a large number of retailers and consumers are mainly located in urban areas. Technology diffusion in rural areas is much slower than that in urban areas (Newell *et al.* 2000). This gap in technology diffusion has a direct influence on the flow of information through the red meat supply chain, which may ultimately affect trust.

Abattoirs form the main interface organisations between meat supply chain entities in rural areas and other entities located in urban area. This study is limited to deals with trust and technology of abattoirs only.

3. AUSTRALIAN RED MEAT

Australia is the one of largest red meat exporter in the world and has a high reputation for food safety that is managed by a sophisticated supply chain. With only 2.5% of world cattle numbers in 2000 (Bindon and Jones, 2001; MLA, 2000; Ashton *et al.*, 2004), retain the position of number two meat trader after USA – about 21% of global beef export in 2001 (Seng, 2003). Australian exports of meat account for about 46 per cent of the total Australian production of meat. About 52 and 33 per cent of Australian meat exports are sold on Asian and the American markets (Kidane, 2003).

The major meat product in Australia is beef production (Ashton *et al.*, 2004; MLA, 2004). Australia exports nearly 65% of its beef production to over 100 countries (Agri-Chain Solution, 2001; MLA, 2001a) with about \$3.2 billion export value in 2000 (MLA, 2002). The export nature of the industries increases the pressures on Australian meat industry to comply with overseas market regulations and requirements. One such pressure is the likely the requirements of the European Union in regard to traceability and quality.

Of about 20,000 lamb producers in Australia, nearly 75% are non-specialist producers whose primary enterprises include wool, beef and grain production (MLA, 2001b). A majority of these lamb producers are wool producers shifting into lamb production when wool prices are down and/or when lamb prices seem promising. Although lamb consumption has declined over the last 20 years, lamb export sales has consistently increased, quarter by quarter since 1990 (MLA, 2001c). During the 1990s, lamb exports had expanded by 400% and this trend is expected to continue. A decrease in sheep population around the world and the on-going disease scares also resulted in an increase in Australian mutton exports.

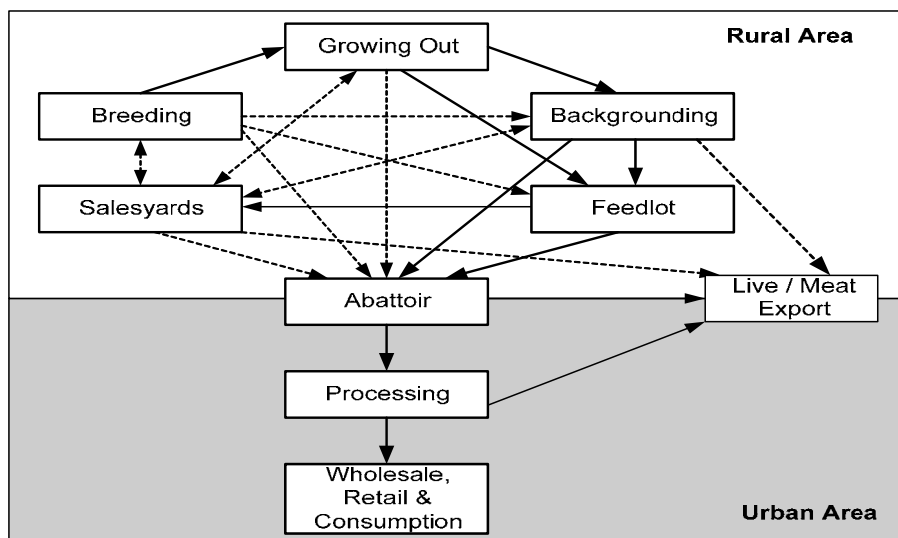


Figure 1: Traditional Meat Supply Chain - Adapted with modification from Bowler and Nufer, 2001.

There are 158 abattoirs (meat processors) registered with Australian Meat Processor Corporation (AMPC, 2005, AMPC, 2006), 36% of them (58 abattoirs) are in Queensland only. Fifty three of registered abattoirs are large organisations dealing with exporting meat overseas. Abattoirs form interface links meat supply chain in rural areas (farmers, producers, lot feeders) and these meat supply chain entities in urban areas (butchers, wholesalers, retailers). Traceability at abattoirs are more sophisticated than other meat supply chain entities due to the facts that abattoirs receiving live castles from large numbers of farms and producers and distribute the meat over large number of wholesales and retailers.

The diagram in Figure 1 provides an overview of the traditional meat supply chain entities and the flow of information throughout the chain. The flow of information is represented by the arrows. Each line's thickness indicates the strength of information flow. The diagram shows existing problem in the continual information flow and information sharing between chain's entities. The diagram in Figure 1 discloses discontinuity in the information flow even between very close entities such as saleyards and abattoirs.

A number of initiatives has been undertaken to improve Australian meat supply chain. Among them is BeefNet initiative which groups almost two thousand cattle producers into 73 local and regional marketing groups (MLA, 2002). In 2004, the 'National Livestock Identification System' (NLIS) has been introduced to trace the Australian meat product from its origin. This system use RFID technology to trace the meat products (MLA, 2004).

4. ICT ADOPTION

The diffusion of innovation (DOI) theory by Roger (1995) has a general application to the adoption of ICT innovations including collaborative commerce. Five innovation characteristics are singled out in DOI as independent variables influencing adoption rates, and these relate to perceptions of: 1) relative advantage over alternatives, involving a range of social, technical and economic benefits; 2) compatibility with existing values, experiences and needs; 3) the complexity, 4) trialability and 5) observability of the innovation. Roger (1995, p216) emphasises the degree of perceived relative advantage, encompassing the full range of possible benefits, is the main variable that influences the rate of ICT adoption. Two major benefits of ICT innovations adoption commonly identified are: reduced costs; and increased demand through increased services and new markets (OECD, 2002). These benefits directly stem from the Internet's intrinsic characteristics of providing low-cost and high-speed global communication. This paper investigates the perceived benefits of IT employed by an organization in terms of transactions, communication type, business volume and information exchange and access.

5. TRUST

Trust forms the foundation of an effective supply chain (Sahay, 2003; Simatupang *et al.*, 2004). It is an essential driver for the long-term stability of an organization and has assumed playing an important role both within organisation and of of inter-organisational relationships (Ryan *et al.*, 2004).

However, building trust relies on the parties' willingness to relinquish some independence and developing mutual dependence means both parties must play the game (O'Keeffe, 1998).

There are several definitions for trust. In generic terms, a working explanation for the term trust can be trust is an expectancy of positive (or non-negative) outcomes that one can receive based on the expected actions of another party in an interaction characterized by uncertainty (Sahay, 2003). In other words, the term trust generally refers to an organization's willingness to take a risk or to make itself vulnerable, in relation to another organization.

5.1 Dimensions and Constructs of trust

Trust is a multidimensional concept. There has been wide range of research conducted in various discipline to determine the dimensions of trust. Researchers attempted to group the dimensions of trust into distinctive constructs. Sako (1992, 1998) distinguishes three group of trust; contractual trust, competence trust and goodwill trust. In addition to Sako's (1992) three-dimensional construct for trust, this research of Ryan *et al* (2004) also takes benevolence as a fourth construct, as there is a marked psychological difference between goodwill and benevolence. This paper adopts the conceptual framework of Ryan *et al* (2004) which classifies the dimensions of trust into four constructs, namely; contractual trust, competence trust, goodwill trust and benevolence. It considers also other dimensions mentioned in literature. These dimensions are opportunism and behaviour trust.

5.2 Contractual trust

Contractual trust is the belief that both parties in a relationship will adhere to universalistic ethical standards (Martin, 2002), such as honouring contracts (Walker, 2004), and carrying out their duties as agreed (Ryan *et al.*, 2004). Walker (2004) suggests that contractual trust is more applicable to formalized relationships which are usually bounded by rules or conditions. According to Ryan *et al.* (2004) trusting your partner to uphold written or oral agreements is a necessary precondition for the success of any collaborative project.

5.3 Competence trust

Competence trust refers to faith in the abilities of the other partner to perform their role in developing collaboration (Ryan *et al.*, 2004; Martin, 2002). It addresses the question of whether the other party capable of doing what it says it will do. Competence trust focuses on behaviours regarding how well people acknowledge other people's skills and abilities,

include them in decisions that affect their jobs, and their lives and how often they help people learn new skills (Reina and Smith, 2004).

5.4 Goodwill trust

Goodwill trust embodies the belief that both parties in a relationship will act in the interests of the other, regardless of formal agreements, and will avoid opportunism; the threat of moral hazard is minimized (Martin, 2002; Ryan *et al.*, 2004). Goodwill trust requires consensus on what is 'fair' between the parties. This is possibly the most difficult form of trust to develop compared to contractual and competence trust and requires a common view about equity and a shared sense of mutuality.

5.5 Opportunism and Behaviour

Competence trust and goodwill trust requires low expectation of opportunities and predictable behaviour of partners. Opportunism refer to the lack of condor or honesty in transactions. To include "self-interest with guile" (Williamson, 1975, p. 9). Behaviour trust arises from the difficulties associated with monitoring the performance of transaction partners (Kwan and Suh, 2005). It is resulted from the inability to predict behaviour of partners. Behaviour trust creates a performance evaluation problem.

5.6 Benevolence

Benevolence is the extent to which a trustee is believed to want to do good to the trustor, aside from an egocentric profit motive (Mayer *et al.*, 1995). Benevolence is the assessment that the trusted individual is concerned enough about the trustor's welfare to either advance interests, or at the minimum not to impede them. It is understood to be of a more inter-personal nature in terms of a specific attachment between the trustor and the trustee (Ryan *et al.*, 2004). Goodwill is perceived as organizational friendship, whereas caring parallels benevolence (Mayer *et al.*, 1995).

6. RESEARCH METHODOLOGY

There is a continuing debate on the pros and cons of quantitative and qualitative research. Quantitative research assumes to have greater validity, can be generalised, and provide greater theoretical contributions (Guba and Lincoln, 1994). On the other hand, quantitative research

This research employs a qualitative research using multiple case studies, that is, semi-structured interviews stems from a questionnaire. The reasons for this methodology are:

1. **Unit of research:** The interest of this study is on the technology and trust relationships that exist between abattoirs and other entities of the meat supply chain. The number of abattoirs in Australia is limited. There is a concern that by employing a qualitative methodology, we may not have the required number of respondents that allows us to validate the survey results.

2. **Focus of the research:** Since the focus of the research is on trust, there is a concern that there will be very limited number of firms willing to participate in a quantitative (large scale) survey.

3. **Scope of the study:** The research is limited to firms within the red meat supply chain. Virtually, most entities of the chain before and including many abattoirs are located in rural areas. There is a perception that such firms may not wish to answering questionnaire that is simply posted to them or even replying to survey via telephone. There is a possibility the firm's owners or CEOs may not comprehend fully some questions and may answer them based on wrong understanding of the questions.

4. **Face-to-face Interviews:** Meetings with respondents provides more insight and understanding for the reasons of selecting specific answers. It can help provide understanding and information on several qualitative issues such as requirements to enhance trust and reasons for disagreement with specific system such as 'NLIS' which come to an effect in 2005.

5. **Validity:** Both within-case analysis and cross-case analysis can be used. This will provide better comparison between various cases and achieve a robust insight and accordingly achieve a higher degree of external validity.

6.1 The Questionnaire

In addition to general knowledge section, the questionnaire comprises two other sections. The first section deals with interviewee opinion from the implementation of factors related to information technology system employed by their organisation. The second section deals with factors affecting trust. The paper aims to rate the expectation from factors affecting trust and the perceptions of the interviewee about the performance of factors by their suppliers and customers. For each factor there are three fields to be answered; one for importance of factors and two for performance of factors. For the first field, the importance field, the interviewee is asked to rate the expectation about critically of the factors, that is how important each factor is to the interviewee's organization. There are two columns deal with performance of factors. The first column considers the interviewee's perception about the performance of factors between the interviewee's organisation and its suppliers. The second column reflects the perception about the performance of factors in relation to the organisation's

customers. If a factor is not applicable to the organisation, the interviewee's is asked to tick N/A. Care is taken to paraphrase the questions with the words used by the interviewees in order not to reveal the answers that the interviewer prefers (Carson *et al.*, 2000). The performance fields are designed to suit aggregate perception. If the perceived performance considerably differ between partners and cannot be aggregated, the interviewee will be asked to consider only one supplier (or one customer) organisation and fill the performance fields.

The Likert scale is used in the questionnaires to rate the importance and performance of factors because it is the most popular method to measure attitudes and easy to administer (Sekaran, 1992). The Likert scales give the researcher a clearer understanding of the interviewees' perceptions on the key issues in the interviews (Yin, 1998). In this research the 7-point Likert scale is chosen to for two reasons. This scale can provide more accurate comparisons between different respondents as compare to the 5-point scale that is commonly used. Also, the odd scale is to allow the respondents to choose the neutral answer (point 3) if they are not sure of the answers. If the interviewee strongly agrees that a factor under consideration is critical or performed well, he / she ticks '7'. The interviewee ticks "1" if he / she strongly disagrees.

6. RESULTS

Nine abattoir firms have been participated in this study. All case firms deals with exporting meat overseas and have formal partnerships with suppliers as well as customer organisations. They use Internet and have electronic data interchange (EDI) for communication with other business and customers. Selected abattoirs have their own local area network (LAN), have bar code reading (BCR) systems and employ RRFID system as part of NLIS requirements.

6.1 Information Technology and Communication

Obtained data (Table 1) shows that IT system employed by the firms help to reduce telephone calls and face-to-face communication but considerably reduce letters and faxes (rating of 6.3 and 6.1, respectively). However the management of the firms does not believe that IT employed by their organisations enables the growth of their businesses during the last 12 months in term of market share and profit (rating 3.5 and 3.9, respectively). IT systems employed by abattoirs considerably facilitate transactions with customers (rating 6.1) but not with government organisations (rating 3.9). Data shows that firms are reluctant to exchange information regarding their marketing plans (rating 4.1) but are reasonably willing to exchange information regarding

Table 1: Abattoirs' perception regarding the performance of their information technology and communication systems.

FACTOR	PERCEPTION	
	Average	STDIV*
Communication Type: <i>IT employed by our organisation considerably reduces the following communication type:</i>		
Letters	6.3	0.70
Telephone calls	5.0	0.87
Faxes	6.1	0.78
Face to face communication	5.1	0.78
Transactions: <i>IT employed by our organisation considerably facilitate transactions with:</i>		
Customers	6.1	0.33
Suppliers	4.9	1.45
Government	3.9	1.05
Business volume: <i>IT enables the growth of our organisation during the last 12 months in term of:</i>		
Market share	3.5	1.01
Profit	3.8	0.97
Innovation	4.9	1.27
Information System: <i>We are keen to have and update our information system to be compatible with that of our:</i>		
Competitor	3.1	0.78
Partners (customers / suppliers)	3.8	1.09
Information Exchange: <i>We regularly exchange information with our partner in relation to:</i>		
Production plans	5.3	0.71
Marketing plans	4.1	1.27
Customer demand forecasts	5.6	0.53
Sales	5.7	0.50
Timely Information access: <i>We share in real time Point-of-Sale (POS) information with our:.</i>		
Customers	3.1	1.27
Suppliers	4.9	0.78
Information gathering: <i>We gather all necessary information that can be used to develop our:</i>		
Strategic plan	4.2	0.44
Operation plan	5.2	0.67
Day-to-day action	5.2	0.67
Record: <i>We have error-free electronic records</i>	4.1	0.78

* STDDIV is a reference to standard deviation.

sales, customer demand forecasts and production plans (rating 5.7, 5.6 and 5.3, respectively). Abattoirs use Internet and web facility to collect information that help them to formulate their operational plans as well as day-to-day actions (rating 5.2). However, they are less enthusiastic to use IT facilities for collecting information for the purpose of formulating their strategic plans (rating 4.2).

Results indicate that abattoirs are open to share point-of-sale (POS) information with their suppliers (rating = 4.9) but with much less extend with their customers (rating = 3.1). In

general, abattoirs believe that their electronic records are not error-free records.

6.2 Trust Issues

Table 2 illustrates the expected importance of factors affecting trust. Table 2 considers only factors whose average weighting of importance are more than 5 (out of 7). In addition, the table illustrates the average weighting for perceived performance of abattoirs' suppliers and abattoirs'

customers. The number of factors have average importance weighting exceed 5 are 14 factors out of 20 factors. The meat processor firms (abattoirs) strongly agree that the following factors are extremely important and critical (Table 2):

- Partner's willingness to customise their product / services (Importance rating 6.6), and;
- The accuracy of predicting the partner's performance (importance rating 6.4).

In general, the firms consider that their agreements with suppliers and customers are fairly detailed. They also believe that the performance of their suppliers and customers is up to the firm's expectation in relation to safety and quality requirements. However, the films judge that their customers are less adaptive to their expectations and are more opportunism than their supplier. The behaviour of customers (rating 4.3) is much less predictable than that of suppliers

(rating 6.2). Customers are reluctant to customise their products / services (rating 3.7) to the expectation of the firms. In regard to maintaining relationships, the firms show that their suppliers commit to maintain the relationships with them (rating 6.2) more than their expectation (rating 5.6). The knowledge and skills play a considerable role in the selection of the partners, but firms rely more in the advice of their suppliers (rating 5.4). Firms perceive that their customers may breach agreements to their benefits (rating 3.1) much more than the suppliers (rating 5.8). In addition, customers aggregate needs or alter facts to get what they desire (rating 3.5). Firms perceive that their suppliers may not breach agreements to their benefits (rating 5.8). This is not the case with their customers (rating 3.1). In addition, abattoirs believe that their suppliers' performance is predictable (rating 6.2) and match their expectation (rating 6.4).

Table 2: Rating of some trust's factors.

Dimension	Factor	Importance	Performance	
			Supplier	Customer
Contractual Trust	Agreement with our partners are well-detailed agreements	5.3	5.1	5.1
Contractual Trust	We are confident that our partner carries out work at the time they agreed to do it.	5.8	5.6	5.2
Contractual Trust	We are confident that our partner provides services with the standard and performance as agreed.	6.2	6	5.8
Competence Trust	The knowledge and skill of the partner in deriving the agreement	5.3	5	4.7
Competence Trust	We are confident that our partners follow precisely safety and quality standard requirements	6.3	6.1	6.1
Goodwill Trust	Our partners always try to inform us if problems occur	5.2	5.8	4.6
Goodwill Trust	The reliance on the advice of the partner	5.6	5.4	3.8
Benevolence	The partner satisfies needs and expectations of the firm.	6.2	6	3.9
Benevolence	Partners commit to maintain and develop relationships with us	5.6	6.2	4.6
Adaptability	Partners' willingness to customise their products / services for us.	6.6	6	3.7
Adaptability	Partner's willingness to invest in resources dedicated to consolidate the relationship with us	6	5.9	3.3
Opportunism	Partners do not breach agreements to their benefits	6.2	5.8	3.1
Opportunism	Partners do not exaggerate needs or alter facts to get what they desire.	6.1	6	3.5
Behaviour	Partner's performance can be accurately predicted	6.4	6.2	4.3

7. CONCLUSION

Collaborative commerce (c-commerce) is an advanced form of e-business that enables a firm to collaborate with their stakeholders and build effective partnerships along their supply chain. This research considers two main conditions of c-commerce, namely, information technology and trust. It studies the effect of these drivers on the Australian meat supply chain. The research employs multiple-case study approach and considers the perspective of meat processors. Abattoirs form the central interface between various entities of the meat supply chain. Senior managers of nine meat processors (abattoirs) have been interviewed. Semi-structured interviews were conducted based on a questionnaire with two sections.

The first section deals with interviewee's opinions regarding the performance of ICT systems implemented in their organisations. The second section deals with factors affecting trust.

Results show that ICT helps to reduce telephone calls and face-to-face communication and considerably reduces letters and faxes. However, firms do not believe that ICT enables the growth of their businesses or facilitate transactions with government.

Results indicate that abattoirs share point-of-sale (POS) information mainly with their suppliers. The firms believe that their customers are less adaptive to their expectations and are more opportunistic than their suppliers. The behaviour of customers is much less predictable than that of suppliers. In regard to maintaining relationships, the firms judge that their suppliers' commitment to maintaining the relationships with them match their expectation.

ACKNOWLEDGEMENT

The author thanks anonymous referees for their constructive suggestions and reports. This research was supported by the Faculty of Business at the University of Queensland, Australia under the grant number 1000851. The author also extends his thanks to Dr Maguire and Ms Roberts for their comments on an earlier version of this paper.

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AUTHOR BIOGRAPHY

Latif Al-Hakim is a senior lecturer of management in the Department of Economics and Resources Management - Faculty of Business at the University of Southern Queensland, Australia. Latif received his first degree in Mechanical Engineering from Basrah University in 1968. His MSc (1977) in Industrial Engineering and PhD (1983) in Management Science were awarded from University of Wales (UK). Dr Hakim has published extensively in information management and systems modelling. He is the editor of the *International Journal of Information Quality* and associate editor of the *International Journal of Networking and Virtual Organisation*. His email address is hakim@usq.edu.au.