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Recommended Citation

Uddin, Mohammad Nasir; Quaddus, Mohammed; and Islam, Nazrul, "Knowledge Asset and Inter-Organizational Relationship in the Performance of Australian Beef Supply Chain" (2010). *PACIS 2010 Proceedings*. 21.

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KNOWLEDGE ASSET AND INTER-ORGANIZATIONAL RELATIONSHIP IN THE PERFORMANCE OF AUSTRALIAN BEEF SUPPLY CHAIN

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Abstract

Supply Chain Management has become a strategic issue in firm's success where Knowledge Asset and inter-organizational system can play a substantial role. Given that Australian beef industry is production pushed and lags behind in productivity improvement, this research was carried out to study if knowledge Asset Management (KAM) and inter-organizational relationship structure in supply chain (SC) have any impact on the performance of Australian beef industry leading into improving the competitiveness of the industry. We utilize concepts from organizational theories and marketing literature in agribusiness to develop the formative/reflective constructs, their measurement scales, and then use partial least squares (PLS) based structural equation modeling (SEM) to test our hypotheses. Data were collected through a telephone survey of a total of 315 firms including input suppliers, producers, processors, and retailers in the beef industry of Western Australia and Queensland. The PLS analysis reveals that 'KAM, is the strongest predictor of SC performance, followed by 'transaction climate' and vertical coordination among the chain members. Result also shows that SC performance strongly influences the 'competitiveness' of the industry as a whole. Thus this study identifies significant strategic supply chain factors, which will enable the stakeholders to do appropriate planning and benchmarking to improve performance of Australian beef industry.

Key words: Knowledge Asset Management, Inter-organizational Relationship, Supply Chain, Beef Industry.

1 INTRODUCTION

Performance evaluation of supply chain(SC) has been a major research issue in the contemporary management literature as companies are increasingly relying on the system efficiency of SC as a source of competitive advantage (Cohen & Roussel, 2005; Gunasekaran *et al.*, 2001). Since the main objective of managing a SC is to increase the value of products and services, Supply Chain Management (SCM) has become a strategic weapon in firm's success that can result in significant cost savings emanating from quick sourcing and upgrading a product, lower inventory and inter-firm transaction cost. The value created from SCM can be enhanced by improving the strategic issues of developing and governing the supply chain in a firm.

The SCM of agri-food industry, more specifically the beef industry, relates to all the linkage from the primary producers to the final consumers such as Producers, feedlotters, slaughterers, processors, wholesalers and retailers. While the chain is involved with high risk and uncertainty due to the intrinsic and extrinsic quality requirements from the consumers, recent study by Meat and Livestock Australia revealed that cost competitiveness and market development issues in supply chain are the major factors for a long term decline of the Australian beef industry (MLA, 2008). Supply chains in Australian beef industry have been based on market arrangements, operations are production pushed, and are often adversarial for which producers do not gain any insight of their customers as they are isolated from rest of the food chain. Likewise, processors are also lacking innovative initiatives to develop a product and the business with the producers while a low trust environment between the two often exists (O'Keefe, 1998; WY associates, 2009). Studies found that these are the key issues that are affecting the performance, competitiveness, and success of the industry highlighting the need of improved knowledge flow and relationship structure in the whole of supply chain participants (Jie *et al.* 2007, O'keeffe, 1998; Uddin *et al.* 2009)

Drawing on the above issues, the motivation of the study was to carry out a survey to test the hypothesis that managing strategic knowledge asset and relationship structure in SC have impact on the performance of Australian beef industry and thus have impact on the competitiveness of the industry. Therefore, the specific objectives were to –i) explore the impact of existing knowledge asset management(KAM) and inter-organizational system(IOS) on Australian beef supply chain performance, ii) discover the impact of associated inter-organizational relationship structure on SC performance, and finally iii) discover how SC performance can influence the competitiveness of the industry.

In this study, we utilize concepts from the resource based/knowledge based view, supply chain management, and marketing literature in agribusiness to develop the constructs and measurement scales, and then use partial least squares (PLS) to test our hypotheses. Thus, the findings of the study can provide extremely important information for appropriate planning and benchmarking of the critical issues in supply chain for a better profitability and performance of the industry. The next section presents the background theories and hypothesis. The research model and methodologies are then discussed followed by the results of the study. Finally, the study concludes with the implications of the results.

2 BACKGROUND THEORIES AND HYPOTHESES

2.1 KAM and IOS as Strategic Resource in SC Performance

Organizational and economic theories have emerged to explain why some firms successfully create core competencies and capabilities and thus improve their performances and competitiveness. Literature focused that knowledge creation, knowledge transfer, firm level learning, and other similar approaches are at the heart of gaining sustained competitive advantage(Bogner & Bansal, 2007; Grant,1996). Firms can pursue two aspects of knowledge capital: the resource of knowledge and the process of knowing, which can be well explained by the complementary underpinning of resource

focused resource-based view(Barney, 1991; Wernerfelt,1984) and process focused knowledge-based view(Grant, 1996).

Resource based view(RBV) argues that all resources and capabilities of firm that are simultaneously unique, rare, imperfectly imitable (costly or impossible to imitate) and non-substitutable (strategically equivalent substitute is unavailable) lay foundation for competitive advantage and superior performance (Barney, 1991). For example, based on the historical experience on inter-firm production management, contracts, investment, and associated tools and technologies in SC, a firm can develop a knowledge base or a knowledge management technique customizing its inter-organizational transaction processes that may help them to reduce inventory and procurement cost. Knowledge asset created in this fashion can be a strategic resource that are not readily available to competitors, not quickly imitable and substitutable, and may enhance supply chain efficiencies and outcomes compared to other competitors. Building on the same notion of RBV, Knowledge based view (KBV) focuses on the role of knowledge as an asset and capability, and argues that the unique abilities to learn and exploit knowledge from cooperative efforts enhance organizational innovations, outcomes, and thus sustained competitive advantage (Hult et al. 2006; Grant, 1996). Researchers again have extended RBV/KBV highlighting dynamic capabilities of knowledge creation/application processes in rapidly changing markets such as in supply chain where building and integrating cutting-edge knowledge is essential for effective strategy and performance (Eisenhardt and Martin, 2000; Bueno et al. 2008).

Studies agreed that the use of IOS such as Electronic data interchange (EDI), Web-based procurement system, electronic trading system, or supplier relationship management system can enhance coordination of the supply chain members, enhance knowledge transfer and sharing, and thus reduce inter-firm transaction cost (contact, control, and monitoring cost), and improve speediness, responsiveness, and performance of firm (Premkumar, 2000; Saeed et al. 2005).IOS differ from KAM in that it provides link among the sources of knowledge to create wider breadth and depth of knowledge flows (Alavi & Leidner, 2001).There is always a major pushing, from the stakeholders to the companies to synchronize their supply chain for an information and knowledge chain for optimizing the demand plan, flow of product, and inventory cost in the chain (Proactive Communication, 1996). Hence, by using IOS companies are increasingly integrating their physical chain (producers, manufacturer, wholesalers and retailers) with a knowledge chain for better performance and competitiveness. It is important to note the difference between KM and IOS where

Drawing on the above discussion, this study argues that the dynamic capabilities of acquiring and exploiting new knowledge in supply chain and the ability of using IOS for integrating the transaction partners in an information and knowledge chain can influence the firm performance and competitiveness over other firms lacking such resources. Therefore this study hypothesizes that:

H1: 'KAM' has a positive influence in the 'SC Performance' of Australian Beef Industry

H2: 'IOS Use' has a positive influence in the 'SC Performance' of Australian Beef Industry

2.2 Relationship Structure as Strategic Resource in SC Performance

Transaction cost economics (TCE) is the most widely used theoretical lens for analyzing the development and impact of governance and relationship structure in food supply chain (den Ouden et al. 1996; Hobbs, 2000; Sculze et al. 2006), even though it was initiated in an economic background. According to TCE, in buyer-supplier dyads, governance structure is related to the choice of a particular transactional and relational mechanism such as a formal contract or bilateral investment that influences the inter-firm transaction process (Bijman 2006; Liu et al. 2009). The process always involves with some common cost such as i) costs of searching information on potential buyers or sellers, product prices, etc.; ii) costs of negotiating physical act of transaction such as writing contracts, hiring lawyers, investment in machineries, intermediary auctioneers, etc.; and iii) costs of monitoring or enforcing pre-agreed terms of transaction such as ensuring quality of goods, behavior of the parties, etc. These costs may increase depending on the information asymmetry, bounded

rationality (decision making under partial information) and opportunistic behavior between partners in transactional relationship. TCE posits that governance structure and relational mechanism are derived from economic rationality such as when transaction costs of using spot or open market system rise, it is efficient to carry out the transaction by a strategic alliance through contracting or by vertically integrating the firms (Hobbs, 1996; Williamson, 1975).

Based on the work of Williamson, studies suggest that the method of vertical coordination (VC) may range from spot market, specification contracts, relation-based alliances, equity-based alliances, and vertical integration. But studies believe that stricter vertical coordination in agri-food chains, specifically in meat industry, is crucial for better product and information flow, better performance and competitiveness. Because, it provides a better way of contact, control, and contracting cost in the supply chain by addressing the issues of growing quality requirement, food safety, and other difficult-to-detect attributes of food products. (Duffy and Fearn, 2004; Hobbs, 2000; Sculze et al. 2006).

Resource Based View (RBV), on the other hand, provides a potential strategy framework to develop the relationship structure, as an intangible and non-tradable asset that is difficult to imitate, for a sustained competitive advantage (Barney, 1991; Wernerfelt, 1984). Studies argued that the sentiments or relational norms, i.e. transaction climate that exist in buyer –supplier relationship such as the compatibility in goals, commitment, and fairness in sharing the risks, benefit, and burden equally in the relationship reduce opportunistic behavior and increase cooperation that in turn increase performance in the supply chain (Clare et al. 2005; Duffy & Fearn, 2004; Nidumolu, 1995). The concept 'transaction climate' is originally introduced by Reve and Stern (1976) to describe the sentiments exist between the parties making transaction.

Thus, a well structured governance mechanism and transactional norms can nourish the cooperation in buyer-supplier relationship (Dyer & Chu, 2000; Duffy & Fearn, 2004). This relationships can enable firms to accumulate organizational capital resources such as increased information sharing and reduced opportunistic behavior that may lead to develop rare, valuable, hard to imitate, and non-substitutable asset for a competitive advantage and sustained firm performance. Based on the above discussion, following hypotheses are developed:

H3: Degree of Vertical coordination will positively influence the SC performance of Australian beef industry

H4: 'Transaction Climate' will positively influence SC performance of Australian beef industry

2.3 Competitiveness through SC Performance

Competitiveness refers to the capabilities that allow an organization to differentiate itself from its competitors & is an outcome of critical management decisions (Jie et al. 2007; Tracey *et al.* 1999). Recent studies focused that firms actually achieve competitive advantage by leveraging the management of their supply chains (Fearn, 2008; Ketchen and Hult, 2007). The seminal work of Porter (1985) formed the basis for the development of supply chain enablers and their ties to firm performance and competitive advantage. While Porter focused on improving the activities of value chain, i.e. the value a firm is able to create for buyers that exceeds the firm's cost of creating it, is a source of competitive advantage; other studies (Proactive communication, 1996; Lee, 2002; Ketchen & Hult, 2007) argued that performance improvement in supply chain provides competitiveness of the industry as a whole.

In respect to the high uncertainty in the food industries for the higher demand of quality, freshness, and value of the money that consumer spend, food industries are developing their strategies stemmed by the performance of supply chain to increase competitiveness. Studies revealed that the participants from the upstream to downstream industries in SC have their own competitive and marketing strategy to keep them viable in the business, such as producers are diversifying their products, developing alternative marketing strategy to increase their competitiveness and profitability in the food chain (Uddin et al. 2008)

Cost efficiency is one of the most highlighted challenges in firms, for which, they are increasingly emphasizing on rapid delivery service performance, reducing distribution steps and lead times, with a highly effective logistic system; and thus getting competitiveness in fulfilling customers and consumer demands with the availability (product) and convenience(cost and time) they want (Lee, 2002; Proactive communication, 1996). As a result, the supply chain performance of food industries, for its association with perishability and high uncertainty of supply/demand, is highly important to gain competitiveness. Based on the discussion the following hypothesis is developed:

H5: 'SC performance' in Australian beef supply chain will positively influence 'Competitiveness' of the Australian beef industry.

3 OPERATIONAL MODEL AND RESEARCH METHOD

3.1 The Research Model:

The operational model is designed according to the hypotheses, which are developed and tested using the partial least square (PLS) based structural equation modeling (Hair, et al. 1998). Figure 1 represents the latent variables and the hypothesized structural relationship between the predictor and predicting variables. The factors 'Knowledge Asset Management (KAM)', 'IOS Use', 'Vertical Coordination', and 'Transaction Climate' are designed as exogenous variables that influence the 'SC Performance'. While the emanating paths from 'SC Performance' are designed as a predictor of

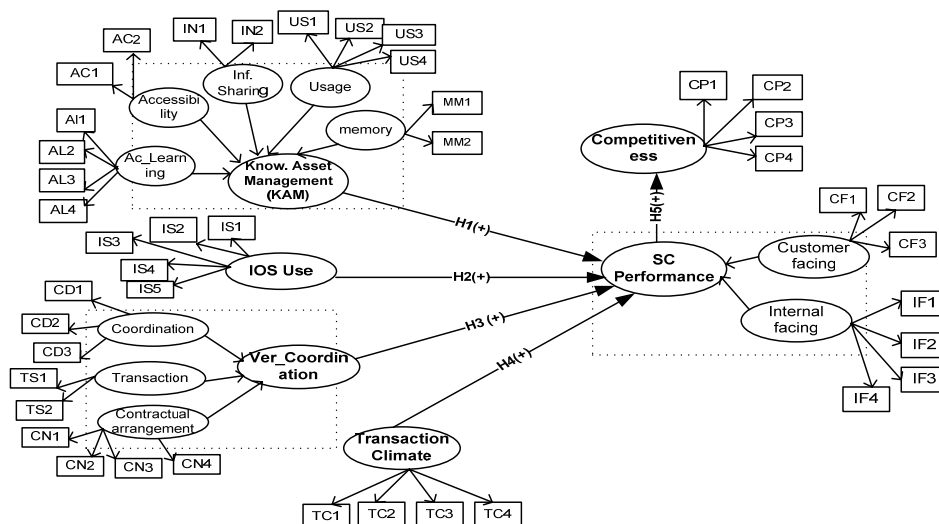


Figure 1: The research model showing the structural relationship and the measurement items

the 'Competitiveness' of firm. At the construct level, there are three 2nd order multidimensional latent construct named as 'KAM', 'Vertical Coordination', and 'SC performance' modeled as being caused by first order latent variables or sub-constructs. A second order construct/factor is modeled as being at a higher level of abstraction, which is essentially created by using all the indicators from first order factors(Chin,1998a).

While the model operationalization relied primarily on reflective measures (the items are caused or driven by the construct), formative measures (the items cause or define the construct) are used for all the 2nd order constructs as they are composed of indicators with different dimension. Formative constructs are formed by several indicators representing different independent phenomenon (Chin,1998b).Except the three 2nd order factors, all first order and other latent variables in the research model are relied on reflective multi item scales most of which are derived from previous studies. Table 1 presents the definitions of constructs including second-order constructs and their sub-constructs in the study.

Construct	Definition
KAM	
Refers to the dynamic ability of creating and utilizing knowledge Asset in supply chain. Based on RBV/KBV, and the work of Hult et al. (2006), Ketchen & Hult et al. (2007), following five KAM dimensions are used.	
Acquisition & Learning	Ability to build SC knowledge from experience, expertise, and existing data source
Memory	Acquired and stored level of knowledge/familiarity on SC transactions
Accessibility	Ease of retrieving, accessing, transferring Knowledge asset among SC partners
Information Sharing	Distribution and shared understanding of available SC information
Knowledge use	Application of knowledge in solving particular problem
IOS Use	
The volume, depth (degree of interpenetration), and diversity (number of transactions) of using an electronic system for communicating or exchanging data with partners in supply chain(Premkumar, 2000)	
Vertical Coordination	
Organization of a supply chain where each successive stage in the production, processing, and marketing of a product is appropriately managed and interrelated. Based on TCE, and the work of Hobbs and Young (2000) and Schulze et al. (2006), we conceptualize VC using following three imensions:	
Coordination of work	Degree of coordination in terms of asset specificity, sales date, and delivery in SC
Formaliz. of Transaction	Degree to which interorganizational activities are governed by rules, procedures, and policies
Contractual Arrangement	Degree to which specific and detailed conditions of exchange are specified
Transaction Climate	
The sentiments or the behavioral factors that exist in buyer –supplier relationship. TC is conceptualized in terms of Goal Compatibility, Mutual understanding, Commitment, and Symmetry in inter-firm relationship (Bensaou, 1997; O’Keeffe, 1998; Duffy and Fearnle, 2004; Nidumolu, 1995)	
SC performance	
The outcome from a coordinated knowledge and relational mechanism in SC in the form of SC reliability, responsiveness, quality, cost and Asset (Supply Chain Council, 2004; Gunasekaran <i>et al.</i> , 2004). SC Perf. is operationalized using following two dimensions	
Customer-facing	Degree to which the responsiveness and reliability of firm to its customers is fulfilled in terms of order deliveries and related queries on time.
Internal-Facing	Degree to which the firm improve its service/product quality, cost structure, and return from the assets
Competitiveness	
The capabilities that allow an organization to differentiate itself from its competitors such as Cost efficiency, Productivity, marketing, and innovation (Porter, 1985, Han et al. 2007; Tracey <i>et al.</i> 1999)	

Table 1: Definition of the constructs and sub-constructs used in the study

3.2 Survey Procedure and Sample

The survey instrument including the set of questionnaire, measurement scales, and logic of the questions against each of the constructs were reviewed by four professional people having long experience of researching in the agricultural industry value chain. The questionnaire was then pretested by three people working in the meat industry. Rephrasing, reordering, and even omitting of some of the similar items were made based on the feedback.

Data were collected through telephone survey by contracting a professional survey centre. In our survey a seven point likert scale ranging from “strongly disagree to “strongly agree and “Never to Always” was used without mentioning any mid point as study found more lower scores and fewer higher scores in telephone survey in Australia when a mid point was mentioned (Dawes, 2001).The sample respondents were categorized as beef-cattle producers, processors, retailers/exporters, wholesalers and input suppliers. A minimum of 30 and a maximum of 100 responses were targeted

for each of the three main categories of producers, processors and retailers firms (one response per firm with the person holding higher position) in each of the two states of Western Australia (WA) and Queensland (QLD).

A total of 315 responses from the beef industries of WA and QLD in Australia were eventually obtained. The responses showed that majorities (43.2 percent) of the firms are producers, which is expected as processors (28.9 %) and retailers (21.9%) were difficult to get because of their busy environment and reluctance to participate. The firms are characterized as SME as 79.6% of them have \$1-\$5 million of yearly average revenue whereas only 10.2 % have more than \$20 million of revenue. In agriculture, SME is defined by the estimated value of agricultural operation (EVAO) between \$22,500-\$400,000(ABS, 2002). In terms of the growth 32.7 % characterized them as growing, 31.1 % as established and trying to get bigger, 15.2 % identified as matured; while 12.1 % said that they are just surviving in the business.

3.3 Data Analysis Using PLS

We use partial least squares (PLS), a confirmatory second-generation multivariate analysis tool, to test the hypotheses as opposed to covariance based approach (such as LISREL, EQS, AMOS) because of its ability to model latent construct under conditions of non-normality, ability to handle both formative and reflective measures, and the ability to deal with small to medium sample size (Chin, 1998b). As a components-based structural equations modeling technique, PLS is similar to regression but simultaneously models the structural paths (i.e., theoretical relationships among latent variables) and measurement paths (i.e., relationships between a latent variable and its indicators). Unlike LISREL, it tests the strength of individual component relationships to show the significance of individual paths rather than the overall fit of a proposed model to observed covariance amongst all of the variables (Johnston & McCutcheon et al. 2004). PLS supports variance analysis (R^2) and is generally recommended for predictive or exploratory research. It calculates and shows the output of all the indirect and direct effect to establish the relative importance of antecedent constructs.

4 RESULTS

The two required steps for data analysis in PLS were conducted using PLS-Graph version 3.0. It involved (i) assessment of the measurement model describing the relationship between latent constructs and their manifest indicators, and (ii) assessment of the structural model describing the hypothesized relationship between latent construct(Barclay et al. 1995; Santosa et al. 2005). Bootstrap or Jackknife (Fornell and Barclay, 1983) output can be used for the analysis and assessment of both the measurement and structural part. This study used Bootstrapping to obtain the path coefficient and its t-value to test the hypotheses.

4.1 Assessment of the Measurement Model

In our model all the reflective constructs used multiple-items measure that had to be tested for reliability. To check whether the measurement items appropriately reflect a construct, the convergent validity of latent construct in PLS is assessed by 1) the reliability of individual item that make up the measure, 2) the composite reliability or internal consistency of the item as a group (comparable to cronbach's α), and 3) the discriminant validity which is the average variance extracted (AVE) from the constructs by each of the items (Barclay et al. 1995; Fornell & Larcker, 1981).

The individual item reliability is assessed by examining the loading or simple correlations of the measures with their respective construct. The initial model was first tested using 43 observed variables. A minimum value of 0.6 was used to accept the reliability of individual items (Hair et al. 1998).The results of the initial model showed that TC4, CD2, TS1, and IF2 had loading less than 0.6.Thus they were removed from further analysis to improve the item reliability. Table 2 shows the individual item reliability after the removal. The only exception is the item IOS3 with a loading of

0.54. The loading is not so low; besides, the researchers found it is important to keep the item for the characteristics of the construct.

Construct & Items	Loading	CR	AVE	Construct & Items	Loading	CR	AVE
Transaction Climate (TC)		0.832	0.561	Accessibility(AC)		0.912	0.828
TC1	0.8			AC1	0.92		
TC2	0.83			AC2	0.91		
TC3	0.8			Memory(MM)		0.889	0.8
IOS Use (IOS)		0.917	0.554	MM1	0.9		
IOS1	0.85			MM2	0.89		
IOS2	0.78			Information sharing (IS)		0.834	0.715
IOS3	0.54			IS1	0.84		
IOS4	0.72			IS2	0.85		
IOS5	0.67			Usage		0.898	0.687
VC*	N/A	N/A	N/A	US1	0.84		
Coordination of work (CD)		0.774	0.633	US2	0.86		
CD1	0.86			US3	0.77		
CD3	0.73			US4	0.84		
Formaliz. of Transaction(TS)		0.737	0.584	SC Performance*	N/A	N/A	N/A
TS2	0.73			Customer Facting (CF)		0.886	0.722
TS3	0.78			CF1	0.86		
Contr Arrang.(CA)		0.892	0.734	CF2	0.86		
CT1	0.86			CF3	0.83		
CT2	0.89			Internal-Facing (IF)		0.754	0.508
CT3	0.82			IF1	0.76		
KAM*	N/A	N/A	N/A	IF3	0.6		
				IF4	0.77		
Aquisition & Learning (AL)		0.881	0.649	Comptitiveness (CPTV)		0.876	0.639
AL1	0.71			CPT1	0.78		
AL2	0.82			CPT2	0.81		
AL3	0.84			CPT3	0.78		
AL4	0.85			CPT4	0.82		

*2nd order formative construct, therefore values are not applicable, CR=Composite Reliability

Table 2. Convergent validity checks for reflective constructs

Composite reliability assesses the inter-item consistency following the procedure of Fornell and Larcker (1981) where the cut-off point is normally 0.7. Table 2 shows all latent variables have acceptable internal consistencies above 0.7. The third standard of reliability is that AVE from the construct by the items should exceed 0.5, meaning that the items, on an average, share at least half of their variance with the construct (Barclay, 1995). Table 2 shows that all constructs performed acceptably on this standard.

Discriminant validity indicates the extent to which a given construct is different from other constructs and addresses the potential problem of having measures for one construct overlap the conceptual territory of another construct. For adequate discriminant validity PLS requires that a construct should share more variance with its measures than it shares with other construct in the model, i.e. the latent construct should be demonstrably closer to its measurement items than to any other construct (Barclay et al. 1995; Johnston et al. 2004). In PLS, it is tested using the procedure of Fornell and Larcker (1981) which compares the square root of AVE (Average Variance Extracted) with the correlation of that construct with all other constructs. The diagonal of table 3 shows the square root of AVE where the off-diagonal elements are the correlations among latent variables. For adequate discriminant validity square root of AVE should be significantly greater than the off-diagonal elements in the corresponding rows and columns. Again table 3 shows all the variables demonstrates acceptable performance on this basis.

4.2 The Structural Model and Test of Hypothesis

The PLS results of the structural part are shown in figure 2. The coefficient of each hypothesized path and its corresponding t-value obtained from 100-sample bootstrap procedure in PLS are also shown in

table 4. It reveals that all of the paths, except IOS use effect on SC performance, have significant loading (standardized β 's) and t-values. Thus it provides support for the hypotheses H1, H3, H4, and H5 at $P < 0.000$ and $P < 0.001$ level. The nomological validity or the explanatory power of the model can be assessed by R^2 of the endogenous construct, which should be at least 0.10 for an acceptable standard (Falk & Miller, 1992). Figure 2 shows that 26 percent variance in SC performance and 37 percent variance in competitiveness was explained giving a substantial nomological validity of the model when a large number of factors could impact both SC performance and competitiveness of the industry.

	TC	IOS	CPV	AL	AC	MM	IS	US	CD	TS	CA	CF	IF
Trns. Clim (TC)	0.75												
IOS Use (IOS)	0.39	0.74											
Competiveness(CPV)	0.43	0.34	0.80										
Acquis & learn (AL)	0.35	0.43	0.45	0.81									
Accessibility (AC)	0.40	0.32	0.35	0.37	0.91								
Memory (MM)	0.50	0.45	0.49	0.56	0.49	0.89							
Information Sharing(IS)	0.40	0.43	0.41	0.59	0.40	0.49	0.85						
Usage (US)	0.46	0.46	0.47	0.64	0.52	0.67	0.60	0.83					
Coord of Work (CD)	0.39	0.27	0.44	0.33	0.30	0.35	0.41	0.39	0.80				
Forml. of Trans(TS)	0.21	0.24	0.19	0.19	0.09	0.12	0.22	0.14	0.28	0.76			
Contr Arrng (CA)	0.18	0.20	0.14	0.18	0.05	0.08	0.18	0.06	0.22	0.74	0.85		
Custm-Fac (CF)	0.25	0.20	0.47	0.28	0.29	0.38	0.27	0.34	0.30	0.20	0.12	0.85	
Internal-Facing (IF)	0.30	0.22	0.61	0.31	0.27	0.35	0.28	0.30	0.35	0.20	0.19	0.61	0.71

Table 3: Correlation matrix for discriminant validity check for latent constructs

5 DISCUSSION

A number of observations can be made from the results. First, the result of the study supports both the direction of theoretical underpinning from RBV/KBV and TCE in agri-food industry that Knowledge Asset Management and Inter-Organizational Relationship Structure can be considered as value creating strategic/economic resource and can contribute to firm performance and competitiveness. The findings reveal that KAM has a strong positive effect on SC performance in the beef industry(H1), which is very consistent with the insight of RBV/KBV. Knowledge can serve as intangible strategic resources as the capacity of learning, accessibility, and exploitation of knowledge through cooperative efforts in supply chain, especially in the process of production and marketing, enhance organizational innovations, outcomes, and sustained firm performance. For example, the survey found that processing and retailing companies generate knowledge from their internal sales data to learn more about the markets and their customers as it affects everything down the lines, production and logistics, and purchasing of the inputs. In a contractual relationship, such as in a production contract these companies share their knowledge with upstream producers to align the production according to the market needs.

Hypothesis	Path	Path coefficient(β)	t-value	Outcome
H1	KAM \rightarrow SC Perf.	0.310	5.189***	Supported
H2	IOS Use \rightarrow SC Perf.	0.053	1.035	Not supported
H3	Vert. Coord. \rightarrow SC Perf.	0.174	3.276**	Supported
H4	Trns. Clim. \rightarrow SC Perf.	0.216	3.084*	Supported
H5	SC Perf. \rightarrow Competitiveness	0.616	15.345***	Supported

*** $p < 0.000$ ** $p < 0.001$, * $p < 0.005$ (Two Tailed). R^2 for SC performance = 0.268, R^2 for Competitiveness = 0.379

Table 4: Test of hypotheses

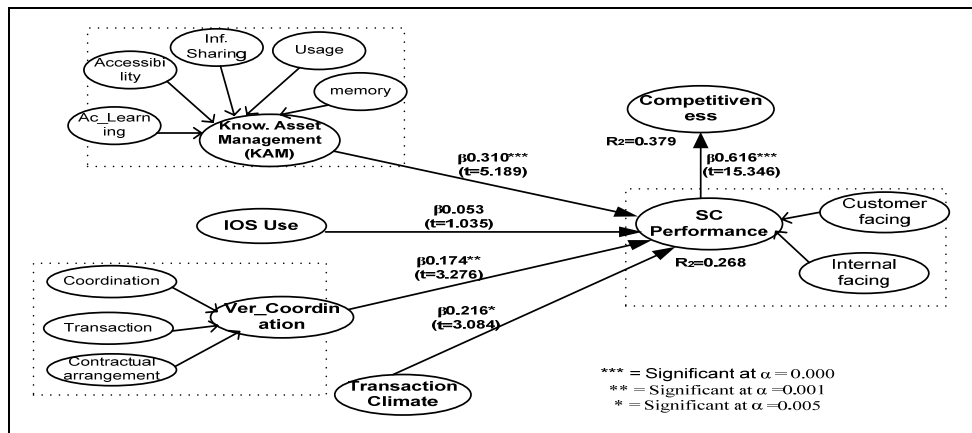


Fig. 2. The model with path loading and corresponding t values.

The findings also demonstrate that vertical coordination (H3) and transaction climate (H4) of the SC relationship have significant positive impact on SC performance, which are inline with the notion of RBV and TCE. It indicates that the structure of inter-firm relationship, specifically the forward and backward integration of beef-meat chain with mutual understanding and commitment can contribute to sustained firm performance. For example, the survey found that the major players in beef retailing and exporting in Australia developed their supply chain based on the contracted growers, and with the brokers on top of that. This sort of vertical coordination give them the flexibility and confidence to source product sometimes with only three days of demand forecast, just before three days they need the product. Structure and understanding in relationship like this has immense impact on maintaining their carcass requirement and specific cut of the meat by eliminating extra cost of transaction with new suppliers as well as the cost of maintaining excessive stocks in store. A good relationship down the supply chain also benefit the growers in setting their cost structure, optimizing market choices, and improving returns for their farms.

Second, the result shows that 'KAM' is the strongest predictor (β 0.310) of SC performance, followed by transaction climate (β 0.216), and vertical Coordination (β 0.174). This finding is expected and inline with the literature on SC performance areas that shows supply chain requires continuous information and knowledge sharing activities to maintain its strategic and operational outcomes (Hult et al. 2006; Ketchen & Hult, 2007). Our survey also found that Knowledge is an important source of chain coordination, chain functioning, and innovation from upstream to downstream production and marketing by driving down many unexpected frictions in the relationship (Hult et al. 2006). For example, the guidelines and feedback that the beef producers receive from their abattoirs for each of the cattle they send for processing help to mitigate the issues in carcass weight and price. Similarly, the market intelligence that the processing companies collect helps to bargain with their mighty buyers to gain strategic focus on sales and profit. Thus, the creation and utilization of supply chain knowledge by combined efforts of the chain members can influence important outcomes. Therefore, the structure and cooperative efforts in supply chain should aim to meet a streamlined information and knowledge flow for a market driven supply chain that can provide a better cost effective mechanism in handling risk and uncertainties.

The non-significant relationship between the use of IOS and SC performance (H2) is counterintuitive. However, may be it is because of the participation of large number of beef producers (43.2%) in the survey, who are significantly behind in using IOS (Uddin et al. 2008). Moreover, Australian beef industry can be characterized as SME as 79.6% of them have 1-5 million of yearly average revenue and have less use of advanced IOS system. At this stage, a revision to the model/theory can be considered for subsequent testing.

Finally, the unique contribution of this model is the evidence of SC performance link (H3) to industry competitiveness, which is supported by more than 37 percent of variance ($R^2=0.379$). As PLS calculate all of the indirect effects, in addition to the direct effect, to establish the relative importance of antecedents constructs; the total output of SC performance effect on Competitiveness reveals that competitive advantage lies in the system efficiencies and performance of supply chain. It also

demonstrate that the ability to learn, create, and exploit new knowledge, and the ability to create shared cooperative environment with a strong vertical coordination of the upstream chain members enhance supply chain performance and thus provides competitive advantage.

6 IMPLICATIONS

This study contributes significantly in both theory and application. On the theoretical side the study developed a reliable and valid model of Australian beef industry supply chain performance. The related hypotheses of which are tested using PLS. On the applied side the study identifies significant antecedents and consequences of SC performance in Australian beef industry supply chain, which are strategic and extremely important information for beef producers, processors, retailers, and other stakeholders for appropriate planning and benchmarking. The important practical implication is that firm should build their supply chain as a resource itself by developing their knowledge asset and cooperative relationship structure. A knowledge based transactional relationship will offer an economic and long lasting transactional relationship among the farmers/producers, processors, wholesalers, retailers and or other partners in supply chain. It will help to improve their on-firm innovation, to specify the contingencies of supply and demand related problems, and thus to improve performance and competitiveness.

7 CONCLUSION

This study presents the results of a survey carried out to test the hypothesis that knowledge asset management(KAM), and relationship structure in supply chain(SC) have impact on the performance of Australian beef industry and thus have impact on the competitiveness of the industry. We utilize concepts from organizational theories and marketing literature in agribusiness to develop the formative/reflective constructs, their measurement scales, and then use partial least squares (PLS) to test our hypotheses. PLS analysis showed that out of five hypotheses, four are supported by the data. The result reveals that 'KAM, is the strongest predictor of SC performance, followed by 'transaction climate' and vertical coordination among the chain members. Result also shows that SC performance strongly influences the 'competitiveness' of the industry as a whole. Thus, the implication of the study is that the structure and cooperative efforts in supply chain should aim to meet a streamlined information and knowledge flow for a market driven supply chain for better handling of risk and uncertainties, and therefore, the better profitability and performance.

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Acknowledgement

The study is a part of a PhD research “Impact of Knowledge Management and Inter-Organizational System on Supply Chain Performance: The Case of Australian Agri-Food Industry” jointly supported by the Curtin University of Technology and Department of Agriculture and Food, WA (DAFWA). The authors cordially thank the industry stakeholders who participated in the supports The support from the staffs of the DAFWA, especially from Stuart Clarke and John Connell is much appreciated.