

**Factors Affecting
Inter-Organisational Information Management Systems used to
Coordinate Australian Food Processor Chains**

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Abstract

It is agreed that good communication systems between organisations increase customer satisfaction and relationship behaviour and are important issues in chain collaboration and competition. However, less is known about the details of how information is used to manage relationships and coordinate customers and suppliers in chains. In earlier stages of the research, a dynamic model of inter-organisational information management systems (IOIMS) and relationships was developed. This paper presents an evaluation of this model based on a survey of Australian food processors and a green life industry case study and an evaluation of a revised version of this model. It was found that a strategic oriented IOIMS was positively associated with IOIMS satisfaction that was in turn positively associated with perceived current outcomes (satisfaction with performance, perceived responsiveness and strength of relationship trust). However, (attitudinal) commitment to develop long-term customer/supplier relationships was not significantly associated with the IOIMS, IOIMS satisfaction or current outcomes. Results were moderated by the nature of the business environment - power/dependency, experience and market uncertainty. These findings have been discussed along with implications for management and suggestions for future research.

Keywords:

Buyer & seller relationships, Inter-organisational information management systems, IOS, Theory testing, Partial least squares graph, Marketing, Strategic Intelligence IS, IS Models, Structural Modelling, IS Performance, Management Assessment of IS, Response Time, System Effectiveness, System Quality, User Information Satisfaction, User Satisfaction, MIS Design, Measuring IS Success, Business Strategy, Organizational Knowledge, Tacit Knowledge, Communication Systems, Executive Intelligence Systems, Human Information Systems, Information Systems, Interorganizational Systems, Management Information Systems – MIS,

INTRODUCTION

There is support for the idea that suppliers' efforts to assist communication increases customer satisfaction that in turn improves competitive advantage (Anderson & Narus, 1990; Keith, Jackson, & Crosby, 1990; Leuthesser & Kohli, 1995; Mohr, Fisher, & Nevin, 1996; Mohr & Nevin, 1990; Mohr & Sohi, 1995; Uzzi, 1997). However very little research has been conducted on how information is exchanged through chains of collaborating organisations to achieve this (chain – a vertical sequence of at least three organisations i.e. focal firm, a customer and a supplier). Of interest were studies that detailed how, when and why information was exchanged to manage customers and suppliers and to increase competitive advantage. The empirical studies found that quantitatively collected data from chains of organisations did not look in detail at how information systems worked (Clare, Shadbolt, & Reid, 2002; Hardman, Darroch, & Ortmann, 2002; Lehtinen & Torkko, 2004; Matanda & Schroder, 2002; Spekman, Kamauff, & Myhr, 1998). Most published chain research has been based on case studies where generalisation of results can be problematic (e.g. Champion & Fearné, 2002; Chatfield & Bjorn- Andersen, 1997; Kola, Latvala, & Vertanen, 2002; Korneliussen & Grønhaug, 2003; Lefebve, Cassivi, Lefebve, Léger, & Hadaya, 2003; Lindgreen, Trienekens, & Vellinga, 2004; Pratt, 2002; Simons, Francis, Bourlakis, & Fearné, 2003; Trienekens, 1999; Van der Vorst, 2000; Van Dorp, 2004). Even in the more substantial research into two organisations in a dyad (eg focal firm and customer), none were found that looked at information systems used to manage the relationship (e.g. Anderson & Weitz, 1992; Anderson & Narus, 1990; Clare et al., 2002; Claro, Zylbersztajn, & Omta, 2004; Ellram, 1995; Forker, Ruch, & Hershauer, 1999; Ganesan, 1994; Heather, 2001; Karalis & Vlachos, 2004; Korneliussen & Grønhaug, 2003; Lindgreen, 2001; McDermott, Lovatt, & Koslow, 2004; Miller, 2002; Sethuraman, Anderson, & Narus, 1988; Sparling & van Duren, 2002; Sweeney & Webb, 2002; Vlosky, Wilson, & Vlosky, 1997; Wilson & Vlosky, 1998). Some of these dyadic studies looked at the effect of implementing information communication technologies (Amanor-Boadu, Trienekens, & Willems, 2002; Wilson & Vlosky, 1998), obtaining information from buyers and suppliers (Claro et al., 2004) and information exchanged with buyers and sellers (Heather, 2001; Langton, 2004; Wilson, 2000). More dyadic studies were found that empirically evaluated associations between communication or information exchange and some of the factors that affect them as indicated qualitatively in the chain studies. For example the association with outcomes (Anderson & Narus, 1990), commitment (Anderson & Weitz, 1992), collaboration (Karalis & Vlachos, 2004; Siemieniuch, Waddell, & Sinclair, 1999), flexibility and joint action (Claro et al., 2004), trust and dependence (Ganesan, 1994). Other dyadic studies looked more generally at the role of information and communication as a partnership success factor (Ellram, 1995), reason for entering an alliance (Sparling & van Duren, 2002), or a determinant of partnership advantage (Sethuraman et al., 1988).

In conclusion, there would seem to be a gap in the research on the role of information systems to manage inter-organisational relationships in chains of organisations. This chapter presents a review of early phases of the research where a model was developed to explain how managerial and executive inter-organisational information systems with customers and suppliers work. Suggestions are made to revise the model. Then a detailed examination of a revised model is made to explain how the nature of inter-organisational information systems were associated with the type of the relationships with customers and suppliers. In addition, the revised model was examined to look at the effect of the business environment. The implications for management and further research are explored.

BACKGROUND LITERATURE

Research Phase 1 - Model Development

When the research was started in 1998, little research was found that explained how managerial and executive inter-organisational information systems with customers and suppliers worked. As a result in the first phase of the research a grounded theory approach was taken using literature reviews, informal in-depth interviews with experts internationally and a case study network of five organisations involved in several Australian food chains ('netchain' Lazzarini, Chaddad, & Cook, 2001). In examining the vegetable, meat and food netchains, a proposed model of inter-organisational information management systems (IOIMS) was developed to explain how information was exchanged by organisations in a chain to manage customers and suppliers and to build the competitive advantage of the chain (Figure 1). The inter-organisational information management system (IOIMS) has been defined as the information exchanged by organizations in a chain for the purpose of managing the relationships of the organisations in the chain. The IOIMS encompasses all aspects of the process of information exchange including the information communication technology tools used. While the IOIMS model has been described in further detail previously (Storer, 2001), the following describes key aspects relevant to this chapter.

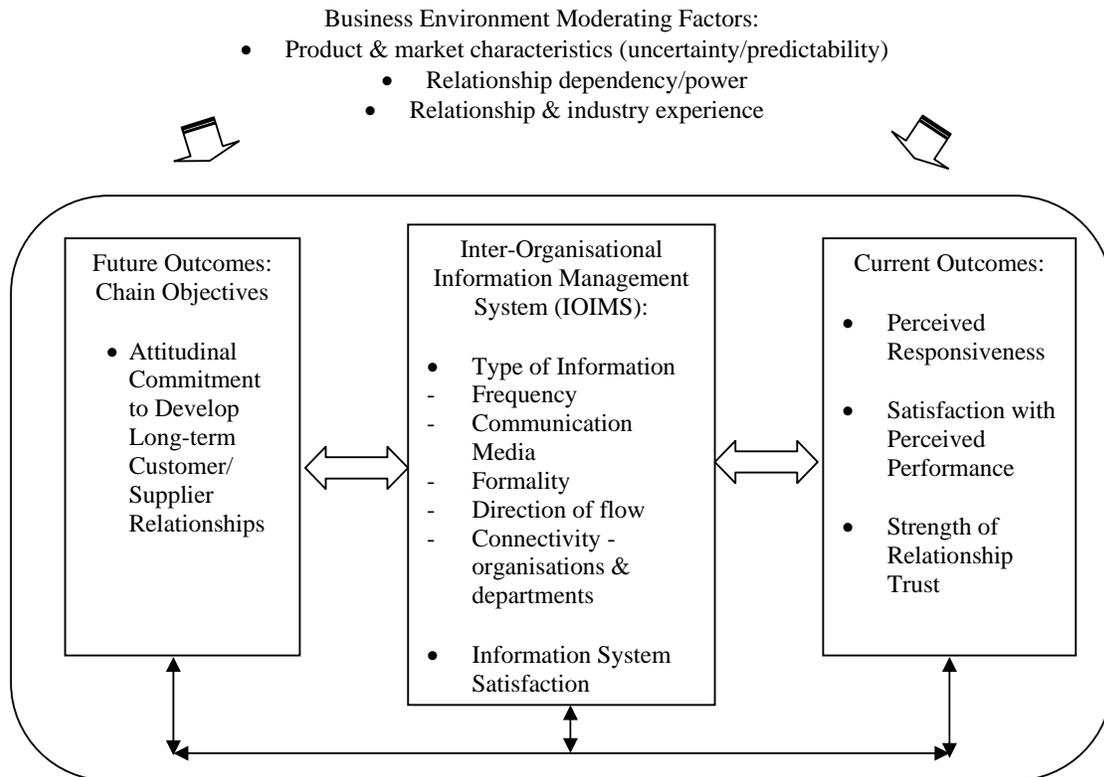


Figure 1 Model of Inter-Organisational Information Management Systems in a Chain Context

In the model, it was suggested that (attitudinal) commitment to developing long-term customer/supplier relationships (future expected outcomes) would be related to the nature of the inter-organisational information management system (IOIMS) adopted in the chain which, in turn, would be related to perceived responsiveness,

performance and trust in the chain (current outcomes) (as suggested by Benedict & Margeridis, 1999; Bowersox & Closs, 1996; Stank, Emmelhainz, & Daugherty, 1996; Vijayasathy & Robey, 1997).

It was proposed that satisfaction with the IOIMS would be dependent on the nature of the IOIMS. It was expected that as the IOIMS system developed and more sensitive types of information more frequently shared, more competitive opportunities would arise and there would be greater satisfaction with the information shared. In addition, as information would be exchanged more frequently to resolve management problems, greater satisfaction would result. The assumption was that an organisation would have different IOIMS with each customer or supplier. If there were greater levels of commitment to developing long-term relationships, there would be a greater investment in the IOIMS. Investment in the IOIMS then being demonstrated by: exchange of a wider range of different types of information, more frequently, by more people (connectivity), using a range of communication media in a less formalised process.

Further, it was argued that the proposed associations in the model would be moderated by environmental factors such as product and market uncertainty, relationship dependency and power, experience in the relationship and in the industry (as suggested by Ancona & Caldwell, 1992; Bensaou, 1999; Spekman et al., 1998).

To operationalise the model, the inter-organisational information management system (IOIMS) was examined by asking participants about the *types of information* exchanged to manage the relationship (Mohr & Nevin, 1990). Specifically, participants were asked whether information was exchanged about performance feedback, problem resolution, new product developments, forecast supply and demand, and opportunities and threats. Based on the netchain case study, performance feedback was expanded to specifically cover product quality, on time delivery, completeness of orders, flexibility to change orders and invoice accuracy. For each type of information shared, details were sought of: the *frequency* it was shared on average in a year (absolute frequency) and adequacy of frequency i.e. was information exchanged as often as necessary (relative frequency); *communication media* used (phone, e-mail, EDI etc); *direction* of flow (upstream, downstream, both directions); *formality* of the process; and the key *people involved* in the exchanges (Anderson, Lodish, & Weitz, 1987; Bensaou & Venkatraman, 1995; Borgen & Ohren, 1999; Choo, 1996; Daft & Lengel, 1986; Daft & Lengel, 1996; Dansereau & Markham, 1987; Ellinger, Daugherty, & Plair, 1999; Farace, Monge, & Russell, 1977; Huber & Daft, 1987; Mohr & Nevin, 1990). Perceived *satisfaction with the information system* was measured in terms of: Accuracy, reliability and completeness; Usefulness and relevancy; Depth and range of content and being Timely and up to date (O'Brien, 1999).

Expected future outcomes from the relationship were measured as attitudinal *commitment* to develop long-term customer-supplier relationships (Ganesan, 1994; Gundlach, Achrol, & Mentzer, 1995; Sharma, Young, & Wilkinson, 2001).

Current outcomes from the relationship were measured as perceptions of the customer/supplier's *performance, responsiveness and willingness to change*, and *trustworthiness* compared to others in the industry (Anderson et al., 1987; Anderson, Håkansson, & Johanson, 1994; Bensaou & Venkatraman, 1995; Doney & Cannon, 1997; Ganesan, 1994; Gassenheimer & Scandura, 1993; Gundlach et al., 1995; Kohli, Jaworski, & Kumar, 1993; Kumar, Stern, & Achrol, 1992; Womack, Jones, & Roos, 1990).

Moderating variables included uncertainty, dependency/power and experience. *Uncertainty* was measured as: predictability of demand, production yield, quality and quantity of supply; market competition; and changing consumer preferences (Ganesan, 1994; Kumar et al., 1992). Relationship *dependency and power* were measured as: availability of alternative customers and suppliers; importance to each other; influence; and ease of replacement (Ganesan, 1994; Kumar et al., 1992). *Experience* was measured in terms of the number of years working in the industry and with the organisation (Doney & Cannon, 1997; Ganesan, 1994).

To explore the dynamics of the interaction over time, the information satisfaction and relationship outcome variables were measured in terms of the current situation and how it had changed over the last five years. Comments were recorded about respondent's perceptions about the reasons for change. As a result of explanations about reasons given for change, two additional questions were added about perceptions of customers/suppliers *initiating new ideas* to improve the category/business or improving the organisation's *knowledge* of the industry.

Research Phase 2 – Model Testing & Revision

The model has been tested in earlier phases of the research on a case study of nursery retail stores and wholesale nursery 'green life' suppliers as well as a survey of Australian food processors (see Storer, 2003; Storer, Soutar, Trienekens, Beulens, & Quaddus, 2004). These studies support some aspects of the model. The structural coefficient comparisons between the two studies have been shown in Figure 2 with G indicating green life case study results and F food processor survey results (a=significant, b=not significant).

Similar to the food processor survey, the green life case study found that the environment had a significant influence on expected future outcomes and that the IOIMS had a significant influence on perceived current outcomes. Both studies found that expected future outcomes were not significantly associated with the IOIMS. In addition, both studies found no significant (green life case study) or meaningful (food processor survey – coefficient $0.09 < 0.20$) association between the environment and perceived current outcomes.

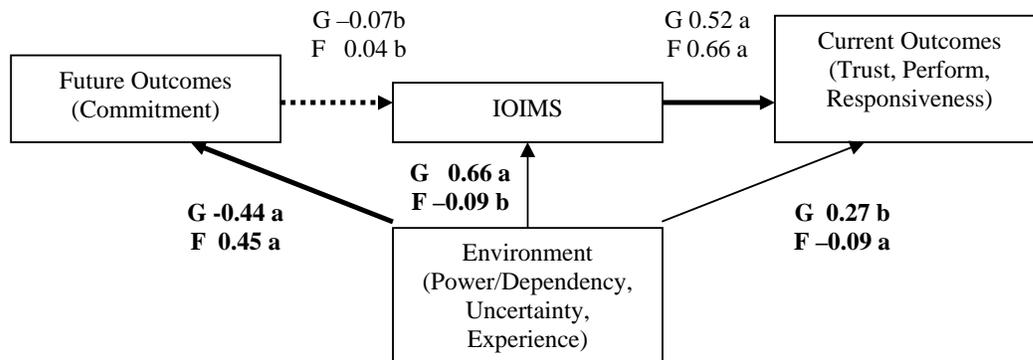


Figure 2 Comparison of Green Life Case Study (G) and Food Processor Survey (F) Structural Model Path Coefficients (a=significant; b=not significant)

There was a difference between the two studies. Unlike the food processor survey, the green life case study found the business environment had a significant association with the IOIMS. The differences may be due to the green life case study small sample size (64) or the way the environment and IOIMS constructs were measured in each study.

In evaluating these results it was concluded that the IOIMS construct was measuring two separate constructs. The social IOIMS subsystem measured satisfaction with the IOIMS and the technical IOIMS subsystem measured the processes used to manage information exchange. It was proposed that the nature of the technical IOIMS may be modelled as an antecedent to IOIMS satisfaction (social). In addition, it was proposed that the model may better show the moderating effects of the environment variables if the constructs were separated (power/dependency, uncertainty and experience). Finally, with the commitment not being related to the IOIMS and current relationship outcomes (trust, performance and responsiveness) as hypothesised, it was proposed that commitment results from the current relationship outcomes rather than being an antecedent. For structural equation modelling purposes the model with these revisions has been shown in Figure 3.

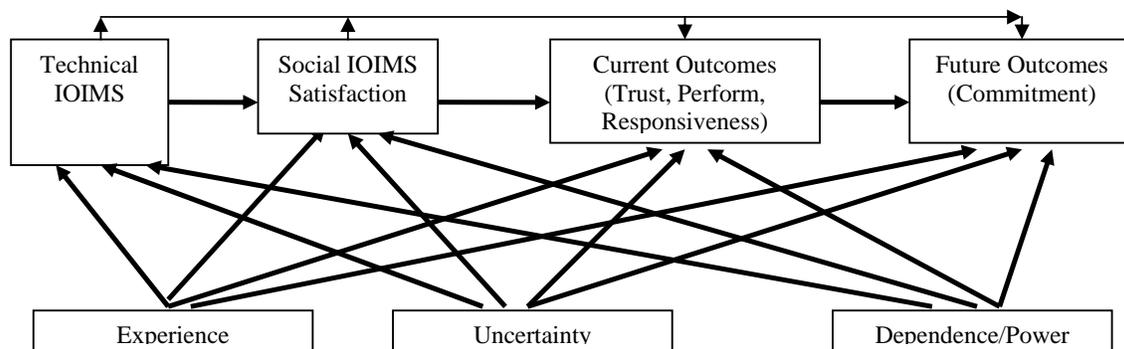


Figure 3 Revised Model of Inter-Organisational Information Management Systems in a Chain Context

The resulting hypotheses were that:

1. The technical IOIMS was positively related to IOIMS Satisfaction
2. IOIMS Satisfaction was positively related to Current Outcomes (perceived trust, performance and responsiveness)
3. Current Outcomes (perceived trust, performance and responsiveness) were positively related to Future Outcomes (attitudinal commitment)
4. The Environment (power/dependency, uncertainty and experience) has a moderating effect on the IOIMS, IOIMS Satisfaction, Current Outcomes and Future Outcomes

The purpose of this chapter is to test the revised model and provide insights into factors affecting information systems used to coordinate customers and suppliers in chains of organisations.

METHODOLOGY

This section outlines the methodology used to conduct the Australian food processor survey that has been used to test the revised model. Support for the research was received from a large Australian retail chain that provided introductions to major food processors in a number of food processing industries. A total of 45 food categories were covered and included dry, fresh, chilled and frozen food products based on meat, dairy, fruit, vegetable and cereals in the form of ingredients as well as snacks, meals and drinks. Food processors varied from large multinational and national organisations to smaller regional suppliers.

In-depth interviews of 111 Australian food processor purchasing managers, sales/marketing managers and general managers/owners in 42 companies were conducted during April to December 2002. Where possible interviews were conducted face to face with phone interviews and self completion used as a last resort (e-mailed or faxed back). Interviewees were asked to discuss two suppliers or two customers that were significant in terms of volume, value or strategic intent (Figure 4). Some interviewees answered questions for several different product categories eg milk, cheese and small goods. Relationships with 176 suppliers and 297 customers were discussed in the interviews.

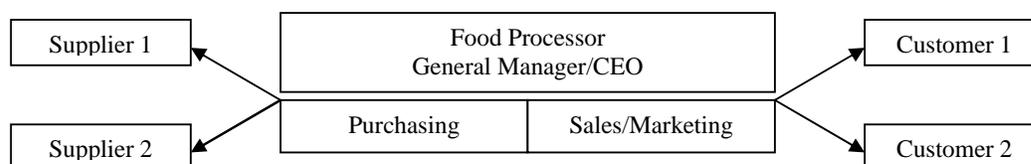


Figure 4 Customers and Suppliers Discussed by Food Processors

Structural equation modelling (causal modelling) was used to test the revised model (figure 3) so that there could be an analysis of the model's multiple constructs and their multiple indicators at the same time (Al-Gahtanl, 2001). Structural equation modelling allows the simultaneous assessment of the reliability and validity of the measures of the theoretical constructs and an estimation of the relationship among these constructs (Barclay, Higgins, & Thompson, 1995). As the model in this research was in the early stages of development with high complexity and low theoretical information, partial least squares graph (PLS) was used instead of LISREL that required a stronger theoretical base (Barclay et al., 1995; Igbaria, Guimaraes, & Davis, 1995). PLS facilitates testing of the psychometric properties of the scales used to measure a variable, as well as estimating the parameters of a structural model - that is, the magnitude and direction of the relationships among the model variables (Igbaria et al., 1995). PLS does not depend on having multivariate normally distributed data (distribution free) and can be used with small samples (Igbaria et al., 1995).

Following procedures set out by Barclay et al. (1995), Igbaria et al. (1995) and Al-Gahtanl (2001) the model was analysed and interpreted in two stages: (1) the assessment of the reliability and validity of the measurement model; and (2) the assessment of the structural model. In stage one the *measurement model* was assessed by examining: (a) individual item reliability; (b) internal consistency; and (c) discriminant validity. *Individual item reliability* was assessed by examining the loadings, or simple correlations, of the measures with their respective construct which indicated the amount of variance in a measure due to the construct rather than error. Using Hair, Anderson, Tatham & Black's (1998) guidelines, loadings greater than 0.30 were considered 'significant'; loadings greater than 0.40 were considered 'more important'; and loadings 0.50 or greater were considered to be 'very significant'. *Internal consistency* was assessed using the measure of reliability developed by Fornell & Larcker (1981). Nunnally & Bernstein (1994) suggested that a value of 0.70 provides 'modest' reliability applicable in early stages of research. *Discriminant validity* refers to the degree to which items differentiate between constructs or measure different concepts. The average variance shared between a construct and its measures (Variance Extracted or VE) should be greater than the variance shared between the construct and other constructs in the model (i.e. the squared correlation between two constructs). Another test of discriminant validity is that no item should load more highly on another construct (cross loading) than it does on the construct it intends to measure. Modest cross loadings (>0.50) may provide doubt about what construct is being captured by such items (Barclay et al., 1995). Following revision of the model based on the assessment of the reliability and validity of the measurement model, the second stage of the analysis was to assess the *structural model*. The structural model was assessed by examining the statistical significance of the loadings and of the path coefficients based on a jackknife analysis (allows the testing of significance of parameter estimates from data not assumed to be multivariate normal). Following Chin (1998), standardized path coefficients should be at least 0.2 and ideally greater than 0.3 in order to be considered meaningful.

Before the model could be tested using PLS, the non-metric variables needed to be translated into a metric scales where possible. Categorical yes/no responses were given about the ten types of information exchanged (IOIMS subsystems), and for each of these ten subsystems the formality, direction of information flow and communication media used (face-to-face and phone being the most common). SIMCA correspondence analysis (Greenacre, 1986) was used to identify if there were any patterns or structures in the sets of nominal IOIMS variables. Correspondence analysis is an exploratory data analysis technique for multivariate categorical data (Hoffman & Franke, 1986). It is a form of principal component analysis (Soutar & McNeil, 1997). The correspondence analysis was run using increasing numbers of dimensions until the 'quality' for each variable exceeded 500, thereby suggesting "the results obtained provide a good representation of that aspect of the data" (Soutar & McNeil, 1997 pp 34). A description of each dimension was made based on the variables that had the highest 'absolute contributions' to that dimension.

CORRESPONDENCE ANALYSIS RESULTS

The correspondence analysis of the type of information, one-way communication and two-way communication resulted in no patterns, as there was insufficient variation in responses. This indicated that these categorical responses could not be translated into metric scales and these variables were not able to be used in subsequent model testing. Correspondence analysis for face-to-face IOIMS, phone IOIMS, formal and informal IOIMS each resulted in four dimension solutions to produce the highest quality scores. Each of these dimensions were used in the model testing. The dimensions have been described below based on the variables with the highest absolute contributions.

Face-to-Face IOIMS

In looking at the face-to-face IOIMS dimensions, more face-to-face oriented communication systems made up the second and fourth dimensions. The second face-to-face dimension related to the more frequent 'negotiations' of prices and resolving problems. The fourth face-to-face dimension related to less frequent 'strategic' systems for product quality, new product development and opportunities and threats. The first face-to-face dimension was related to the more frequently discussed 'logistics' issues of timeliness of deliveries, order completeness and flexibility to accept order changes where little face-to-face communication was used. The third face-to-face dimension was related to less frequently discussed invoice accuracy and forecast information systems where less face-to-face communication were used.

Phone IOIMS

For the phone IOIMS, the first phone dimension was related to phone systems used for 'reliability' issues such as product quality, timeliness of deliveries, invoice accuracy and to some extent order completeness. The fourth phone dimension was for phone 'order reliability' systems to discuss the completeness of orders and forecasts for future orders. The second and third phone dimensions related to phone systems to develop the relationship. The second phone dimension related to 'relationship depth' where the phone was used to discuss the flexibility to accept order changes, negotiate prices as well as future opportunities and threats. The third phone dimension related to 'relationship future' where the phone was used to resolve problems, negotiate prices and discuss new product development.

Formal IOIMS

With the formal IOIMS, formal dimension one related to not having formal systems for 'current issues' such as resolving problems, product quality, timeliness of deliveries, order completeness and flexibility to accept order changes. The second formal dimension was related to not having formal systems for discussion of 'future' oriented issues of new product development, opportunities and threats. The third formal dimension related to not having 'formal forecasting' communication systems. The fourth formal dimension related to not having 'formal price negotiation' communication systems.

Informal IOIMS

Informal dimension one related to not having informal systems for 'tactical and operational' communication of problems, order completeness and invoice accuracy. The second informal dimension related to not having 'informal service quality' systems to discuss timeliness of deliveries, flexibility to change orders and new product developments. The third informal dimension related to not having 'informal strategic operational' systems to discuss problems, product quality and forecasts. The fourth informal dimension related to not having 'informal price negotiation' systems.

PARTIAL LEAST SQUARES GRAPH (PLS) ANALYSIS RESULTS

The structural equation modelling program partial least squares graph (PLS) was used to test the revised model. Firstly the results of assessing the measurement model have been presented followed by the assessment of the structural model.

Measurement Model Assessment

In assessing the measurement model in terms of *internal item reliability*, all perceptions of the IOIMS satisfaction, current and future relationship outcomes construct variable loadings were over 0.5 and considered 'very significant'. The results for the IOIMS and environment (dependency, uncertainty and experience) constructs were varied with one dependency variable, two experience variables, three uncertainty and 31 IOIMS variables dropped with loadings of less than 0.30. In the case of the technical IOIMS construct all that remained was a measure of 'strategic' IOIMS where there were more face-to-face negotiations and more people involved in exchanging information about forecasts, new product developments, opportunities and threats. Therefore the technical IOIMS has been referred to as the 'strategic IOIMS' in subsequent discussion.

After the model had been revised with the exclusion of low loading variables, *internal consistency* of the constructs was assessed. The reliability of all reflective constructs exceeded 0.70 (strategic IOIMS was a formative measure so composite reliability was not applicable) and therefore they were considered satisfactory (Table 1).

Table 1 Construct Internal Consistency

Construct	Number of Variables	Composite Reliability (reflective constructs)
Power/Dependence	4	0.83
Uncertainty	3	0.73
Experience	3	0.81
Technical 'Strategic' IOIMS	5	Not Applicable
IOIMS Satisfaction	10	0.93
Current Outcome	6	0.86
Commitment	2	0.80

Initial assessment of *discriminant validity* was satisfactory as all variables loaded more strongly on their constructs than on other constructs. Of concern was that several variables had modest cross loadings greater than 0.50 on other constructs (IOIMS satisfaction and current relationship outcomes). However, given that these variables had high loadings with their constructs they were retained in the model.

Finally in terms of discriminant validity, all constructs had a variance extracted (VE - variance shared between a construct and its measures) above the suggested 0.50 criteria (Table 2) except for the uncertainty construct that was close at 0.48. However, all of the constructs had correlations less than the squares of the construct average variance extracted (bold diagonal in Table 2). In other words, the constructs were correlated more highly with their indicator variables than with other constructs in the model.

Table 2 Construct Discriminant Validity Correlations Between Constructs and Variance Extracted

Construct	Variance Explained (VE)	Correlations Between Constructs *						
		Power/Depend	Uncert.	Exper.	Strategic IOIMS	IOIMS Satis	Current Outcome	Commit.
Dependence	0.55	0.74						
Uncertainty	0.48	0.04	0.69					
Experience	0.60	-0.01	0.05	0.77				
Tech. 'Strategic' IOIMS	N/A	-0.37	-0.25	-0.19	N/A			
IOIMS Satisfaction	0.57	0.01	-0.21	0.01	0.38	0.75		
Current Outcome	0.52	-0.04	-0.21	0.05	0.34	0.66	0.72	
Commitment	0.68	0.28	0.24	0.01	-0.05	0.02	0.11	0.82

* Diagonal elements in the 'correlations of constructs' matrix are the square roots of variance explained. For adequate discriminant validity, bold text diagonal elements should be greater than the corresponding off-diagonal elements.

In summary, the constructs in the measurement model were assessed as being adequate in terms of individual item reliability, internal consistency and discriminant validity although there might be discriminant validity problems with the environment construct. The next step was to assess the structural model propositions.

Structural Model Assessment

In *analysing the structural model* Figure 5 shows the significant path coefficients (labelled a) between the constructs and the multiple R² below each construct. The effect of the current relationship outcomes construct (trust, performance and responsiveness) on future relationship outcomes (commitment) was not significant (t value 1.29 < 1.96). Current relationship outcomes were not significantly affected by experience (t value 1.65), dependency (t value 0.20) or uncertainty (t value 1.77). In addition, experience did not have a significant moderating effect on IOIMS satisfaction (t value 1.81) or future outcomes (t value 0.08). Therefore, these aspects of the proposed model were not supported. The model was rerun with PLS after removing the non-significant paths with little change in the results.

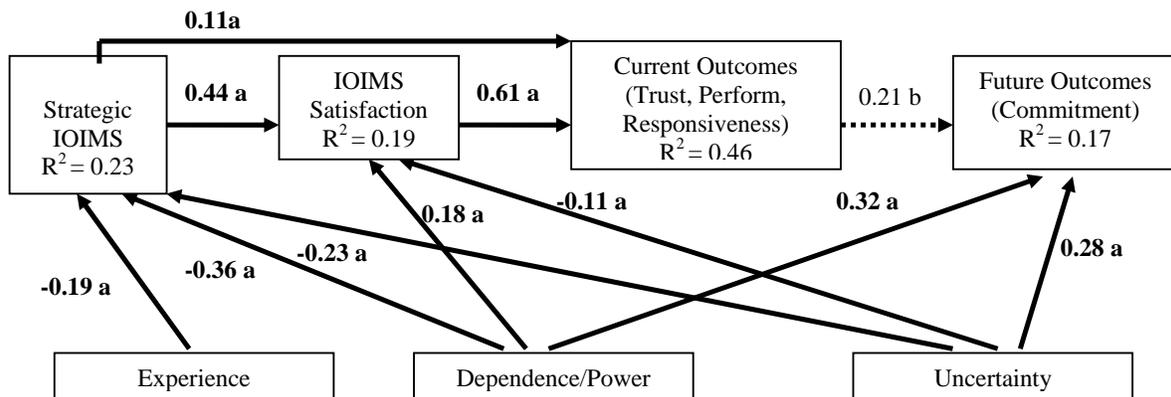


Figure 5 Structural Model - Path Coefficients & R² (a=significant; b=not significant)

There was support for the other aspects of the proposed model with an average of 15 percent of the variance in the constructs explained (strategic IOIMS 23%, IOIMS satisfaction 19%, perceived current relationship outcomes 46% and future relationship outcomes 17%) and significant t values greater than 1.96 (table 3).

Table 3 Structural Model Path Coefficients and Multiple R²

	Strategic Inter-Org Info Management System	Inter-Org Info Management System Satisfaction	Current Outcome	Future Outcome Commit
Dependency	-0.36 a	0.18 a	-0.01 b	0.32 a
Uncertainty	-0.23 a	-0.11 a	-0.06 b	0.28 a
Experience	-0.19 a	0.10 b	0.07 b	0.01 b
Strategic Inter-Org Info Manage System		0.44 a	0.11 a	0.11 b
Inter-Org Info Manage System Satisfaction			0.61 a	-0.11 b
Current Relationship Outcomes				0.21 b
Total	-0.78	0.61	0.72	0.82
Multiple R ²	0.23	0.19	0.46	0.17
Average R ²	0.15			

T Value: a > 1.97 (significant); b < 1.97 (not significant)

Satisfaction with the IOIMS was positively associated with a 'strategic oriented IOIMS' where there were more face-to-face negotiations and more people involved in exchanging information about forecasts, new product

developments, opportunities and threats. A strategic IOIMS and satisfaction with the IOIMS were both positively associated with perceived current outcomes (satisfaction with performance, perceived responsiveness and strength of relationship trust). However, commitment to develop long-term customer/supplier relationships was not significantly associated with a strategic IOIMS, IOIMS satisfaction or current relationship outcomes as hypothesised.

Factors affecting the relationships in the model constructs included respondent's experience and business environment power/dependency and market uncertainty. Dependency, market uncertainty and experience were negatively associated with a strategic IOIMS. However, IOIMS satisfaction was negatively associated with uncertainty and positively associated with dependency. Dependency and market uncertainty were both positively associated with commitment.

CONCLUSIONS & DISCUSSION

The review of literature identified a gap in research looking at the role of information systems to manage inter-organisational relationships and to coordinate customers and suppliers in chains. A model was developed to identify aspects of the inter-organisational information management system (IOIMS) to coordinate customers/suppliers and how it was associated with perceived current and future outcomes from the relationship (satisfaction with performance, perceived responsiveness, strength of relationship trust and commitment to developing long term customer/supplier relationships). In addition, the model looked at the effect of environmental factors (experience, market uncertainty and power/dependency). Following on from previous testing of the model based on a survey of Australian food processors and an exploratory green life case study, the model was revised. Results of testing of the revised model were examined in this chapter.

In conclusion, the food processor survey presented and a previous exploratory green life case study provided some support for the model of IOIMS as originally proposed and the revised model. In all studies and models, satisfaction with the IOIMS was positively associated with perceived current outcomes (satisfaction with performance, perceived responsiveness and strength of relationship trust). The revised model showed up an additional positive association between having a strategic IOIMS and IOIMS satisfaction. These findings were as hypothesised. It was expected that satisfaction with the IOIMS and perceptions of creation of knowledge and business improvement would be positively associated with current outcomes (greater perceived trust, performance and responsiveness compared to others in the industry as well as improvements in trust, performance and responsiveness over time). Similarly it was expected that the nature of the IOIMS would be positively associated with IOIMS satisfaction. What was interesting was that IOIMS satisfaction was associated with the more strategically oriented IOIMS where there were more face-to-face negotiations of prices and resolving problems as well as more people involved in exchanging information about forecasts, new product developments, opportunities and threats. This indicated that more sophisticated and developed IOIMS were important in developing IOIMS satisfaction. It may be that the management control type IOIMS were seen as a prerequisite for business rather than as a value added extra.

Managerial Implications

In terms of implications for management, the finding that the business environment was associated with commitment is not likely to be very surprising and will have been built into strategic planning processes. However, a key issue for management was the finding that increasing power/dependency was associated with greater IOIMS satisfaction while increased uncertainty reduced satisfaction. This indicates that rewards of greater customer/supplier IOIMS satisfaction can be gained through management action to provide greater certainty in predictability of demand, production yield, quality and quantity of supply. Anecdotal evidence collected during interviews indicated that many organisations had been addressing improvements in these areas. Uncertainty related to market competition and changing consumer preferences would be much harder, if not impossible, for management to influence.

Perhaps the main finding was that perceptions of customer/supplier trust, performance and responsiveness were positively associated with users satisfaction with an IOIMS and perceptions that it improved business and their knowledge. Therefore if management is concerned to ensure the organisation is getting the best from customers/suppliers, they can monitor boundary-spanning staff's perceptions about these matters. Another key issue was the importance of relationships rather than technical efficient IOIMS in satisfaction. This implies that a major managerial issue is to ensure the culture of the organisation encourages the development of personal relationships between boundary-spanning staff and customers/suppliers. It can be encouraged in more social activities such as attendance of conferences, trade shows and industry events. These more 'softer' skills can be emphasised in staff selection, training and performance assessment processes. Management also need to ensure they allow time for relationships to develop by not rotating staff through boundary-spanning roles too quickly.

A common complaint was that boundary spanning staff in the customer/supplier organisation were changed too quickly. Some respondents commented that time was needed to understand each others business and how to get the best response. Such comments may indicate that managing relationships with customers and suppliers is not based solely on explicit organisational rules and process that can be quickly learnt and passed on to successors. More detailed implicit knowledge may need to be gained that relies on personal experience that cannot be passed on to subsequent boundary spanning staff. Such implicit knowledge takes time and experience to gain.

Further Research

In terms of areas for future research, the aspects of the proposed model that were not supported need to be examined in more detail. What was not expected was that in all studies and models expected future outcomes (commitment) were not significantly associated with either IOIMS satisfaction or current outcomes (performance, responsiveness and trust). The moderating effects of the business environment variables may explain this finding. Both studies using the original model found that the business environment (power, dependency and market uncertainty) had a significant influence on future expected outcomes or attitudinal commitment to develop long-term customer/supplier relationships. When these environment variables were separated out under the revised model, both power/dependency and market uncertainty had a significant positive association with commitment while experience did not. This meant that environments of greater dependence on customers/suppliers and market uncertainty were associated with greater commitment now and over time (future outcomes). It had nothing to do with the experience of the respondent in the industry or with the organisation or their understanding of the organisation. With the long average length of relationships with these customers and suppliers (22 years) being longer than found in three out of four other studies (Jonsson & Zineldin, 2003; Karalis & Vlachos, 2004; Langton, 2004) it may be that the food processors felt locked into these relationships. If the food processors felt locked into the relationships, the boundary spanning staff (purchasing and sales) may not feel they have any say in who the company does business with and therefore there was no association between commitment and their perceptions of IOIMS satisfaction or current outcomes (performance, responsiveness and trust). Many of the relationships discussed were with retailer supermarkets (35%) who Amanor-Boadu, Trienekens & Willems (2002) note wield significant power in the agri-food sector through control of market access. In Australia with three retail chains dominating the market this power would be even more pronounced. Future research could be carried out to compare retailers and non-retailer relationships to explore this further.

Another explanation for the lack of an association between future expected outcomes (attitudes to commitment) and the IOIMS may be that the organisations do not have different systems in place to cater for different customers or suppliers needs, as there was little variation in the nature of the IOIMS. A situation one may expect in practice because of investments in systems and establishment of standards. As Anthony suggests, (1988), management control systems need to ensure responsibility centres, even if physically separated, act consistently and in accordance with senior management wishes. This conclusion was supported anecdotally during data collection with the same system used for all major customers and the same system used for all major suppliers, even for divisions in different states. Note organisations had significantly different IOIMS for customers to that used for suppliers. Further analysis could be undertaken to investigate whether organisations have different IOIMS for different categories of customers and different IOIMS for different categories of suppliers. There was anecdotal evidence during data collection that adaptations were only made to systems with very important customers/suppliers where there were highly developed relationships. Therefore, in conducting this research care will need to be taken to only analyse highly developed relationships. The adaptations may be in the form of restructuring boundary-spanning staff along product category or customer lines, exchanges of staff, greater range of staff involved. Note the adaptations may be done more for managerial processes than the more frequent operational or transactional processes.

In terms of the impact of the business environment variables both studies found no meaningful effect on perceived current outcomes (performance, responsiveness and trust). This was contrary to expectations. The business environment (power/dependency and market uncertainty) was not strongly associated with perceptions of: satisfaction with the IOIMS; creation of knowledge; business improvement; trust; performance; and responsiveness nor with changes in trust, performance and responsiveness over time. One explanation may be that the current outcome constructs were based on measuring aspects of respondent's personal relationships with customer/supplier counterparts. Rather than measuring the organisation's perceived official position on these matters, respondents gave their opinions on whether they personally were satisfied etc. Peters & Fletcher 2004 (2004) raise the concern that much of the inter-organisational research has been based on personal psychological dimensions but interactions are between groups of people and each individual is embedded in groups, organisations and networks. Hardman, Darroch & Ortmann (2002) measured trust based on both personal confidence and business confidence but unfortunately did not report if respondents gave significantly different results to these two questions. From the personal relationship perspective, the business environment may have

less of an influence with the nature of the individuals involved being more important. Further studies could be done to collect data based on the official company position and personal opinions to see if this affects the results.

The impact of the business environment variables on IOIMS satisfaction was different in the two studies. Unlike the food processor survey, the green life case study found the business environment had a significant association with the IOIMS. These differences may be explained from the results of the revised model when the business environment constructs were separated out. In the food processor survey the power/dependency and uncertainty effected IOIMS satisfaction in opposing ways. While increasing power/dependency was associated with greater IOIMS satisfaction, increased uncertainty reduced satisfaction. Possibly the increased uncertainty created more problems. Future research could be conducted to explore the interactions of these two business environment factors on the green life case study to see if the patterns were similar or if they reflect differences in the industries studied.

An alternative explanation for the differences in the studies may be to do with the way the data was collected. Additional variables used to measure the IOIMS in the food processor study resulted in a more reliable and valid assessment of it as a construct. This along with the larger sample size of the food processor study may mean the food processor study results were more accurate.

The other main finding from the revised model was the significant negative effect on strategic IOIMS of experience, power/dependence and uncertainty. Strategic IOIMS were based on more face-to-face negotiations of prices and problem resolution as well as more people involved in exchanging information about forecasts, new product developments, opportunities and threats. It may be expected that less strategic information exchange would be required for respondents with greater experience in the industry and with the other organisation and with greater understanding of the other organisation. There may also be withholding of this type of information when in a dependency situation. However, it was expected that the exchange of strategic information would be critical in situations of uncertainty. The only explanation thought of was that perhaps the information exchange is dominated with dealing with day-to-day operational control management issues arising from the uncertainty. With the role of strategic IOIMS in IOIMS satisfaction, it is a concern that there seem to be so many forces affecting it negatively. Future research could look at factors that ameliorate these negative forces and promote the development of strategic IOIMS.

Many of the conclusions above have resulted in suggestions for further research. This should not come as a surprise given the gaps found in previous research. Any considering further work in this field that is an important element for future chain collaboration and competition are welcome to contact the author to discuss ideas and collaborate on research.

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