

**Inter-Organizational Information Feedback Systems
in Agribusiness Chains:
A Chain Case Study Theoretical Framework**

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Abstract

A consumer perceived food contamination crisis in Japan was the catalyst for a focus on chain management in an Australian food chain. The results of case study research of the inter-organisational feedback systems of five organisations in an Australian food processor centred chain are presented.

Using a grounded theory approach, it is proposed that the nature of the inter-organisational information feedback systems in chains will be related to expected future outcomes as measured by chain objectives (organisational philosophy about developing long-term relationships with suppliers and customers). In addition, the nature of the inter-organisational information feedback system will be related to the current outcomes as measured by the strength of the relationship and perceived performance. Outside environmental factors that impact on the relationships may also have an effect such as the: nature of the product, competition and uncertainty in the market; power and dependency in the relationship; industry experience and duration of the relationship; as well as personal characteristics.

The Problem

It all started with a crisis. Japanese consumers in a popular family restaurant were complaining about finding pieces of plastic in their meals. The Japanese trading house and distributor of the food was alerted and an investigation started to track down the source of the food contamination. With the importance of food safety and integrity to Japanese consumers, it was perceived to be a top priority to determine the cause of the problem and ensure the contamination did not happen again. Tracing the food back to an Australian food processor it was determined that the “contaminate” was in fact the outer layers of onion that were harder than Japanese consumers were used to. Onion was a key ingredient in the food and therefore it was difficult to remove the source of the problem. A Japanese delegation was sent to Australia to find out more details and discuss the issue with the first stage vegetable processor and the onion primary producer.

Over a period of time many changes through the chain were instigated to improve the quality standards to meet the needs of the Japanese consumer from ensuring only the softest parts of the onion were used to reducing gristle and fat in the mince. However, perhaps the biggest breakthrough was when the onion producer & seed supplier product trials turned up with an onion like that grown in Japan that was better suited for the Japanese taste and texture preferences. All these changes were only possible because of the way the supply chain was managed and a key aspect was the development of an improved information feedback system up and down the chain. This paper will describe results of case study research carried out on this chain in the form of a theoretical framework of how the inter-organisational information feedback system worked. Perhaps it will provide the impetus for more chains to get into chain management before being faced with a major crisis.

Procedures

The research will be conducted in two phases, of which the first phase has been reported in this paper. The first phase was to explore the nature of inter-organisational information feedback systems in chains and develop a theoretical framework using a grounded theory approach (Denzin and Lincoln 1994). The first phase involved a literature review, informal in-depth interviews with experts internationally and a case study of an Australian food

processor centred chain. In the second phase the theoretical framework will be evaluated, tested and refined in a survey of food processors and further food processor centred chain case studies.

The food processor centred chain case study was carried out during 1999 and 2000. The chain consisted of a food processor and four of their suppliers - two vegetable primary producers, a primary stage vegetable processor and a secondary stage meat processor. As suggested by Anderson, et al. (1994), suppliers were chosen by the food processor as being significantly important in terms of strategic positioning, volume and value. The food processor identified a strong relationship with the vegetable processor with information flows that had improved over time. By contrast, the food processor perceived there were problems with the volume and quality of information flows with the meat processor.

Data was collected using thirty personal in-depth interviews and organisational interactive workshops. Interviews lasted from one to five hours. Workshops were for a half day. A multiple informant approach (Anderson, et al. 1994) was used with key people at different hierarchical levels (operations, management and executive) in each organisation in the chain interviewed. The aim was to determine the current IOS and how it had developed over time as well as perceived problems and recommendations. The personal in-depth interview data was taped, transcribed and then collated using Nudist 4.0 software into broad themes and categories such as types of performance information (transactional, managerial or strategic), parties involved, how information was communicated, frequency of communication, strength of relationship, problems and recommendations. The chain information systems were modelled using GRAI grids (Trienekens 1999). This data was augmented by interactive workshops run for each organisation where all participants were invited to contribute. The workshop allowed for perceptual agreement (Kumar, et al. 1993) and further detail to be added on how the IOS operated. In addition, it facilitated action to resolve problems identified in the in-depth interviews by prioritising and categorising problems, translating problems into needs, prioritising needs and developing an action plan for the highest priority needs. Implementation, monitoring and review of the action plans for organisations were the responsibility of individual organisational Chief Executive Officers.

Results

Based on the literature review, expert interviews and analysis of the five organisation chain case study, the theoretical framework model developed is shown in Figure 1. The proposed theoretical framework of the chain inter-organisational information feedback system was based on an extension of Silver, Markus & Beath's (1995) organisational "Information Technology Interaction Model", Mohr and Nevin's (1990) "Model of Communication for Marketing Channels", Hakansson's (1982) business-to-business relationship "Interaction Framework" and the British Deming Associations "Elements of Successful Customer/Supplier Relationships" (Anonymous 1993).

It is proposed that the nature of the inter-organisational information feedback systems in chains will be related to expected future outcomes as measured by chain objectives (organisational philosophy about developing long-term relationships with suppliers and customers). In addition, the nature of the inter-organisational information feedback system will be related to the current outcomes as measured by the strength of the relationship and perceived performance.

The inter-organisational information feedback system will be measured in terms of: what Content is exchanged and why as well as the when, how & who of the process (Frequency, Directionality, Formality & communication tools used, Organisational position in the chain, Department, Hierarchical level of the person).

Outside environmental factors that impact on the relationships may also have an effect such as the nature of the product, competition and uncertainty in the market, power and dependency in the relationship, industry experience and duration of the relationship as well as personal characteristics.

As recommended by Fredriksson & Vilgon (1996 p59), the model uses a dynamic approach to reflect the interaction of one factor on another where the effects depend on the total set of factors. For example expected future outcomes affects information sharing which in turn affects perceived current outcomes and expected future outcomes. The dynamic nature of the process is consistent with comments by some respondents in the chain case study. While not tested empirically, Bensaou (1997 p118) found his fieldwork suggested a 'feedback loop', where cooperation and communication lead to appreciation of the benefits, norms of behaviours and new 'sharing' attitudes that developed and become institutionalised along with expectations of continuity of cooperation and communication in the future. Similarly, Spekman et al. (1998) in an empirical study found that sharing information and interdependence improved performance in terms of cost reduction and customer satisfaction. Uzzi (1997) in an ethnographic study found that close, long-term, 'embedded' relationships were associated with 'fine-grained' information transfer, trust and joint-problem solving.

Expected Future Outcomes - Chain Objectives

The objectives of the organisations and their *philosophy about developing long-term relationships with suppliers and customers* will be pivotal to the nature of the feedback information system adopted. In the case study the problem with concerns about tough onion pieces was the catalyst for the chain members to meet and discuss the importance of each other in delivering a product valued by the end consumer. In developing and adopting improvements, each in the chain has clearly identified their objectives to continue to develop the relationships in the long term with comments like "we work together and help each other develop in the long term". As Biemans (1999) note, intense cooperation through the use of information communication technology to communicate more frequently, more efficiently and to improve coordination of actors in value chains will only be realistic when companies share the desire to cooperate. Others support the importance of shared goals in building cooperation (eg Anderson & Narus 1991, Bensaou 1997, Ellram 1991, Ellram 1995, Hines 1994, Hughes 1994, Mohr & Spekman 1996, PriceWaterhouseCoopers 1999). Hamel, Doz & Prahalad (1989) go further and argue as well as converging strategic goals, companies also need to have diverging competitive goals and a belief they can both learn from the other and limit access to proprietary skills. PriceWaterhouseCoopers (1999) argue shared goals are particularly important when parts of the supply chain are separated by distance, time zones and other factors such as language and culture.

Hughes (1994) suggests the goals should focus on meeting the needs of the end consumer and the long term objectives of the relationship. Similarly many authors suggest working toward adding value as defined by the ultimate consumer (eg Anderson, Britt & Favre 1999, Anonymous 1993, Ellram 1991, Hines 1994, PriceWaterhouseCoopers 1999, Schroder 1999, Womack & Jones 1996). Womack, Jones & Roos (1990) add the aim of ensuring all in the chain make reasonable profits.

Relationship literature also see shared values as being related to relationship commitment and trust (Gundlach, et al. 1995, Morgan and Hunt 1994) as well as communication flows (Mohr and Sohi 1995). Morgan & Hunt (1994) define shared values as the extent to which partners have beliefs in common about what behaviours, goals and policies are important or unimportant, appropriate or inappropriate and right or wrong.

The British Deming Association suggest "good internal communication depends upon everyone knowing and understanding the corporate mission statement and how their actions are designed to help the organisation achieve it. The emphasis should be on outcomes and success criteria, rather than on fixed methods" (Anonymous 1993 p46-47). Anderson et al. (1999) also see setting explicit outcome targets such as revenue growth, asset utilisation and cost reduction as a critical step for the chain to meet end consumers' needs. As Spekman et al. (1998) found, the gap between the goals and concerns of senior management and buyers as well as the differences in beliefs about the merits of supply chain management between buyers and sellers in the chain would explain delays in implementing the concept of supply chain management.

Inter-organisational Information Feedback Systems

The Inter-organisational information feedback system will be measured in terms of the hierarchical decision level, content, frequency, departments, organisations, directionality, formality and tools.

Hierarchical Decision Level

According to Trienekens (1999 p50) "many authors have underlined the importance of a hierarchically structured decision function (Anthony 1988, Bertrand, et al. 1990, Burbridge 1990, Meal 1984, Slomp 1993, Wild 1979)." It reduces complexity and separates the short, medium and long term aspects of management (Slomp 1993). Keen & Scott-Morton (1978) suggest the characteristics of the information used by different decision level varies in terms of the accuracy, level of detail, time-horizon, frequency of use, source, scope, type and age of information. Three types of hierarchical decision levels have been adapted from Bowersox & Closs's (1996) functions of logistics information systems with management control and decision analysis combined to form management information to align with the more common categories of operational, tactical/management and strategic (Stevens 1989; Anthony 1988).

Transaction data is generated principally by operational staff conducting day to day activities of filling customer orders, ordering materials from suppliers and production of goods and services. Data flows through all organisational departments and is exchanged with suppliers and customers more as the relationship develops. Large volumes of transactions are generated regularly allowing for formalised processes and procedures. Costs are high due to the high transaction volume, large number of system users with heavy communication demands and significant software complexity (different functional requirements). As the costs are relatively well defined and exhibit more certainty with respect to benefits and returns, the major emphasis is on information system efficiency to produce competitive advantage through reduced costs such as through electronic data interchange (EDI). Most of the literature on IOS and logistics to date have focused on technology and how to improve exchange of transactional data. Customer relationships can be developed further by provision of information about order status, product availability, delivery schedules, and invoices. Supplier relationships can be developed further by provision of information about forecast demand, demand trends and new product developments. (Bowersox and Closs 1996)

Management control information systems focus on performance measurement and reporting of feedback. The emphasis is on intermediate-term, tactical, evaluation of past performance and identification of alternatives. Common performance measures include financial, customer service, productivity and quality indicators. Another important role is to identify exceptions as soon as possible to identify potential customer or order problems and enable corrective action to be taken eg predicted future inventory shortages, late delivery, quality issues. (Bowersox and Closs 1996)

Strategic knowledge systems focus on decision applications to assist managers and executives identify, evaluate, and compare strategic and tactical alternatives (Bowersox and Closs 1996). The information used tends to be older, aggregated, qualitative information from a wide range of sources that are often external to the firm (Keen and Scott-Morton 1978). The focus is on the future rather than the present (Keen and Scott-Morton 1978).

In the case study it was observed that increasing amounts of transactional data were exchanged by operational staff with strategically significant customers and suppliers such as product availability and delivery schedules. There was also more managerial information exchanged including quality performance exceptions, delivery performance exceptions, forecast supply and demand. In addition there was more executive information exchanged including suggestions for new product developments, future opportunities and threats. These findings were consistent with Ellram (1995) and Hughes (1994) suggestions that in establishing and maintaining chain relationships there needs to be communication and information sharing at different levels between the organisations.

Content

The range of information content being exchanged has been illustrated under the descriptions of the hierarchical decision levels.

General Chain Understanding is needed by all staff so that constraints of chain members are recognised (Hughes 1994 p210). Understanding customer requirements is also the basis for a customer orientation that has been shown to improve performance (Jaworski and Kohli 1993, Kohli, et al. 1993, Narver and Slater 1990). A starting point for chain management is adding value to the chain as defined by customers and end consumers (Womack and Jones 1996).

Product & Organisational Performance notification as soon as exceptions are identified is necessary so that corrective action can be taken prior to a customer service failure (Bowersox and Closs 1996). If corrective action is not possible, customers can be notified in advance and offered alternatives to take the surprise out of the service failure. The Japanese automobile manufacturers take it a step further by determining the ultimate cause of the problem and devising a fix so it does not happen again and customer expectations will be met more consistently and costs are minimised (Womack, et al. 1990). A continuous consumer feedback and response system also helps fine-tune and catch embarrassing and dangerous errors in new products before massive and highly visible public recalls are needed (Womack, et al. 1990).

Accurate and timely *Supply & Demand Forecasts* allow for just-in-time inventory management and efficient customer response so that inventory levels and associated costs such as obsolete stock and working capital are reduced (Andraski 1998, Bowersox and Closs 1996, Christopher 1997, Cunningham and Tynan 1993, Van Hoek 1998, Womack, et al. 1990). Preferably complex fast changing goods are made to order to allow for customisation where it is valued by consumers eg cars, computers (Van Hoek 1998, Womack, et al. 1990). Involvement of chain members in *New Product Development* allows for faster responses to changes in customer demands and ensures designs can be produced efficiently by all chain

members as well as meeting the needs of the final consumer (Bowersox and Closs 1996, Christopher 1997, Van Hoek 1998, Womack, et al. 1990).

Future Opportunities & Strategic Planning discussions allow for chain members to respond in a timely manner to changes in end consumer demands as well as competitive pressures (Bowersox and Closs 1996, Christopher 1997, Hines, et al. 1998, Womack, et al. 1990).

Frequency

In the chain case study there was an increase in the frequency of information exchange in absolute frequency terms. In addition, the less frequent management performance and strategic information was seen to be exchanged as it was required. Ellinger, Daugherty & Plair (1999) found that frequency of communications were related to customer satisfaction and loyalty.

Organisations & Departments

It has been suggested by Galbraith (1973, 1977) that information processing capacity can be increased by increasing lateral ties within organisations. This may explain the increase in inter-departmental and inter-organisational information links in chains found in the case study as well as by Womack et al. (1990) and Bensaou (1999) in markets where it was important to closely monitor rapid environmental changes (eg technology changes and perishable product availability/quality) and provide customised products. Carter & Ellram (1994) found that parallel communications between comparable functional departments was more suited to strategic alliances than single points such as purchasing departments.

Directionality

While products flow downstream between organisations in the chain, information flows both upstream as well as downstream (Borgen and Ohren 1999). In the case study information flowed in both directions eg product availability, forecast supply and demand, product and service feedback, future opportunities. Ellram (1995) found that one of the highest rating factors important in establishing and maintaining partnerships was two-way information sharing.

Formality & Communication Tools

The Supply Chain Partnerships Program (2000) suggest a move from formal and slow communications in conventional supply chain to fast and informal communications in supply chain partnerships. The case study findings were consistent were management and executive information was increasingly exchanged spontaneously either face to face or through the telephone. Cunningham (1996) suggests flexible systems allow for learning and adaptation and are better suited to markets and customer needs that are rapidly changing. In addition, informal rich communication media provide instant feedback and cues and enable people to interpret and reach agreement about difficult, unanalysable, emotional and conflict-laden issues (Choo 1996).

Current Chain Outcomes – Performance & Relationship Strength

Respondents in the case study were unanimous in their perceptions of improvements in supplier performance and that there were stronger relationships with those suppliers who had been more responsive and innovative. While respondents were generally satisfied (further issues still need to be addressed), there was little positive feedback given or received through the chain and therefore respondents perceptions of satisfaction were based on a lack of complaints and an increase in orders. Many authors acknowledge the role of communication between firms to improve *performance and satisfaction* (eg Benedict & Margeridis 1999, Bowersox & Closs 1996, Stank, Emmelhainz & Daugherty 1996, Vijayasathy & Robey

1997) as well as develop the *strength of the relationship* in terms of mutual trust and commitment (eg Hughes 1994, Mohr & Nevin 1990, Vijayasarathy & Robey 1997).

Environmental Factors Affecting Inter-organisational Information Feedback Systems

The effects of environmental factors have been included in the model to overcome the criticism that behaviour research gives limited attention to contextual variables analysed by economics such as conditions under which particular power strategies are appropriate (Heide 1994).

Relationship Power & Dependency Characteristics

All of the organisations in the chain studied were mutually dependant on each other with the arrangement based on low levels of control through agreement not by ownership. Mohr & Nevin (1990) hypothesised that the impact of collaborative communication may be a function of the conditions under which it was used. In a subsequent study of computer dealers Mohr et al. (1996) found that governance strategy of integration and control affected the impact of collaborative communication on channel outcomes. When integration or control was low, the effect of collaborative communication was higher.

Product & Market Characteristics (Uncertainty)

The demands of the task environment have been found to affect the required information processing capacity and frequency of information exchanged between teams and their environment (Ancona and Caldwell 1992). Bensaou (1999) suggest that the type of relationship needs to be appropriate to the type of product and market conditions (technological uncertainty). The food industry analysed in the case study is well know for it's inherent uncertainty in terms of product quality, supply, end consumer demand, and production yield (Trienekens 1999).

Relationship & Industry Experience

All organisations in the chain case study had many years of experience in the industry and in working with each other. Leuthesser & Kohli (1995) found that the age of the relationship affected satisfaction.

Organisational Participants as Information Processors

Cunningham & Tynan (1993) point out that technology to link organisations was available (1970s) a long time before it generated much interest (mid 1980s) and suggest manager's beliefs and assumptions about the potential role of the technology affect adoption. The main difference observed in the chain case study was the continuing traditional adversarial attitudes of purchasing staff with a strong emphasis on cost minimisation that was not consistent with cooperative and relational building views of staff in other functions through the chain. This observation was consistent with findings by Spekman et al. (1998) in empirical research that buyers were less sensitive to information to link organisations in the chain.

Conclusions

In analysing this chain of five Australian organisations in the food industry, a theoretical framework has been developed of how the inter-organisational information feedback system operates. The next stage of the research is to evaluate, test and refine key aspects of it to see if the propositions made are valid in other chains. This will be based on a survey of Australian food processors and further food processor centred chain case studies. The author would be very interested to hear from any interested in participating in further studies on a strictly confidential basis.

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