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# CAN INTER-FIRM NETWORKS ALLEVIATE SUPPLY CHAIN RISKS WITHIN GLOBAL FOOD SUPPLY CHAINS?

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## ABSTRACT

The food supply chain is truly a global supply chain wherein finished products and raw materials are transported across continents to fulfil requirements of consumers. The networks of supply encompass different languages, cultural systems, regulations etc. The entire farmer to end user cycle spans multiple risks and uncertainties which can manifest themselves in form of financial losses to human fatalities. In the past there have been instances of product recalls and food contamination which have had serious consequences as witnessed by the China milk scare, the Sudan1 dye in Worcester sauce and the Tomato salsa recall amongst others. This paper presents a literature study of the issues surrounding these complex and multi-tiered supply chain structures. It also presents a secondary analysis of the literature pertaining to supply chain risks in the food sector. Inter-firm aspects specifically in terms of relationships, trust and governance are analysed and a conceptual model for mitigating risk is derived.

## INTRODUCTION

Generically, a food supply chain starts from the farmer, who produces (grows) the raw food and then supplies this to food processors. Transport companies/ logistics providers link the farmer to the food processors. Sometimes, wholesalers/ marketers may be a part of the chain who will buy from the farmer and sell to the food processors. The exact supply chain path for a particular food product depends on the product characteristics, size and market power of the supply chain members (Maloni and Brown 2006). The 'farm to fork' cycle spans different organisation types, continents, cultural systems, regulations etc. As supply chain members increase, the complexity increases on account of issues related to trust, traceability and transparency. Roth et. al. (2008) have suggested that the major forces affecting traceability and transparency are globalisation, consolidation and commoditisation. Globalisation refers to the movement of the food supply chain model from regional to global in terms of both importing raw materials to exports of final products. Consolidation refers to the trend amongst food supply chain members to combine as many food categories as well as levels of the supply chain in pursuit of higher margins. Commoditisation refers to the distinction between food products as either value added or commodities. This highlights not only the high interlinking of the food supply chains but also the vulnerability of such chains. Inter-firm networks have been an important element of Japanese and Korean manufacturing supply chains. This paper studies the various factors driving inter-firm networks and considers the concept for alleviating risks in the global food supply chain.

## FOOD SUPPLY CHAIN RISKS

Fearne, et. al. (2001) suggest that frequent food safety and security scares has led to an increase in the focus on the causes, effects and prevention of hazards. Peck (2006) in her report has identified a gap in the preparedness for business continuity management (BCM) as organisations tend to adopt a more reactive mode of crisis management than a proactive mode. One of the conclusions of her report was that the drive for efficiency and the just-in-time philosophy used by the food industry has progressively reduced stock levels throughout the supply chain - with the resulting damage to its resilience when an emergency occurs. Reduction of distribution sites due to consolidation means that the loss of a site due to events such as a fire or flood could also cause a disruption in the supply chain. Although the probability of these events happening can be ascertained, according to Peck (2006) due to larger and fewer distribution sites the impact of the event is greater. Kleindorfer and Saad (2005) classify risks as those occurring due to

coordinating supply and demand and those arising from disruptions to normal activities. Agiwal and Mohtadi (2008) categorise the risks on a very broad level including risks arising from either intentional or unintentional causes. They argue that intentional contamination is not very infrequent. Sheffi (2005) argues that robust and flexible systems need to be built to effectively handle contamination incidents and increase the risk management capability of the firm in the wake of an event. Sheffi and Rice (2005) advocate that managers need to look into increasing not just safety measures but also safety awareness and a proactive safety culture increasing supply chain resilience.

#### INTER-FIRM NETWORKS

Sydow and Windeler (1998) define an 'Inter-firm' network as an institutional arrangement among distinct but related for-profit organisations which is characterised by: 1) a special kind of (network) relationship, 2) a certain degree of reflexivity and 3) the logic of exchange that operates differently from that of markets and hierarchies. Ring and Van de Ven (1994) suggest that inter-firm network relationships demand more trust and loyalty and that the relationships are typically complex, reciprocal and relatively stable (Sydow, 1992). Sydow and Windeler (1998) when discussing about the need for reflexivity within inter-firm networks suggest that managers working in inter-firm networks are more likely to consciously consider process improvements that will cut across organisational boundaries, also they are more likely to keep these inter-organisational processes under control. Granovetter (1985) implies that the logic of exchange within an inter-firm network is the social embeddedness within the network, implying that stable relationships between the social actors shape the expectations and behaviours. This embeddedness thus combines co-operative and competitive elements, autonomy and dependence, trust and control (Sydow and Windeler, 1998). Inter-firm network practices create expectations that are based on the 'norm of reciprocity' (Gouldner, 1960) thus creating a 'collective logic' (Lincoln, et. al. 1996) of exchange within the network.

#### RESEARCH DESIGN

When considering the recent cases of food contamination and the percolation of the risk across national boundaries through the supply chain, the research questions that arose for this study were:

- (1) Can inter-firm networks alleviate supply chain risks within global food supply chains?
- (2) What are the factors that impact inter-firm networks?

In order to explore the research questions, a literature review was conducted on inter-firm networks and food supply chains. Also, the literature surrounding the recent food contamination cases was analysed using grounded theory principles to identify themes impacting inter-firm networks. The analysis identified that for inter-firm networks to work in managing and mitigating food supply chain risks the factors to consider are: Trust and Governance. These have to be supported by the appropriate Internal Controls which will eventually lead to a good Supply Chain Relationship.

#### CASE EXAMPLES

##### 1) China milk scare

In November 2008, the milk scare materialised after milk and milk powder was found contaminated with Melamine. Kidney dysfunction caused by the Melamine led to 240,000 infants being affected with 50,000 hospitalised and six deaths were confirmed (WHO, 2008). Although this was a case of deliberate contamination the global dimension of the problem was only apparent when the contamination was confirmed in New Zealand. Despite warning signs and tests confirming contamination the issue became public and production at 'Sanlu' stopped only when 'Fonterra', a New Zealand based group who owns 43% stake in 'Sanlu', confirmed the contamination and informed the New Zealand Government which in turn notified the Chinese Government and the WHO (Vaudine England, 2008). This led to a trade recall of products with Chinese milk derivatives in it

and at least eleven countries stopping all imports of Chinese dairy products. Non fatal cases were reported from Asian countries like Hong Kong and Taiwan and contaminated products were identified as far as the Netherlands and USA. Besides milk, Melamine was also found in derivatives like frozen yogurt dessert, biscuits, candies and in coffee drink. The recalls cascaded down leading to major recalls by global giants like Tesco recalling the white rabbit candy from its UK stores, Cadburys recalled all 11 products made in its Beijing factory supplying to Australia, Hong Kong, Taiwan besides China (Reuters, 2008a). Heinz, Nestle, Unilever and Starbucks also responded with similar recalls or substitutions in Southeast Asia (New Mexico Business Weekly, 2008; Coghlan, 2008). News articles suggest that this was not an isolated case and that Melamine has been used previously by poor farmers, milk collectors and milk dealers as "protein powder" to enrich test results for milk produced by weak or malnourished cows. Also, the literature suggests that Melamine can enter the food chain through the use of pesticides like Cyromazine. Testing at lower levels of the supply chains like farmers and marketers is difficult as it can be expensive and time consuming (Coghlan, 2008; Reuters, 2008b ; Fairclough, 2008).

## 2) Sudan 1

Another recent case of food contamination which affected the UK was the detection of Sudan 1 dye in Worcester sauce produced by Premier foods, a UK based food manufacturer. Sudan 1 dye was identified as a contaminant in chilli powder and is associated with increased risk of cancer. Sudan 1 was first identified in a consignment of Worcester Sauce exported to Italy. This led to a recall of over 580 products mostly ready meals, snacks, sauces and drinks. (FSA, 2005; BBC, 2005). Although inspection requirements were in place to test Sudan 1 on all chilli powder being imported into the UK since 2003 but the contaminated consignment identified in 2005 was reported to have originated before 2003. Considering the long shelf life of both chilli powder as well as the final products like sauces and snacks the recall of products required extensive coordination between local authorities and the Food Standards Agency (FSA). A review of the incident was commissioned to be carried out by an independent panel. The report identified major failures in communications and coordination between agency, industry and the local enforcement authorities (FSA, 2007).

## FACTORS AFFECTING THE ABILITY OF THE INTER-FIRM NETWORK TO ALLEVIATE SUPPLY CHAIN RISK

### 1. Trust

A high degree of trust between the partners in a buyer-supplier relationship is favourable for co-ordinated behaviour, whereas low trust leads to competitive behaviour (Anderson and Narus, 1990). Long-term relationships and trust encourage effective communication, information sharing and joint pay-offs (Dwyer, et. al., 1987; Ring and Van den Ven, 1992). Liker et. al. (1995) link the concept of trust to mutual dependency, "Trust as mutual dependence suggests that each party realizes that it has much to lose by endangering the relationship." Within a food supply chain trust is very important when traceability and transparency are difficult to achieve. In the food industry, as in others, one strategy for safeguarding quality is investment in long term relationships with trustworthy suppliers, rather than chasing lower prices by constantly putting contracts out for bidding (Roth, et. al., 2008). Trust built up through long term relationships also requires a mutual agreement to meet international certification standards and other auditing requirements. Alternatively, certification programs, shared values and reciprocity in benefits can help in developing trust and long-term relationship.

### 2. Governance

As food supply chains get global and complex it is getting extremely difficult for individual companies in the supply chain to monitor the supply chains themselves. To add to this, legal obligations to consumers have increased for supply chain entities: for e.g. under the

EU law, retailers and brand owners have a legal responsibility for their brands (Business Standards, 2008). Food certification programs provide an alternative to purely market or regulatory mechanisms in the global marketplace (Roth, et. al., 2008). ISO 22000 standardises global food safety standards and emphasises interactive communication and traceability right through the supply chain. The Sanitary and Phytosanitary Measures Agreement or SPS is an international agreement on food safety and animal and plant health standards that sets out the basic rules. However, it allows individual countries to set their own food safety standards. Member countries are encouraged to use international standards, guidelines and recommendations where they exist. If an exporting country can demonstrate that the measures it applies to its exports achieve the same level of health protection as in the importing country, then the importing country is expected to accept the exporting country's standards and methods (<http://spsims.wto.org/>).

### 3. Relationship

Supply chain relationships have been seen to be an important aspect of managing supply chains. Research has concentrated on the actual dynamics of the supply chain and the role of each entity at the inter-organisational boundary. Some of the researchers have tried to work on developing Relationship assessment programmes (Lamming, et. al. 1996) which have tried to focus more on Vendor assessment. The emphasis upon managing the supply chain as a source of competitive advantage has led many organisations to reassess the role of the supplier within their own ability to achieve or sustain competitiveness and customer service. Within the food supply chain, better relationships could help to reduce opportunistic behaviour and facilitate better implementation of food safety thus reducing the proliferation of the food risk through the global supply chain.

### 4. Internal controls

Some of the Internal controls which an organisation within the food supply chain can utilise to manage/ mitigate supply chain are:

IT disaster recovery plans.	Mission critical assets and activities identification
Recall procedures	Scenario planning
Crisis Management Team / Incident Management Team	Relocation readiness
Risk registers	Continuity planning with suppliers and customers.
Risk analysis and categorisation (Likelihood/ Impact)	Supplier compliance audits and risk diagnosis

### DISCUSSION AND CONCLUSION

The paper has presented insights from a preliminary qualitative study conducted to explore the effect of Inter-firm networks on alleviating risks within the international food supply chain. The analysis of literature and the case examples (two of which are depicted in the paper) showed that four factors were important for managing and mitigating risks within the international food supply chain. These factors are depicted in figure 1 below:

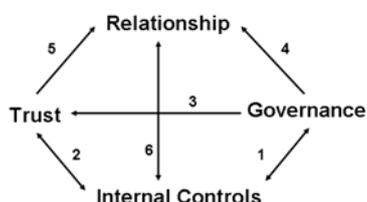


Figure 1: factors important for an inter-firm network

Since inter-firm networks tend to create motivation and social contracts for working together towards a common goal, it can be implied that in relation to international food supply chains and issues regarding food safety and contamination, the formation of inter-firm food supply chain networks may invoke a collective sense of responsibility towards managing and mitigating risks. In order to create these networks, the factors depicted in figure 1 are important. It can be argued from both sides: that these factors may facilitate inter-firm networks, whereas having inter-firm networks may facilitate trust among the supply chain entities, lead to better governance and eventually form 'win-win' supply chain relationships. The focus of this paper however, is in considering these factors only from the point of creating enablers and drivers within the food supply chain to manage and mitigate risks across international boundaries. With reference to figure 1 the links can be explained as follows:

- 1) Governance will define the internal controls required within individual organisations and the network, reciprocally, when the internal controls are set in it will lead to better governance of the food supply chain,
- 2) Setting up of the appropriate internal controls will lead to trust among the supply chain members, reciprocally, trust within the members will lead to common network – spanning controls,
- 3) Implementing internationally recognised governance mechanisms will lead to trust among the members,
- 4) Implementation of governance mechanisms within the network will help to form better relationships among the supply chain members, coupled with,
- 5) Trust will help in maintaining and sustaining the relationship and the required motivation and collective focus to manage and mitigate risks,
- 6) A good relationship among the members will mean that each member will follow the network- spanning controls, reciprocally, a good supply chain relationship will enable the members to modify and implement new controls on a dynamic basis.

Although, the model seems to be simplistic, the relationship between the four factors as depicted through the links is complex and dynamic. A vertical Keiretsu, which is a form of inter-firm network has been an important part of the Japanese industry (widely used within the Japanese automotive sector). Williamson has suggested (1985, pg. 120) that the 'unusual relationship' between Toyota and its' subcontractors arose as Toyota could emphasise to the network that they all faced a common destiny. According to Edwards and Samimi (1997), the lead firm in the vertical keiretsu (inter-firm network) developed punishment and reward systems to maximise co-operation, i.e. relational contracting, continual monitoring of supplier performance, etc. This suggests that controls and governance will play an important role in the operation of an inter-firm network. Hagen and Cho (1998), mention that institutional sanctions help to foster cooperation and eventually trust. Hence, in order to reduce food contamination and increase cooperation between the food supply chain partners the factors leading to inter-firm networks should be studied in detail. The next phase of the research will endeavour to operationalise the links and empirically test out the factors for their strength in alleviating food supply chain risks.

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#### REFERENCES

Agiwal, S., Hamid M. (2008) "Risk mitigating strategies in the food supply chain", paper presented at the American Agricultural Economics Association Annual Meeting, Orlando, FL, July 27-29, 2008

Anderson, J.C., Narus, J.A. (1990) " A Model of Distributor Firm and Manufacturer Firm working Partnerships", Journal Of Marketing, Vol. 54, January, pp 42-58.

BBC (2005) Food recalled in cancer dye scare, 18<sup>th</sup> February 2005.

Business Standard (2008) Feeding the food chain, 28 May 2008, ([http://www.businessstandards.com/Articles/080528\\_BS23\\_FoodChain](http://www.businessstandards.com/Articles/080528_BS23_FoodChain))

Coghlan, A.A.R. (2008) Melamine 'widespread' in China's food chain. *New Scientist*, September 23rd.

Dwyer, F. R., Schurr, P.H., Sejo Oh,(1987) "Developing Buyer- seller Relationships", *Journal of Marketing*, Vol. 51, April, 11-27.

Edwards, C, T., and Samimi, R. (1997) Japanese inter-firm networks: exploring the seminal sources of their success, *Journal of Management Studies* 34:4 July 1997

Fairclough, G. (2008) Tainting of Milk Is Open Secret in China, *The Wall Street Journal*, November 3.

Fearne, A., Hornibrook,S., Dedman, S.(2001) "The management of perceived risk in the food supply chain: a comparative study of retailer-led beef quality assurance schemes in Germany and Italy", *International Food and Agribusiness Management Review*, 4, 19-36

FSA (2005) 3rd April, 2005-last update, Sudan dyes, Available: <http://www.food.gov.uk/safereating/chemsafe/sudani/> [15th May, 2009].

FSA (2007) Report of the Sudan1 Review panel, 23<sup>rd</sup> July, 2007-last update, Available: <http://www.food.gov.uk/multimedia/pdfs/sudanreview.pdf> [15th May, 2009].

Granovetter, M. (1985) "Economic Action and Social Structure: The Problem of Embeddedness", *American Journal of Sociology*, 91,3, 481- 510

Gouldner, A. W. (1960), "The Norm of Reciprocity: A Preliminary Statement", *American Sociological Review*, 25, 161-179

Hagen, J.M. and Choe, Soonkyo (1998) "Trust in Japanes Inter-firm relations:Institutional sanctions matter", *Academy of Management Review*, Vol. 23, No. 3, pp 589-600

Kleindorfer, P., & Saad, G., (2005) "Managing disruption risks in supply chains", *Production and Operations Management*, 14, 53–68

Lamming, R.C., Cousins, P.D., Notman, D.M. (1996) "Beyond Vendor assessment: the relationship assessment project", *European Journal of Purchasing and Supply Management*, Vol.2, No. 4, pp 173-181.

Liker, J. K., Kamath, R. R., Nazliwasti, S. and Nagamachi, M. (1995) Integrating suppliers into Fast-Cycle Product Development in Engineered in Japan: Japanese Technology Management Practices (Eds, Liker, J. K., Ettlie, J. E. and Campbell, J. C.) Oxford University Press: Oxford, pp152-216

Lincoln, J.R., Gerlach, M. L., Ahmadjian, C.L. (1996) "Keiretsu Networks and Corporate Performance in Japan", *American Sociological Review*, 61, 67-88.

Maloni, M.J. and Brown, M.E. (2006) "Corporate Social Responsibility in the Supply Chain: An Application in the Food Industry", *Journal of Business Ethics*, (68:1), pp. 35-52

New Mexico Business Weekly (2008) Heinz to stop using Chinese milk in its products, 30<sup>th</sup> September.

Peck, H. (2006) "Resilience in the Food Chain: A Study of Business Continuity Management in the Food and Drink Industry". Final Report to the Dep.for Environment, Food and Rural Affairs, Dep.of Defence Management & Security Analysis, Cranfield University, Shrivvenham, pp. 1–193

Reuters (2008a). Cadbury Withdraws China Chocolate on Melamine Concern. Business News for Food Industry, 29th September.

Reuters (2008b) Melamine use rampant in China feed business, Reuters, 25 Sept.

Ring P.S., Van de Ven (1994), "Development Processes of Cooperative Interorganizational Relationships", Academy of Management Review, 19, 1, 90-118

Roth, A.V., Tsay, A.A., Pullman, M.E. and Gray, J.V.,(2008) "Unraveling the food supply chain: Strategic insights from China and the 2007 recalls", The Journal of Supply Chain Management, 44(1), pp. 22-39

Sheffi, Yossi (2005) "The Resilient Enterprise", The MIT Press, 2005

Sheffi, Yossi and James B. Rice Jr.,(2005) "Building the Resilient Enterprise", MIT Sloan Management Review, Vol. 47, No.1, Fall 2005

Sydow, J. (1992) "On the Management of Strategic Networks", in H. Ernste and V. Meier (Eds.), Regional Development and Contemporary Industrial Response, London, UK: Pinter, 115-131

Sydow, J., Windeler, A. (1998) "Organizing and Evaluating Interfirm Networks: A Structurationist Perspective on Network Processes and Effectiveness", Organization Science, Vol. 9, No. 3, Special Issue: Managing Partnerships and Strategic Alliances, May- June, pp. 265- 284

Vaudine England (2008) Why China's milk industry went sour. BBC, 29<sup>th</sup> Sept.

WHO (2008) Toxicological and Health Aspects of Melamine and Cyanuric Acid: Report of a WHO Expert Meeting 2008

Williamson, O. E. (1985). The Economic Institutions of Capitalism- Firms, Markets, Relational Contracting. New York: The Free Press