Opportunities and Pitfalls Associated with Coordination Structures in Supply Chain Management: An Exploratory Case Study

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Abstract **— Supply chain management has recently received considerable attention with an aim to reduce production costs, manage risks, reduce delays, maximize profit, and improve the quality of products, with the result of increased competitiveness and profitability for all stakeholders. It is in this context that this paper investigates what coordination structures (focal, mediated or collaborative) are adopted by supply chains in an attempt to conduct integrative planning. We investigate what coordination structure is required by the focal firm to successfully manage supply chain activities. This paper draws on evidence from the extant literature and demonstrates the prevalence of the newly defined coordination structures in the manufacturing of complex products with a multitude supply chain based on findings from exploratory case studies. Potential opportunities and pitfalls associated with each of the coordination structures in regards to governance, supply risk, quality and supplier involvement practices are examined. Hypotheses are developed to help understand the impact of coordination structures on various supply chain activities. Previous studies have not considered the potential pitfalls and opportunities for the focal firm in choosing to adopt a particular coordination structure in the complex products manufacturing industry, which poses specific regulatory considerations. The two explanatory case studies also consider the perspective of tier 2 suppliers, which are not commonly considered in the supply chain literature. Moreover, this research is able to demonstrate that there is no such coordination structure as one size fits all, and instead illustrates that even different component supply chains in the same organisation can have different coordination structures.**

Keywords **—** *Supply Chain Management; Coordination; Centralisation; Decentralisation; Collaboration; Information Structure; Complex Products Manufacturing, case study*

1. Introduction

Supply Chain Management (SCM) is multidisciplinary and inarguably complex. A supply chain aims at producing and delivering products to meet customer needs at the right time, to the right location, and in right quantity through direct and indirect involvement of various stakeholders [17], [68]. Collaborative and integrative planning among the various echelons of a supply chain is one of the most strategic objectives as it provides significant opportunities for all stakeholders. Most organisations focus only on the management and planning of physical and financial resources in the supply chain whilst undermining the importance of knowledge and information related intangible aspects [8], [80]. When managers and decision makers of various supply chain tiers have incomplete information and minimal incentive to share knowledge a lack of coordination exists across the supply chain [87]. Thus, to achieve supply chain objectives, firms need to conduct a series of SCM activities [46] or routine processes for the alignment of activities in order to achieve efficient coordination [46]. This creates an agile and adaptable supply chain [46]. Henceforth, a specific consideration of this research is the aligning of SCM activities such as quality management, governance, risk management and supplier involvement practices to facilitate effective coordination in the supply chain.

With this backdrop, we consider the paradox of potential opportunities and pitfalls that can be realised when adopting approaches that involve direct coordination of tier 1 and tier 2 suppliers by the focal firm as opposed to the delegated coordination by the focal firm of its tier 2 suppliers, by their tier 1 suppliers, across the supply chain. We describe pitfalls and opportunities as mechanisms that deteriorate or enhance value, respectively [47].

Although research interest in the importance of SCM is growing, there are notably a number of definitions of SCM that exist in the extant literature. This study considers the most relevant definition of SCM by McLaren, Head & Yuan [53] as the best fit for the purpose of this study. McLaren et al [53] state that SCM

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"involves the coordination of an organisation's internal planning, manufacturing, and procurement efforts with those of its external partners". This definition in particular focuses on the coordination element in SCM that is the main focus for this paper. This level of coordination in the supply chain requires a well-defined structure [72]. Hence, Malone [52] defined coordination structure as a "pattern of decision-making and communication among a set of actors who perform tasks in order to achieve goals." The context of this study perceives these actors to be the focal firm, tier 1 and tier 2 suppliers in a supply chain.

The allocation of resources towards coordination of different aspects of SCM such as governance, supply risk, quality and supplier involvement practices, has been debated in the extant literature [40], [84], [43], [41]. We consider these four dimensions as specific value adding supply chain activities. Through focusing on coordination of these activities in SCM, focal firms can respond more quickly to demand and reduce inefficiencies along the supply chain. Therefore, a more specific outcome for this research is the amount of coordination and control the focal firm should have in order to successfully manage its tier 1 and tier 2 suppliers in regards to supply chain activities.

2. Literature Review

2.1 Aligning Information Structure with Coordination Structure and SCM Activities

Organisations are accustomed to keeping information, such as core competencies, close to them in the form of private information [63]. When organisations choose not to share information it results in sub-optimal system performance leading organisations to resort to formal structures to enforce provisions for specific information sharing [64]. Benefits in effective information exchange can enable the focal firm and their suppliers to leverage complementary resources and capabilities with benefits such as lower obsolescence and more efficient asset utilisation [39].

Anand & Mendelson [4] propose an inherent link between the concept of market or supply chain structure and information structure, as this is important to the success of any supply chain, as evident from the supply chian of Dell Computers [44]. Malone [52] defines information structure as a structure that determines how members perceive and communicate information across the supply chain. Anand & Mendelson [4] argue that both the information structure and the supply chain structure should be aligned and synchronised, especially in regards to specific activities in regards to SCM. In this context, the ability of organisations to manage the flow of information along the supply chain is particularly relevant to this study.

It is important to examine the flow of technical information along the supply chain and how it can contribute towards specific capabilities of the various entities in the supply chain [59]. According to Lee [48] effective information integration in the supply chain requires sharing of demand information, promotion plans, demand forecasts, and shipment schedules as well as coordination of forecasting and replenishment [65]. This level of information can be codified and documented and therefore is easily transferable across supply chain entities [4]. When this information is embedded in a specific context, it has the potential to become valuable knowledge [35]. An understanding of a firm's context specific knowledge can enhance an organisation's capabilities as well as contribute to the capabilities of the supply chain when it is shared among entities.

The ability to extract knowledge from one place and apply it to another is highly sought after. These knowledge sharing practices however are dependent upon the willingness of groups or individuals to share their tacit understanding to provide mutual benefit [26], [74]. Alavi & Leidner [3] claim that the most important aspect of knowledge management is the potential to extract and apply knowledge to where it is needed the most. One reason why this practice is so difficult and complex is characterised by the fact that some knowledge is distinctive to specific contexts including people, technology, structures and environmental conditions [6]. Moreover, not all types of knowledge are equally transferable which consequently requires the development of routine, systems and practices for sharing knowledge among organisations [5]. Since the conception of terms such as knowledge management the focus of organisations has shifted to how tacit knowledge can be extracted from a context and applied to another based on an organisations needs, this type of knowledge is hard to transfer [74]. Explicit knowledge on the other hand, is more easily shared [57].

Anand & Mendelson [4] believe that information structure and information systems underpin an integrated architecture for a supply chain. In essence, information systems can be used for effective SCM in providing timely planning and information processing along the entire supply chain, if managed appropriately.

2.2 Information Systems

Organisations in the present business environment are demanding visibility of their supply chain through an integrated approach. However, implementing the best information system infrastructure does not guarantee

effective supply chain management [23]. This suggests that information systems or information communication technologies (ICT) are merely a support structure in SCM and not a process in itself that breeds superior performance in the supply chain. ICT includes technologies such as the Internet, intranet, electronic data interchange (EDI), enterprise resource planning systems, and the use of email for constant communication. When information or data is received and shared across the supply chain through deployment of information systems, it is rendered into knowledge through its application, and therefore can lead to enhanced decision-making and consequently improvements in business process performance [58],[62].

Investment in ICT infrastructure in the supply chain has the potential to free buyers and management from day-to-day problems and enables them to focus on long-term analytic work and planning [41]. "Relationship-specific IT investments undertaken by one or both parties through customisation enhance the integration of the supplier's IT solutions and the buyer's IT Infrastructure" [39]. Further benefits of an improved IT infrastructure include price reduction or savings, inventory reduction, reduced clerical work, and better delivery and service [41]. Delayed, scarce or distorted information hold serious ramifications in the supply chain [61]. Therefore, integrated information systems for information and knowledge sharing processes play a pivotal role in adding value in supply chain activities [28]. Integrated information systems need to be embedded into organisations so that they can link coordination structures and relevant supply chain activities across supply chains.

In the next section, we will analyse a variety of theoretical paradigms that are particularly relevant to SCM and more specifically to the context of this research in regards to coordination structures. This will include theories such as agency theory, transaction cost theory and lastly coordination theory.

3. Theoretical Frameworks

Coordination theory provides the backbone for this paper as it provides the basis for the supply chain structures, however transactional cost theory and agency theory are equally applicable for the context of this research.

3.1 Agency Theory

Agency theory can be used in supply chain research to assess the situation where the focal firm delegates responsibility and accountability to their suppliers to manage processes further downstream in the supply chain. A decentralised coordination structure requires significant delegation and responsibility to tier 1 suppliers. The complexity that arises as a result of this delegation downstream of the supply chain can be analysed from an agency theory perspective. Eisenhardt's [22] agency theory focuses on the potential for conflicting interests that may arise when one entity delegates authority to a second to act on its behalf. Supply chain members are left to choose between activities that benefit their organization or the supply chain as a whole [38]. This becomes an issue as the focal firm cannot monitor the actions of their suppliers without an associated cost. Agency theory can also be applied to consider the problem of risk sharing that can arise when the focal firm and suppliers have different attitudes toward risk [22]. From this perspective supply risk is associated with the variability of outcomes, lack of knowledge of potential outcomes and the uncontrollability of supply chain partners [87]. The issues arise when organisations are not able to recover quality from the negative effects of disruptions [32], which include financial losses, negative corporate image, and a loss in demand [36].

Reward structures and risk sharing are important aspects to consider when assessing contracts that act as a means of governance in supplier relationships. Empirical evidence suggests when a focal firm has an opportunistic mentality it leads to negative economic consequences for the relationship between buyer and supplier [55]. In supply relationships, organisations that do not focus resources in establishing relationships with their suppliers are at an increased risk, as governance mechanisms such as trust and loyalty do not exist. The relative cost saving gained by consistently engaging suppliers that provide the lowest unit price may not provide the best outcome in the long term.

3.2 Transaction Cost Theory

Transaction cost theory is closely related to agency theory but more specifically covers the issues encountered within this research regarding governance in the supply chain context. Moreover, transaction cost theory provides a lens with which we can critically view investments in resources within inter-organisational relationships in SCM. Transaction cost theory suggests key characteristics that may arise from specific transactions across entities. There are two behavioural assumptions that are the basis for transaction cost theory [82]. Bounded rationality refers to how a complete evaluation of all the consequences of a particular transaction is not necessarily considered. In the context of this study, the impact of bounded rationality depends upon the knowledge of the end customer that the

focal firm can draw on in determining which products and supplier to choose for the manufacture of their products. Bounded rationality is also relevant where the focal firm has to consider whether to keep activities that are not within their core competency within their organisation, or whether to delegate these activities to suppliers. The lack of expertise in areas outside an organisations core competency creates a gap for opportunistic behaviour. Organisations are becoming increasingly inclined to outsource activities that are not within the scope of their core competence to maximise efficiencies. Specific suppliers can use their knowledge and expertise to their advantage when liaising with the focal firm. A focal firm's decision to keep activities within their organisation or delegate or outsource activities at a cheaper cost is a paradox faced by many. Hence bounded rationality provides a basis for behavioural uncertainty, which also strains buyer-supplier relationships.

Williamson [82] considers that people act in self-interest that will be apparent in transactions. This can be the case when suppliers exaggerate their capabilities to the focal firm which would lead to an over commitment on the part of the focal firm. This issue of over commitment will eventually affect the focal firm if suppliers are not able to deliver components on time to the agreed specifications. Tier 1 suppliers can commit to the management of tier 2 suppliers by accepting the responsibility for sub assembly, but these tier 2 suppliers will not have visibility of what the focal firm's expectations are in regards to SCM activities. The focal firm has to trust their tier 1 supplier to act in the best interest of the focal firm by engaging sub tier suppliers that are aligned to the quality requirements of the focal firm.

Incentives have been cited in the extant literature as mechanism with which to remove the opportunistic behaviour proposed by transaction cost theory [82]. When manufacturers provide increased incentives to suppliers, there is an increased likelihood that the supplier's decisions will support the manufacturer's strategy [43]. The incentives provided can be in the form of mutual benefits that can be achieved through supply chain efficiencies.

3.3 Coordination Theory

The theoretical underpinning behind this paper is based on an exploration of coordination theory. Coordination in the supply chain involves the integration of financial, physical as well as informational flows along the supply chain. Malone & Crowston [51] coined the term coordination theory to analyse specific coordination mechanisms apparent in organisations. Coordination theory is built on the basis of understanding activities called coordination mechanisms, which are used to manage various interdependent activities and resources, as well as activities that directly contribute to the output of a process or task. In fact, coordination has been defined as managing dependencies among activities [51]. This definition is in line with a number of other organizational theorists who have similarly emphasized the importance of interdependence of organizational activities [75], [45].

The context of this research considers coordination in relation to the complex products manufacturing industry, which poses specific regulatory considerations. Coordination is imperative in the supply chain otherwise "Just-in-Time processes fail, production stops, and any planned mutual advantage cannot be achieved" [54]. The extant literature proposes a number of different supply chain coordination structures, while we do not refute their existence they are not particularly relevant to this research context so we aim to focus on coordination structures that we believe to be essential in real supply chains. The first coordination structure is defined as a centralised coordination structure [52], [81], [4]. A centralised coordination structure refers to the situation where the focal firm makes all the decisions using information gathered from all entities. The second, a decentralised coordination structure involves individual entities making their own decisions based solely on their local knowledge [52], [81], [4]. A third fully distributed coordination structure for decision-making is proposed by Anand & Mendelson [4]. A fully distributed coordination system is where all the data is shared end-to-end; hence each entity makes decisions based on all the data and knowledge available.

Examples of coordination theory have been studied through the application of one or more of the theoretical structures mentioned above. Stank, Crum & Arango [71] studied the inter-firm coordination processes that exist as a result of effective communication, information exchange, partnering and performance monitoring in the supply chain. Cheng, Federgruen & Zheng [16] examine the value of coordination for a distribution system with one supplier and multiple retailers. Simatupang, Sandroto & Lubis [67] assess how supply chain coordination is driven by determinants, namely the association of supply chain coordination with responsibility interdependence, uncertainty and inter-functional conflict. Howleg & Pil [33] assess coordination in the supply chain from a theoretical perspective when looking at information and physical flows as well as the complex rationales driving supply chain evolution.

4. Research Aims and Objectives

This research considers a company in the Australian complex (or advanced) products manufacturing industry as the focal firm, and considers respective downstream suppliers (tier 1 and tier 2), refer to Figure 1. The complex product manufacturing industry is particularly interesting as it is characterized by rapid technological change and rapid pace of innovation, both of which renders supply chain scalability, flexibility and adaptation as a critical competency [48].

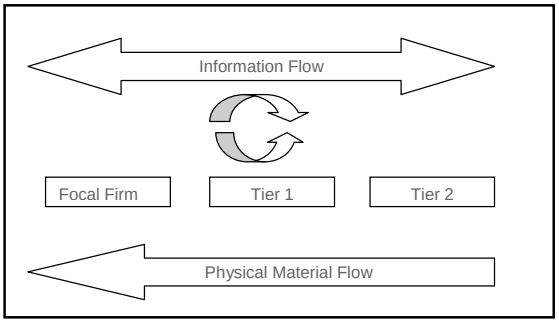

Figure 1. Illustration of Downstream Supply Chain in the Australian complex products manufacturing industry.

It is this context that this paper seeks to investigate the prevalence in practice of a centralised, decentralised and or collaborative supply chain structures as identified by coordination theory. In doing so, we examine the potential opportunities and pitfalls that exist with the adoption of one or the other coordination structure in regards to specific supply chain activities (refer to Figure 2). This paper will demonstrate a number of hypotheses as a direct result of the observations from the exploratory case study. We will then demonstrate the need for further research in this field.

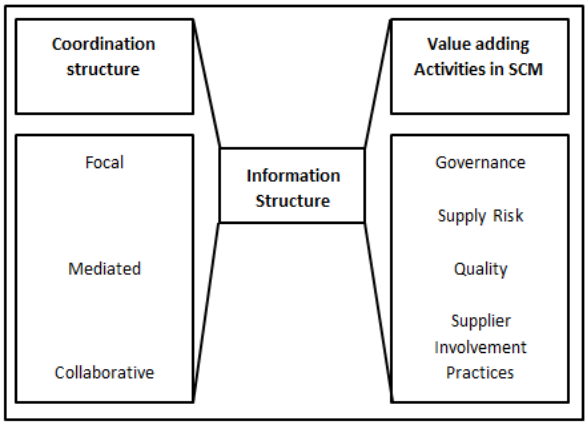

Figure 1. Illustration of a framework representing the link between the coordination structure and specific supply chain activities.

The next section will develop the assumptions and meanings behind each coordination structure.

5. Theory Building

5.1 Coordination in the Supply Chain re-defined

SCM literature reveals that there is a lack of information available on the structures required to successfully manage tier 2 suppliers, as the emphasis is mainly on tier 1 suppliers [67]. Ineffective knowledge transfer between manufacturers and tier 2 suppliers leads to decision-making based on assumptions, which in turn contributes to wastage of resources [83]. Moreover, the lack of consideration of tier 2 suppliers by the focal firm leaves room for uncertainties [42]. Direct communication with tier 2 suppliers is pivotal in the supply chain for the focal firm to supply products to its end customer. The focal firm needs to understand that without consideration of tier 2, they could face a situation where their lack of knowledge of their sub tier suppliers leads to poor quality deliverables to end customer. The search for stable relationship mechanisms has arisen as a result of the impossibility for one company to have control of the productive flow of materials, from raw material supply to final product [9]. The next section will delve deeper into the proposed coordination structures to re-define the concepts in the context of this study.

5.2 Focal Coordination Structure

As discussed earlier in this section, the centralised coordination structure refers to the focal firm making all the decisions by using all the data available. The channel integrator approach is where one party, the focal firm, plays the key role in the supply chain by initiating direct contact and communication with many nodes along the supply chain [20]. The focal firm in this type of structure works closely with all entities in the supply chain. The theoretical concepts of the centralised decision making [4] and the channel integrator approach [20], coupled with case study analysis, was applied to coin a new coordination structure namely, a focal coordination structure, which is defined as:

The focal firm centrally coordinates supply chain operations for the supply chain based on information collected by themselves and from suppliers

As the focal firm is the closest to the end customer, it is expected that the focal firm would have access to extensive and highly valuable customer data. This customer data could be in the form of market research that demonstrates customer preferences, which directly

impacts the supply chain in its ability to forecast demand.. Therefore a focal coordination structure would entail the focal firm making decisions in regards to product design and demand planning (Refer to Figure 3a). This coordination structure is conducive to the focal firm taking on all accountability to coordinate and transfer information across their tier 1, tier 2 and beyond suppliers. In doing so, although the focal firm has visibility of all processes in tier 1 and tier 2 suppliers, tier 1's knowledge of tier 2 is minimal.

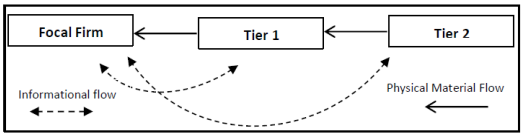

Figure 3a. Application of the focal coordination structure.

5.3 Mediated Coordination Structure

Anand & Mendelson [4] defined a decentralised coordination structure as occurring when an entity makes decisions based on its own knowledge. A dyadic management approach involves the focal firm managing suppliers in which they have immediate contact, their tier 1 suppliers [20]. These tier 1 suppliers are then expected to work closely to manage their immediate suppliers, and so forth [20]. The concept of a decentralised coordination structure and a dyadic management approach [20], coupled with case study analysis was used to define a mediated coordination structure as:

Individual entities in the supply chain have the responsibility to coordinate their activities with their respective supplier based on information provided by this supplier.

By this proposed definition, the focal firm expects their suppliers to be accountable for their own respective supply chain partners (Refer to Figure 3b). Although this supply chain structure passes the responsibility of the management of tier 2 suppliers to the tier 1 suppliers, a gap is present where the focal firm has little information or visibility of the tier 2 supplier.

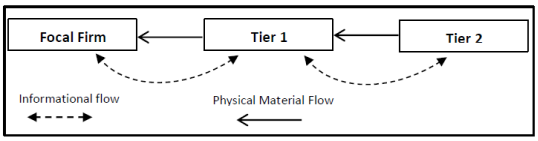

Figure 3b. Application of the mediated coordination structure.

5.4 A Fully Distributed Coordination Structure as a Collaborative Coordination Structure

For the purpose of this research, we propose that the fully distributed coordination structure defined by Anand & Mendelson [4] can be linked to the concept of collaboration as defined by Cao & Zhang [13] in the context of SCM. In both cases, we are referring to the amalgamation of supply chain operations decision-making with close information exchange to ensure the achievement of common goals and mutual benefits. In the context of this study, we propose that the two concepts of a fully distributed coordination structure and collaboration can be paralleled.

Managers have used collaboration in the supply chain/networks as a way to leverage the knowledge and resources inherent among supply chain members [1], [2]. The term supply chain collaboration has been defined by Cao & Zhang [13] "as a partnership process where two or more autonomous firms work closely to plan and execute supply chain operations toward common goals and mutual benefits." Some research studies have defined collaboration as a strategy [34]; however, we apply the concept of collaboration as a form of supply chain structure. Studies such as Moody [56] have used the terms "collaborative structure" or "collaborative network" in the context of their research and hence provide support for the use of collaboration in the context of our research. We define the third coordination structure, a collaborative coordination structure as follows:

A collaborative coordination structure when all supply chain members share all the information available to them to jointly make supply chain decisions.

This structure implies that all the data is shared so that partners can make informed decisions on supply chain operations based on all the data and knowledge available to the supply chain (Refer to Figure 3c.)

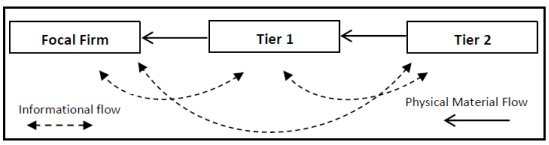

Figure 3c. Application of the collaborative coordination structure.

6. Valuing Adding Activities in SCM

The integration and coordination of entities along the supply chain is multifaceted. An understanding of the benefits of coordination promotes organizational relationships in order to encourage the sharing of information [64]. A supply chain is considered coordinated when all supply chain activities are aligned to meet system objectives [86], [46]. Supply chain activities include routine processes that are undertaken in order to ensure effective SCM.

Governance mechanisms are context specific in supply chain entities and hence a mismatch of governance structure causes performance losses, such as product design and delivery, in processes and workflows with external suppliers [43]. Quality and supply risk management are key components of SCM that are required for efficient SCM [24], [41], [39]. It is important to define the appropriate level of supplier involvement in order to gain maximum benefit [84]. The four aforementioned value adding activities in SCM are among others that have been cited in the literature, such as relationship management [70]; however in the context of this study we will consider a rather limited scope of the SCM activities. Next we will consider all four supply chain activities that we perceive to add significant value in SCM and their linkage to coordination structures.

6.1 Governance

Governance structures play an important role in maintaining structure and conduct for supply chain partners. Control structures that govern buyer-supplier relations are important, including joint planning, joint problem solving, collaborative communication and legal contract [12]. Governance mechanisms such as formalization, centralization and clannish behaviour provide certainty regarding roles and procedures for making decisions [69]. Formal contracts are not as influential as implicit contracts based on a set understanding [50]. In accordance with relational exchange theory, trust is a governance mechanism used to remove opportunistic behaviour from supply relationships [14], [2]. Various processes can be used to enhance coordination and compliance among supply chain partners such as open communication, trust, and transparency.

In a mediated coordination structure, responsibility and decision-making is delegated to suppliers, who have the most intimate knowledge of their surroundings (Hayek, 1945). Manufacturers requiring timely decision-making based on specialised information to operate in increasingly competitive environments will follow this strategy [48].

An aspect of this delegation responsibility given to suppliers is trust. Trust is important and can itself act as a self-enforcing contract that reduces vulnerabilities that exists in supply chain structures [14], [58]. Moreover, trust is necessary to remove opportunistic behaviour from supply relationships [14]. Hence, we propose that giving trust and responsibility to suppliers to manage their supply chain based on their specific knowledge, acts as effective governance mechanisms for supply chain management.

6.2 Supply Risk Management Practices

In recent times SCM has been proven to be no longer reactive to apparent risks but proactive in communicating with entities in the supply chain to identify and minimize the risks involved [88]. The effect of external events on supply chain has led to an increase in literature on supply risk [18]. A study of the effects of supply chain complexity found that poor information linkages and inflexible production systems can cause uncertainty in management systems and lead to minor shortages in supply [78]. The relationship between supply chain risk and activities that cause supply chain vulnerability includes various characteristics such as a firm's dependence on certain suppliers, the degree of single sourcing, or reliance on global supply chain sources, all contribute to supply chain risk [79]. U.S car manufacturer, Land Rover experienced significant supply chain disruptions in 2001 when one of their key suppliers of a Chassis, UPF-Thompson, filed for bankruptcy [66].

Kull & Closs [42] consider exposure of supply risk in a decentralised supply chain environment when tier 2 supplier failures occur and the impact it has on the supply chain. A practical example of supply risk that existed in a tier 2 supplier which mounted to millions of dollars' worth of damage is in the case of the German components supplier Robert Bosch who in 2005 delivered defective high pressure pumps for diesel fuel injection systems [79], [76]. The consequences of recent SCM trends that are pro collaborative engagement in supply chain contribute to increased inter-firm dependence as well as the vulnerability of the supply chain in unexpected events [30], [79]. Widely adapted concepts such as Just-In-Time manufacturing in order to create lean supply chains results in low inventories but add to supply chain vulnerability, due to a lack of safety stock with this type of supply chain configuration.

In a focal coordination structure, the decision-making responsibility is focused and centralised to one area of the supply chain. Here we suppose that the delegation of responsibility to various suppliers downstream will

increase the level of uncertainty in the supply chain as different decision-makers have different information and therefore would assess this information based on different assumptions [4]. An assessment of supply risk would take into consideration available resources, number of suppliers, competitive demand, make or buy opportunity, storage risks and substitution possibilities [41].

6.3 Quality Management Practices

The purpose of quality assurance activities and processes lies in their ability to contribute to the synchronization of inter-organizational operations by documenting processes, clarifying ambiguities and clearly defining responsibilities [27]. The implementation and maintenance of effective inter-organizational quality assurance programs has faced failure rates as high as 80% [37]. Empowerment and teamwork is the key to meeting quality objectives in organisations. This level of empowerment is not provided by a focal coordination structure as tier 1 suppliers are not responsible for quality outcomes of products of their tier 2 supplier.

Honda requires tier 1 suppliers to manage tier 2 suppliers as well as define common objectives and communicate Honda's quality performance metrics, delivery schedules, and other information to its suppliers [63]. Dell's approach to quality management is considered best practice in the way that they launched a Critical Supplier Partnership Program and saw a significant improvement in quality metrics. This Critical Supplier Partnership Program included fact finding, sharing of initial ideas, getting input and ownership from many areas with people at Dell and at the suppliers [73]. In the process Dell was able to develop specific processes to ensure adequate attention to strategic issues such as partnership growth, capacity planning, sharing of technology growth plans, software links and process improvement [73].

A mediated coordination structure would be most effective in managing quality. Quality management requires a decentralised approach where responsibility for performance in regards to quality needs to be delegated to the source [49], [24]. Context specific information is pivotal so that problem-solving action can be taken immediately and hence improves quality performance and outcomes for the entire supply chain. In a focal coordination structure, quality issues from the tier 2 supplier, that affects the tier 1 supplier, would be dealt with by the focal firm excluding the tier 1 supplier.

6.4 Supplier Involvement Practices

Mechanisms for coordinating the decisions on product design, manufacturing and delivery capabilities are still largely undetermined [60]. However, the rationale for involving suppliers at an early stage allows the focal firm to reduce its workload and focus on activities of core competence but also capitalise on the competencies and expertise of suppliers. The involvement of suppliers in product development allows for suppliers to gain an understanding of the culture of the focal firm, their requirements, and decision-making patterns which allows them to adjust and apply resources in the way that best suits the focal firm. However the involvement of suppliers in this phase is not regarded as easy. There are significant drawbacks in supplier involvement in product development where both the focal firm and supplier risk a loss of proprietary knowledge. The focal firm also has a reduction in the control over the development process. Gadde & Snehota [25] also agree that supplier involvement can be a resource demanding strategy. Wynstra & ten Pierick [84] argue that too much or too little of a particular resource allocated for supplier involvement practices is not effective in managing these engagements.

A focal coordination structure implies that the focal firm will make all decisions and hence not include suppliers in the product development stage. Research demonstrates that successful companies use suppliers' knowledge and input to gain optimum outcomes in the new product development stages [60]. Suppliers that are effectively integrated into supplier involvement practices at the focal firm can assist them to achieve the improvements necessary to remain competitive [29]. A focal coordination structure could face challenges in interpreting the diverse information that is necessary for optimizing the supply chain. Hence, it is important to demonstrate empirically how far a lack of supplier involvement practices can negatively impact the focal firm.

The next section seeks to explore the prevalence of the re-defined coordination structures in the complex product manufacturing industry through two exploratory case studies, which then facilitates our hypothesis for future research.

7. Exploratory Case Studies

7.1 Research Method

An exploratory case study was conducted in the Australian complex product manufacturing industry. The use of a case study methodology is highly relevant for the research at hand as it poses questions of 'how' and 'why'

and 'the focus is on a contemporary phenomena' within a real-life context [85]. Moreover our approach to interview the focal firm as well as their suppliers ensures that the issue is not explored through one lens, but rather a variety of lenses, which allows for multiple facets of the phenomena to be revealed and understood [11]. This methodology was chosen to understand whether our theoretical coordination structures existed in practise. Interviews were conducted on a focal firm (Company X) and their respective tier 1 and tier 2 suppliers.

Company X is a leader in the significant manufacturing of complex products with a multitude supply chain. Details of case studies and interviews conducted are listed below in Table 1.

Table 1. Summary of Sampling Frame

	Case Study 1		Case Study 2	
Interviews in focal firm and corresponding industry	2	Complex product manufacturing	2	Complex product manufacturing
Interviews in tier 1 and corresponding industry	1	Complex plastic injection moulding	1	Electronic component distributor
Interviews in tier 2 and corresponding industry	2	Diet cast solutions	1	Plastic injection moulding

All suppliers interviewed were suppliers of components in Company X's custom design product range, as well as categorised as a high spend suppliers; hence Company X allocates significant resources towards supplier management. Interviews were conducted on a one on one basis with the researcher and interviewees selected on the basis of their interaction with the respective focal firm and or sub-suppliers. The total sample size of the interviewees was eleven. All interviews were done using a semi-structured questionnaire and lasted thirty-five to forty-five minutes.

7.2 Findings – Case Study 1

Company X has customised product specifications for both tier 1 and tier 2 products and has self-sourced the components required for their manufacture. Company X places orders directly with the tier 2 supplier for these components, who then delivers components to the tier 1 supplier for subassembly. In conversations with the tier 1 supplier, it was clear that the tier 1 supplier had no direct relationship with this tier 2 supplier unless the situation was critical and their involvement was necessary.

"It was only during real critical issues when things were out of control that we were involved in the discussion"

All concerns that the tier 1 and tier 2 supplier had with each other were generally raised directly with Company X. From the perspective of tier 2, it was clear that they felt their customer was the focal firm and not the tier 1 supplier where their components were being used during sub-assembly.

"If we have any issues like delivery issues, quality issues or pricing issues we will go back to Company X because at the end of the day, they are the final customer, whereas tier 1, they are doing the final assembly".

A Company X manager explained that there are a number of reasons why the company has used a centralised approach to manage their tier 2 suppliers. Company X has previously used cost justifications to support this structure. Being a large company, Company X is able to negotiate competitive prices for expediting products that the tier 1 supplier cannot. The value of lower component prices is a direct benefit to Company X. Further, many of the tier 1 suppliers fall under the category of SME's and therefore do not have the capabilities or the finances to purchase and manage large amounts of stock. From a strategic perspective, Company X may require more or less stock than what is proposed in the forecast. Therefore with direct control of their tier 2 suppliers, Company X can alter the amount of stock required by their tier 1 supplier. This is a significant strategic advantage as often tier 1 suppliers may not foresee changing market conditions that the end customer, Company X, may be privy too.

However, this focal coordination has significant drawbacks, which are represented clearly in this present case study. Members of the procurement team at Company X acknowledge the fact that the tier 1 supplier is out of the loop. With Company X sending their purchasing requirements directly to the tier 2 supplier, but the products being sent directly from tier 2 to tier 1, Company X has no visibility or traceability of the component until it is booked in, based on what tier 1 reports. This is a significant drawback as Company X spends a considerable amount of money in purchasing inventory from the tier 2 suppliers that Company X themselves do not see.

Furthermore, the supply chain structure is managed such that the present tier 1 supplier does not have any responsibility or accountability for the products that it

receives from the tier 2 supplier. The relationship between buyers and suppliers exists only between the Company X and the tier 2 supplier. When the focal firm request the tier 1 supplier to conduct a risk assessment of their tier 2 supplier, they did not want to take accountability because the tier 2 supplier was chosen by the focal firm. The tier 1 supplier in this context felt that conducting a risk assessment for the focal firms supply chain was the responsibility of the focal firm itself.

"We do not conduct risk assessment for tier 2 suppliers. That was a responsibility that Company X needed to take on because we didn't choose them."

This significant gap in information flow poses an issue because of the lack of communication and coordination that exists between tier 1 and tier 2 when Company X is controlling these supply chain partners centrally (Refer to Figure 4).

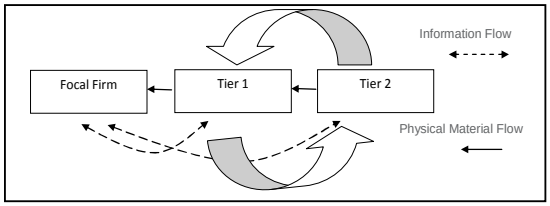

Figure 4. Illustration represents the lack of information flow linkage between tier 1 and tier 2 in a focal coordination structure.

As a result of the lack of coordination among tier 1 and tier 2, in the situation where tier 1 does not take responsibility for communicating faulty component information to tier 2, there is a significant loss in the potential for improvements.

"As a result of this scrap process reject at tier 1 being recognized only after the subassembly, Company X is unable to claim credit for the faulty parts at tier 2."

This demonstrates that the management of this present relationship between tier 1 and tier 2 adds significant implicit and explicit costs. In this case study it was evident that the tier 1 supplier wanted to take on greater responsibility for their processes and the management of tier 2 suppliers. The inclusion of tier 1 in the design processes was believed to provide better final products for Company X.

"The benefit to us is that we would be designing a more robust product. The current product we supply to Company X was completely designed with the product development team and very little involvement with tier 1, subsequent to that we've had a lot of problems moulding the product. …in hindsight that would have simplified the design process …and the final product would be a lot cheaper."

7.3 Findings – Case Study 2

The tier 1 supplier issues purchase orders directly to tier 2 based on their requirements. The tier 1 supplier for the case study works closely with Company X on projects where they are considered to have a close working relationship. The tier 1 supplier was said to spend a lot of time at Company X's manufacturing site. The nature of the product that Company X receives from tier 1 made it pivotal to have technical support. The tier 1 supplier is then expected by Company X to manage their respective suppliers (tier 2).

The components that the tier 2 supplier provides are based on specifications that are received from Company X. In this scenario, as a result of the lack of visibility of tier 2 by Company X, they communicate directly with tier 2 to understand operational issues or concerns in regards to component specifications. In doing so, the tier 1 supplier then is often not in the loop for vital information. Information exchanges that are taking place between tier 2 and Company X are unknown to tier 1 and hence feel as though they are not in the loop for relevant information (Refer to Figure. 5).

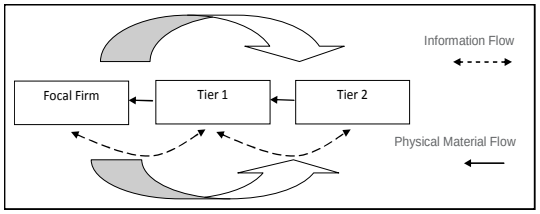

Figure 5. Illustration represents the lack of information flow linkage between tier 2 and the focal firm in a mediated coordination structure.

In this case, the tier 1 supplier feels they have to be prompted by tier 2 supplier for information in regards to Company X, which is often not ideal. The lack of clear communication and information transfer between them and Company X provides a challenge in this structure.

"It is dangerous for Company X to go to tier 2 and not tier 1 supplier. Because if there any changes set in place there and no tells the tier 1 supplier, then that leads to other issues such as wrong information going into certificate of conformances or mis-delivery because there could be changes there. So this is dangerous."

When Company X is said to communicate directly with tier 2 suppliers, it reduces the responsibility and accountability provided to the tier 1 supplier. The tier 1

supplier not only feels like they have the capabilities to manage tier 2 in this respect but also believes that it will reduce cost and effort at Company X.

"We (tier 1) have the capabilities to manage our suppliers. It would free up a lot of bandwidth that we can then channel that energy into other areas of our business where we are involved with Company X"

In this case study, tier 1 was considered to be proactive in raising quality concerns to both Company X and tier 2 when these issues arose. This level of proactive effort demonstrated by tier 1 can be attributed to the level of responsibility that has been provided to them by Company X.

"Tier 1 will arrange for their manufacturer (tier 2 supplier) to help us with our concerns (Company X) by direct site visit to us or teleconference."

8. Research Analysis

Through the exploratory case studies, this research is able to show that despite the focal firm for both case studies being the same, we cannot assume that one coordination structure can explicitly apply to all component supply chains. For this reason, even in a situation where both components are customised products, we can see the existence of two coordination structures. Furthermore, this study illustrated a more holistic understanding of tier 1 and tier 2 supply chain perspectives as opposed to other studies such as Anderson & Christensen [5] whose methodology only considered the perspective of tier 1 suppliers and did not take into account the perspectives of tier 2 suppliers. In adopting a focal coordination structure we can see that this approach may provide reduced environmental uncertainty because of the accountability and control being centred in one area. Supply risk is more highly associated with a mediated coordination structure because of its contribution to a bullwhip affect [76]. Thus we can attribute supply risk management as an opportunity for a focal coordination structure.

Supplier involvement practices are minimal in the focal coordination structure where the focal firm makes all the decisions in regards to product specifications to operational supply chain activities. This proves to be problematic in some cases where tier 1 suppliers have the capabilities to provide sourcing and design contributions with a potential to decrease time to market and reduced cost [84]. In a mediated coordination structure, trust in the form of responsibility for coordinating suppliers is given to tier 1 suppliers. Hence, we propose that governance mechanisms such as trust can be attributed to a mediated coordination structure. The use of trust as a governance mechanism can effectively reduce the exploitation of resources in partner firms in the supply chain. A lack of governance through trust as seen in the focal coordination structure was evident in case study 1 through the lack of direct engagement of tier 1 and tier 2 suppliers. Finally, we propose that the level of accountability that is given to tier 1 suppliers in a mediated coordination structure can also be related to improved quality management. A lack of responsibility in tier 1 and tier 2 suppliers for the quality management programs causes poor quality management. Table 2 shows a summary of the findings established through extant literature and the exploratory case studies.

Table 1. Summary of propositions from literature and exploratory case studies

Supply Chain Activities	Coordination Structure	
	Focal	Mediated
Governance	Pitfall	Opportunity
Supply Risk	Opportunity	Pitfall
Quality	Pitfall	Opportunity
Supplier Involvement Practices	Pitfall	Opportunity

These case studies have provided insight into scenarios where the focal firm maintains control and responsibility. We propose that the instinct of organisations in the complex product manufacturing industry is to expect visibility of their suppliers as a result of external regulatory and quality requirements by their industry specific standards. External regulatory bodies are among the institutions that demand companies have visibility of their component suppliers to ensure traceability. Hence, organisations in the complex product manufacturing industry are left to balance between maintaining competitiveness by focusing on core competencies such as R&D, and coordinating the operational level supply chain activities.

9. Future Research and Implications

Further empirical evidence is required to solidify the prevalence of our re defined coordination structures and their suitability in different industry contexts. Consequently, based on the literature review and the exploratory case studies demonstrated in the previous section, further research can be conducted to address the following research hypothesis:

H1. Effective governance in the supply chain is positively associated with a mediated coordination structure.

H2. Supply risk is negatively associated with a focal coordination structure.

H3. Quality management is positively associated with a mediated coordination structure.

H4. Supplier involvement practices are negatively associated with a focal coordination structure.

Our hypothesis focuses on the existence of two supply chain structures as there was no evidence of a true collaborative coordination structure in practice in our case study. We attribute this to the significant financial investment and complexities associated with a collaborative coordination structure and the stringent regulatory conditions of the complex product manufacturing industry. In practice, companies often struggle to adopt the ideal supply chain structure as the rapid pace of their growth renders their structure to be ad hoc as opposed to strategy based [48]. A number of studies have considered collaborative efforts to show considerable value added benefits in regards to SCM activities. For example, a study by Nyaga, Whipple & Lynch [58] show that dedicated investments in the collaborative structure has a positive impact on demonstrating commitment by the firm. However, it is important not to be blindsided about the potential pitfalls that exist with a collaborative structure as the implementation of such collaborative coordination structure has its challenges [19]. Studies have shown that collaborative supply chains are often initiated without consideration of the selection criteria of the supply chain partners, matching inter-organisational needs and capabilities, and without clearly defined standards, goals, and implementation procedures to cover the long term strategic horizon [21]. This creates room for a wider discussion around whether supply chain collaboration is able to benefit all members equally. Partnering can be unsuccessful as a result of over powering by a certain party, a lack of communication, lack of honesty about established goals, as well as poor performance [77].

Therefore, we propose that further research should study the prevalence of the third collaborative coordination structure, as well as its potential variance in its applicability to different industry sectors. From our exploratory case study, suppliers in a focal coordination structure were not conducting supply risk assessment, as it was a delegated responsibility of the focal firm. Further analysis needs to be conducted to assess the association between risk and a collaborative coordination structure. We posit that the lack of prevalence of a collaborative coordination structure may be attributed to the fact that risk is positively associated with a collaborative coordination structure. Therefore, we hypothesise:

H5. Supply risk is positively associated with a collaborative coordination structure.

Furthermore, through case study 2 it was clear that the tier 1 suppliers' contributions in the design phase of product development increased the value of the product. From this we can consider that the contribution of both tier 1 and tier 2 suppliers in the design phase would result in further value in supplier involvement practices, hence we hypothesise also that:

H6. Supplier involvement practices are positively associated with a collaborative coordination structure.

Another consideration for further research is off-shoring. The application of coordination structures in the context of off-shore suppliers (tier 1 and tier 2) could potentially demonstrate dissimilar attributes. Off shoring in particular requires correct processes as a result of the specific operational and structural risks that it poses to supply chains [7]. Hence we propose that off-shoring has the potential to impact upon the coordination structure and further research in this area is required to ascertain the key requirements in terms of structure for organisations that are pursuing off shoring strategies.

10. Conclusion

The primary objective of this paper was to understand which approaches to coordination structures was existent in practice. Previous studies have only considered the theoretical implications of coordination structures [4], [81]. This study delves into an examination of the implications that can be attributed to supply chain structures that are evident in a complex product manufacturing company. The context of this research had huge implications on the outcome for this research. This study has specifically operationalised potential opportunities and pitfalls of a focal coordination structure and mediated coordination structure in the context of the complex product manufacturing industry. Finally, this study showed the reality of more than one supply chain coordination structure in a focal firm demonstrating that there is no such coordination structure that can be applicable to all component supply chains.

This research is important in the context of SCM as it demonstrates to supply chain managers the prevalence of such coordination structures and the opportunities and

pitfalls that result. By understanding the particular implications of specific coordination structures, organisations will be able to better allocate resources, integrate information and knowledge, align practices and activities, and hence improve the efficiencies in the supply chain.

References

[1] Agarwal, R, Selen, W, "*Dynamic Capabilities Building in Service Value Networks for Achieving Service Innovation*". Decision Sciences, Vol 40 No. 3, pp. 432-475, 2009

[2] Agarwal, R, Selen, W, "*The incremental effects of dynamic capability building on service innovation in collaborative service organisations"*, Journal of Management and Organization, under print, 2013.

[3] Alavi, M, Leidner, D.E, "*Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues"*, MIS Quarterly, Vol 25, No. 1, pp. 107-136, 2001.

[4] Anand, K, Mendelson, H, "*Information and Organization for horizontal multimarket coordination"*, Management Science, Vol 43, No. 12, pp. 1609-1627, 1997.

[5] Andersen, P.H, Christensen, P.R, "*Inter-partner learning in global supply chains: lessons from NOVO Nordisk"*, European Journal of Purchasing & Supply Management, Vol 61, pp. 105-116, 2000.

[6] Argote, A, "*Group and organisational learning curves: individual, system and environment components*", British Journal of Social Psychology, Vol 23 pp. 31-35, 1993

[7] Aron, R, Singh, J.V, "*Getting Off shoring Right"*, Harvard Business Review, Vol 83, No. 12, pp. 135-143, 2005

[8] Ayers, J. B, *Handbook of Supply Chain Management*. Florida: Auerbach Publication. 2001

[9] Ballou, R.H, *Business Logistics/Supply Chain Management*, 5th ed., Prentice-Hall, Upper Saddle River, NJ, 2004

[10] Barrat, M, "*Understanding the meaning of collaboration in the supply chain"*, Supply Chain Management: An International Journal. Vol 9 No. 1. pp. 30-42, 2004.

[11] Baxter, P, Jack. S, "*Qualitative case study methodology: Study design and implementation for novice researchers*", The Qualitative Report, Vol 13 No. 4, pp. 544-559, 2008

[12] Cai, S., Yang, Z, Hu, Z, "*Exploring the governance mechanisms of quasi-integration in buyer-supplier relationships*", Journal of Business Research, Vol 62, pp. 660-666, 200

[13] Cao, M, Zhang, Q "*Supply Chain Collaboration: Impact on collaborative advantage and firm performance*", Journal of Operations Management. Vol 29, pp.163-180, 2011

[14] Cavusgil, S. T. Deligonul, S., Zhang, C. Curbing, *"Foreign Distributor Opportunism: An Examination of Trust, Contracts, and the Legal Environment in International Channel Relationships"*, Journal of International Marketing, Vol 12 No. 2, pp. 7-27, 2004

[15] Chen, F, "*Echelon Reorder Points, Installation Reorder Points, and the Value of Centralised Demand Information"* .Management Science. Vol. 44 No. 12, pp. 221-233, 1998.

[16] Chen, F. Federgruen, A. Zheng, Y.-S. *"Coordination Mechanisms for a Distribution System with One Supplier and Multiple Retailers"*, Management Science. Vol 47 No. 5, pp. 693-708, 2001.

[17] Chopra, S, Meindl, P, *Supply chain management: Strategy, planning and operation*. New Delhi: Pearson Education, 2003.

[18] Chopra, S & Sodhi, M, "*Managing Risk To Avoid Supply-Chain Breakdown "*, MIT Sloan Management Review. Vol 46 No. 1, pp 53-61, 2004.

[19] Corsten, D. and Kumar, N, "*Profits in the Pie of the Beholder"*, Harvard Business Review, Vol 81 No.5, pp. 22-23. 2003

[20] Cooper, Martha C., Douglas M. Lambert, Janus D. Pagh, "*Supply Chain Management: More Than a New Name for Logistics"*, The International Journal of Logistics Management, 8, 1, pp. 1-14, 1997

[21] Daugherty, P.J, Glenn, R.R, Roath, A.S, Min, S., Chen,H., Arndt, A, A. & Genchev, S.E, *"Is collaboration paying off for firms?"*, Business Horizons. Vol. 49, pp. 61-70, 2006

[22] Eisenhardt, K.M., *"Agency Theory: an assessment and review"*, Academy of Management Review, Vol. 14 pp.5*7-74*, 1989

[23] Fisher, M, "*What is the right supply chain for your product?"*, Harvard Business Review, Vol 27 No. 2, pp. 105-117, 1997.

[24] Flynn, B.B, Schroeder, R.G.,Sakakibara, S, *"A framework for quality management research and an associated measurement instrument"*. Journal of Operations Management, Vol 11 No. 4, pp. 339-366, 1994.

[25] Gadde, L. & Snehota, I, "*Making the Most of Supplier Relationships"*, Industrial Marketing Management, Vol 29 No .4, pp. 305-316, 2000.

[26] Goh, S.C "*Managing effective knowledge transfer: an integrative framework and some practice implication* , Journal of Knowledge Management, Vol 6 No.1 pp. 23-30, 2002.

[27] Gotzamani, K.D, Tsiotras, G.D, "*An empirical study of the ISO 9000 standards' contribution towards total quality management"*, International Journal of Operations & Production Management, Vol. 21, pp. 1326–1342, 2001.

[28] Gunasekaran, A, Ngai, E.W.T, "*Information systems in supply chain integration and management*", European Journal of Operational Research. Vol 159, pp 269-295, 2004.

[29] Handfield, R. B. Ragatz, G. L. Peterson, K. Monczka, R. M, "*Involving Suppliers in New Product Development?"*, California Management Review. Vol 42 No 1, pp. 59-82, 1999.

[30] Harland, C., Brenchley, R. & Walker, H, *"Risk in supply networks"*, Journal of Purchasing and Supply Management , Vol 9 No. 1, pp. 51–62, 2003.

[31] Hayes, R.H, Wheelwright, S.C, *"Link manufacturing process and product life cycles*", Harvard Business Review, Vol 57 No. 1, pp. 133–140, 1979.

[32] Hendricks, K.B & Singhal, V.R, *"Association Between Supply Chain Glitches and Operating Performance"*, Management Science, Vol 51 No. 5, pp. 695-711, 2005.

[33] Holweg, M , Pil, F.K, *"Theoretical perspectives on the coordination of supply chains"*, Journal of Operations Management, Vol. 26 , pp. 389-406, 2008.

[34] Imperial, M.T, *"Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs"*, Administration and Society, Vol 37, No.3 pp. 281-320, 2005.

[35] Irani,Z, Sharif, A, M, Love, P.E.D, *"Mapping knowledge management and organizational learning in support of organizational memory"* , International Journal of Production Economics, Vol. 122, pp. 200-215, 2009.

[36] Jüttner, U., Peck, H, Christopher, M, *"Supply Chain Risk Management: Outlining an agenda for future research*", International Journal of Logistics: Research & Applications, Vol. 6 No. 4, pp. 197-211, 2003.

[37] Kearney, A.T. *"Total quality - time to take off the rose tinted spectacles*" TQM Magazine. 1992.

[38] Ketchen, D.J, Hult, T.M., *"Bridging organization theory and supply chain management: The case of best value supply chains"*, Journal of Operations Management, Vol 25, pp. 573-580, 2007.

[39] Klien, R. & Rai, A, *"Interfirm strategic information flows in logistics supply chain relationships"*, MIS Quarterly, Vol 33, No. 4, pp. 735-762, 2009.

[40] Kim, B & Oh, H, *"The impact of decision-making sharing between supplier and manufacturer on their collaboration performance*", Supply Chain Management: An International Journal , Vol 10 No. 3, pp. 223-236, 2005.

[41] Kralljic, P, *"Purchasing must become supply management"*, Harvard Business Review, Vol 61 No.5, pp. 109-117, 1983.

[42] Kull, T. & Closs, D, *"The risk of second-tier supplier failures in serial supply chains: Implications for order policies and distributor autonomy"*, European Journal of Operational Research, Vol 186 pp. 1158-1174, 2008.

[43] Kumar, A, Heide, J.B, Wathne, K.H *"Performance implications of mismatched governance regimes across external and internal relationships"*, Journal of Marketing, Vol 75 , p 1-17, 2011.

[44] Kumar, S, Craig, S, *"Dell, Inc.'s closed loop supply chain for computer assembly plants"*, Information Knowledge Systems Management, Vol 6, pp. 197-214, 2007.

[45] Lawrence, P. & Lorsch, *Organisations and Environment*, Division of Research, Harvard Business School. Boston, 1967.

[46] Lee, B., Kim, P., Hong, K, Lee, I, *"Evaluating antecedents and consequences of supply chain activities: an integrative perspective"*, International Journal of Production Research, Vol 48 No. 3, pp. 657-682, 2010.

[47] Lee, H.L, Billington, C, *"Managing supply chain inventory: pitfalls and opportunities"*, Sloan Management Review, Vol 33 No 3, pp. 65-73, 1992.

[48] Lee, H.L, *"The Triple A supply chain*", Harvard Business Review, Vol 82 No. 10, pp. 102-113, 2004.

[49] Lee, S.M, Ebrahimpour, M, *"An analysis of Japanese quality control systems: Implications for American manufacturing firms"*, SAM Advanced Management Journal, pp. 244-231, 1985

[50] Macneil, I.R, *"Power, Contract and the Economic Model"*, Journal of Economic Issues, Vol 14 No. 4, pp. 909-929, 1980.

[51] Malone, T.W, Crowston, K, *"The Interdisciplinary Study of Coordination"*, ACM Computer Surveys, Vol 26 No 1, pp. 88-119, 1994.

[52] Malone, T.W, *"Modelling Coordination in Organisations and Markets"*, Management Science, Vol 33 No. 10, pp. 1317-1332,1987.

[53] McLaren, T., Head, M & Yaun, Y, *"Supply chain collaboration alternatives: understanding the expected costs and benefits", Internet Research: Electronic Networking Applications and Policy*, Vol 12 No. 4, pp. 348-364, 2002.

[54] Mohr, J & Spekman, R, *"Characteristics of Partnership Success: Partnership Attributes, Communication Behaviour and Conflict Resolution Techniques"*, Strategic Management Journal, Vol 15, pp. 136-152, 1994.

[55] Morgan, N.A, Kaleka, A, Gooner, R.A *"Focal supplier opportunism in supermarket retailers category management"*, Journal of Operations Management , Vol 25, pp. 512-527. 2007.

[56] Moody, J, *"The Structure of a Social Science*", American Sociological Review, Vol 69, No. 1, pp. 213–238, 2004.

[57] Nonaka, I & Takeuchi, H, *The Knowledge- Creating Company.* Oxford University Press, New York, 1995.

[58] Nyaga, G.N., Whipple, J.M, Lynch, D.F, *"Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ?"*, Journal of Operations Management, Vol 26 No. 2, pp. 101-114, 2010.

[59] Patnayakuni, R., Rai, A, Seth, N, *"Relational Antecedents of Information Flow Integration for Supply Chain Coordination"*, Journal of Management Information Systems, Vol 23 No. 1, pp .13-49, 2006.

[60] Petersen, K.J, Handfield, R.B, Ragatz, G. L, *"Supplier integration into new product development: coordinating product, process and supply chain design*", Journal of Operations Management, Vol 23 No. 3-4, pp. 371-388, 2005.

[61] Power, D, *"Supply Chain Management Integration and implementation: a literature review*", Supply

Chain Management: An International Journal, Vol 10 No. 4, pp. 252-263, 2005.

[62] Pyke, D., Robb, D., & Farley, J, "*Manufacturing and supply chain in China: A survey of state-, collective-, and privately owned enterprises"*, European Management Journal, *Vol 18*, No.6, 577-589, 2000.

[63] Robinson, J.R & Malhotra, M.K, "*Defining the concept of supply chain quality management and its relevance to academic and industrial practice*", International Journal of Production Economics. Vol 96, pp. 2-40, 2008.

[64] Sahin, F, Robinson, P.E, "*Flow Coordination and Information Sharing in Supply Chains"*, Decision Sciences, Vol 33, No. 4 pp. 505-536, 2002.

[65] Seifert, D, "*Efficient consumer response as the origin of CPFR"*, In D. Seifert (Ed.), *Collaborative planning, forecasting, and replenishment*, New Delhi: Prentice Hall of India, 2007.

[66] Sheffi, Y., Rice, Jr., J.B, "*A supply chain view of the resilient enterprise"*, MIT Sloan Management Review, Vol 47 No. 1, pp. 41–48, 2005.

[67] Simatupang, T. M. Sandroto, I. V, Lubis, S. B *"Supply chain coordination in a fashion firm"*, Supply Chain Management, Vol. 9 No. 3, pp. 256-268. 2004.

[68] Simchi-Levi, D., Kaminsky, P., Simchi-Levi, E., Shankar, R, *Designing and managing the supply chain*. New Delhi: Tata McGraw Hill, 2008.

[69] Sivadas, E. Dwyer, F. R, "*An Examination of Organizational Factors Influencing New Product Success in Internal and Alliance-Based Processes*", The journal of Marketing, Vol 64 No. 1, pp. 31-49, 2000.

[70] Soares, R.A, Navarro, Lima, R.S, "*Supply Chain Management of Second Tier Suppliers: The Use of Soft Systems Methodology and its Benefits in a Brazilian Company"*, The Flagship Research Journal of International Conference of the Production and Operation's Management Society, Vol 1 No. 2, pp. 53-66, 2008.

[71] Stank, T. Crum, M. Arango, M, "*Benefits of Interfirm Coordination in Food Industry Supply Chains*" *Journal of Business Logistics*. Vol 20 No. 2, pp. 21-42, 1999.

[72] Stock,G.N , Greis, N.P & Kasarda, J.D, *" Enterprise logistics and supply chain structure: the role of fit"*, Journal of Operations Management, Vol. 18, pp. 531-547, 2000.

[73] Supplier Selection & Management Report, "*How Dell Resolved Its Quality Issue Through Supplier Partnerships"*, Vol 2, No.8, pp. 1–3, 2002

[74] Syed-Ikhsan, S.O.S, Rowland, F. "*Benchmarking knowledge management in a public organisation in Malaysia"*, Benchmarking- An International Journal, Vol 11 No.2, 2004.

[75] Thompson, J.D, "*Organisations in Action: Social Science Bases of Administrative Theory"*, McGraw-Hill, New York, 1967.

[76] Thun, J. & Hoenig, "*An empirical analysis of supply chain risk management in the German automotive industry"*, International Journal of Production Economics, Vol 131, pp. 242-249, 2011.

[77] Tuten, T.L, Urban, D.J, *"An Expanded Model of Business-to-Business Partnership Formation and Success"*, Industrial Marketing Management, Vol 30 No. 2, pp. 149-164, 2001.

[78] Vachon, S. & Klassen, R.D, "*An Exploratory Investigation of the Effects of Supply Chain Complexity on Delivery Performance"*, IEEE Transactions in Engineering Management, Vol. 49 No 3, pp. 218-30, 2002.

[79] Wagner, S.M, Bode, S, "*An empirical investigation into supply chain vulnerability"*, Journal of Purchasing and Supply Management, Vol 12 No 6, pp. 301-312, 2006.

[80] Westgren, R, "*Innovations and future directions of supply chain management in US agri-food"*, Journal of Agricultural Economics, *Vol 46* No.4, pp. 519-524, 1998.

[81] Whang, S, "*Coordination in operations: A taxonomy"*, *Journal of Operations Management.* Vol 12 pp. 413-422, 1995.

[82] Williamson, O.E, *The Economic Institutions of Capitalism*. New York: Free Press, 1985.

[83] Wisner, J.D., Tan, K & Leong, G.K, *Principles of Supply Chain Management: A Balanced Approach.* 2nd ed. USA: Cengage Learning. 2008.

[84] Wynstra, F & Pierick, E, "*Managing supplier involvement in new product development a portfolio approach"*, European Journal of Purchasing & Supply Management, Vol 6, pp. 49-57,2000.

[85] Yin RK, *Case study research. Design and methods*, 3rd edn. London, Sage, 2003.

[86] Yin, R, *Applications of case study research.* Beverly Hills, CA: Sage Publishing, 1993.

[87] Yu, M., Ting, S. & Chen, M, "*Evaluating the cross-efficiency of information sharing in supply chains"*, Expert Systems with Applications, Vol 37 No. 4, pp. 2891-2897, 2010.

[88] Zsidisin, G.A, *"A grounded definition of supply risk"*, Journal of Purchasing & Supply Management. Vol. 9, pp. 217-224, 2003.