

**Exploring the Effects of Supply Chain Structure on Supply Chain  
Integration in the Manufacturing Industry**

**Pınar Koç Baban**

**Supervised by  
Professor David Zhang  
Professor Mickey Howard  
Doctor Stephen J. Childe**

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# **Exploring the Effects of Supply Chain Structure on Supply Chain Integration in the Manufacturing Industry**

Submitted by Pınar Koç Baban to the University of Exeter  
as a thesis for the degree of Doctor of Philosophy in Engineering  
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Pınar Koç Baban

## **ABSTRACT**

This research is an exploratory study of the relationship between two supply chain management (SCM) concepts, namely supply chain structure and supply chain integration. The objective is to enhance the understanding of the extent to which supply chain structure is relevant to the supply chain integration, and of how this relationship between these concepts contributes to the ideas of supply chain quality (SCQ) in the manufacturing industry. The literature review with reference to the structure and integration results in the following structural dimensions: centralisation, formalisation and communication which are likely to have an effect on the supply chain integration; ultimately, on supply chain quality.

For the purposes of this research, the conceptual model was developed, and its validity was explored via case-studies. The two manufacturing supply chains including their focal firms and the first-tier suppliers based in Turkey were selected as the case-supply chains. A total of 41 face-to-face, semi-structured interviews were carried out. The findings of the present study suggest that while formalisation and communication are positively related to the supply chain integration, centralisation in which a focal firm designs and manages the whole network negatively affects the supply chain integration. Hence decentralised, formalised supply chains facilitated by the means of communication are proposed in today's global economy in order for supply chains to achieve integration, hence considered to attain supply chain quality.

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## **CHAPTER I - INTRODUCTION**

### **Introduction**

The Introduction chapter provides an overview of the research. The reasons for why the chosen research area is selected and what the main concepts the research is based is briefly described. In section two, a description of research background is provided in detail. This section is divided into six sub-sections. In the first sub-section, the synergy between Quality Management (QM) and Supply Chain Management (SCM) is explained. The categorisation of quality and supply chain management practices is presented in the second section. The prime reason for the development of the field of Supply Chain Quality Management (SCQM) and its existing definitions are given in the following sub-section. Before addressing the research problems, aims and objectives of this PhD study, and posing research questions, an explanation for the perceptible changes in the evaluation of the supply chain performance is provided in the second section of this chapter. Section three explains the design of this thesis. Finally, the chapter concludes with a brief summary.

### **1.1 Introduction to the Research Area**

From the perspective of the consumer, the different stages of a supply chain are not of critical importance (Emmett & Crocker, 2006). What they seek is to receive a product/service they desire. They do not differentiate between quality problems that originate with the manufacturer of the product or its suppliers (ibid, p. 11).

During the data collection stage of this research, a simple answer to the interview question of 'how a company ensures that it receives parts and /or products which are in compliance with requirements at all times' seems to validate the initial conceptual framework of this study. The answer consists of three main parts. The first part is about an ability to describe the expectations clearly and concisely. The second part is related to providing the necessary infrastructure at wherever it is required so that the expectations are realised. The final part is about the way the relationships need to be managed. When the above mentioned aspects are fulfilled, an organisation is likely to receive parts and/or products which comply with specifications. Hence, a quality objective in addition to possible other goals is achieved in the organisational context.

Evaluation of organisational goals and achievement of those goals are based on performance studies and models (Gunasekaran et al., 2004). A single or set of performance measures are created so that the output of processes enabled by supply chain are measured and compared with a set of standards, thus the effectiveness of the strategy or techniques employed is assessed (ibid). In the field of Operations Management (OM), studies provide evidence to prove that for better performance measures regardless of their types (strategic, tactical, operational level, and financial, non-financial or tangible, intangible), closer integration in a supply chain is required. Authors argue that in order to

reach targets in supply chain context, that particular chain should act like a single organisation, goals and objectives should not be determined independently by each organisation. The existing studies are mostly able to show that there is a positive relationship with supply chain integration and higher business performance. However, there is no consensus or no specific path to ensure how a supply chain can achieve integration in which the goals are attained, and the supply chain becomes competitive in the market. Different approaches are suggested. This research while accepting the necessity of the integration in which higher performance is achieved in every aspect of measures, it emphasises the importance of the supply chain structure to achieve that goal. In addition, in spite of the acknowledgment of the importance of supply chain integration in OM, there has been relatively little empirical research attempted to explicitly examine the roles of supply chain design (or supply chain structure, used interchangeable) play in achieving supply chain integration. To provide additional insights into the factors of supply chain structure that are likely to be associated with supply chain integration, this study develops a conceptual model that includes the factors of supply chain structure and supply chain integration.

Based on the context it is used, structure may connote all of the following words: classification, organisation, planning, design, form, management, and several others. In whatever context it is used, the primary purpose of structure is to be organised in a specific way to reach objectives. For that the focus needs to have unambiguous goals as opposed to specific ones. If any system is able to attain what it is established for, the quality of that system may be considered high; otherwise that particular system needs to have rectification and/or refinement. Therefore, the objective of the study which is explained in detail in the following sections is to understand *how do the dimensions of supply chain structure affect supply chain performance?*

## **1.2 Research Background**

### **1.2.1 Synergy between Quality Management and Supply Chain Management**

The focus of quality-based paradigm has evolved from the traditional organisation level to complete supply chain systems (Kuei & Madu, 2001). Although the significance of quality and its management has been recognised for single organisations, knowledge about how to design and manage a supply chain for quality has not reached its maturity level (Gunasekaran & McGaughey, 2003; Kuei & Madu, 2001). Hence, there is an increasing need for new constructs, frameworks, and theories of quality in the supply chain context in order to obtain scientific knowledge.

Similar to individual organisations, the reason for any commercial supply chain to come into existence is to generate profit by creating maximum value for the targeted customers. The value a supply chain produces is *the difference between what the final product is worth to the customer and*

*the effort the supply chain expends in filling the customer's request* (Chopra & Meindl, 2003). Therefore, it could be rightly claimed that the primary aim of the researchers in the field of Operations Management (OM) is to develop strategies, models, tools to enable supply chains to fulfil the requirements of customers effectively and profitably.

There have been a large number of studies investigating the effects of different management approaches on the overall performance of both individual organisations and supply chains in the area of OM. Total Quality Management (TQM), Supply Chain Management (SCM), Lean Manufacturing and Just in Time are just a few of these approaches whose effects have been examined on the performance measures of either organisations or supply chains (Flynn & Flynn, 2005; Kannan & Tan, 2005; Kaynak, 2003; 2008; Kuei et al., 2001; Lin et al., 2005; Tan et al., 1998; Yeung, 2008). While some of these studies have investigated the impacts of an individual management approach on performance measures, others have looked into synergies among the existing approaches and their collective effects on performance measures. There is a considerable amount of research suggesting that synergy among management approaches exists, proven empirically and leads to higher business performance.

Among the existing management approaches, the synergy between SCM and QM has taken an enormous amount of attention from the researchers working in the field of OM. One of the early studies which examines the effects of both QM and supply base management activities on the organizational performance is Tan et al. (1998). Results of this research indicate that QM and supply base management techniques and tools must be implemented simultaneously to achieve the superior business and financial performance. A similar study is carried out by Flynn & Flynn (2005) to investigate the relationship between QM and SCM activities, and their effects on the supply chain performance. Based on an extant literature review, the study of Flynn & Flynn (2005), which was carried out at supply chain level, confirms the results of Tan et al. (1998) that there is synergy between QM and SCM, and goals of QM and SCM should be pursued concurrently for the highest business performance for the supply chain. The authors suggest that the term 'cumulative capabilities' which is defined as *high performance in multiple capabilities simultaneously* (Noble, 1995; Flynn & Flynn, 2004) can be used to explain the relationship between QM and SCM. Flynn & Flynn (2005) also emphasise that QM is fundamental for all new activities including that of SCM. Results of this research prove that supply chain performance measurements such as delivery dependability, speed, and cost efficiency are directly related to successful implementation of quality practices. Furthermore, Flynn & Flynn (2005) suggest that implementation of QM and SCM is not restricted within the organizations, but it could be applied throughout the supply chain. Due to the competition in the global economy, companies aim to increase the quality of their products while reducing the costs. In order to achieve that target, many companies are focusing on their core competencies while

subcontracting the non-core operations (Krause, 1997; Liker & Choi, 2004). Managing few key suppliers strategically is important for both quality and supply management aspect. Yeung's (2008) empirical study investigates whether quality initiatives such as ISO certification and TQM facilitate strategic supply management. In his study, strategic supply management is defined as *a long-term, planned effort to create a capable supplier base and leverage the benefit of supply management* (Carr & Pearson, 1999; Monczka et al., 1998; Shin et al., 2000). Yeung's (2008) results confirm the results of similar study conducted by Lin et al. (2005) indicating that ISO 9000 does not stimulate SSM, but Total Quality Management does. According to ISO 9000, expectations from purchasing department are limited by only choosing key suppliers and controlling the supplied products. However, by definition, strategic supply management requires a long-term, close relationship between a manufacturer and its few key suppliers. Another reason could be pointed out that ISO mainly supports the operational processes; it does not focus on processes outsourced. On the other hand, in the QM intensive firms, working in teams, close internal communication and the cooperative culture are encouraged. This type of company culture leads the firms to manage their suppliers strategically, which means forming a long term and collaborative relationship with them. In modern idea of strategic supply management, the relationship between a manufacturer and the key suppliers based on a mutual learning process in which both parts learn from each other and contribute positively to inter-organizational performance. The research findings also confirm that strategic supply management is positively associated with time-based delivery and cost-related efficiency. By reducing the production cycle time, the goods are delivered to highly dynamic market on time. Having the lower cost of quality and fewer engineering changes, strategic supply management also improves cost-related efficiency in operations. These two factors lead to customer satisfaction and superior business performance. The research findings indicate that QM is a foundation for a successful implementation of strategic supply management as long as the requirements of QM are fulfilled. Furthermore, there is a direct relationship between strategic supply management and firm's business performance. Similar to the studies of Flynn & Flynn (2005) and Yeung (2008), Kannan & Tan (2005) conclude their work stressing the importance of quality and supply chain relationships for the business performance. Their research focuses on the relationship among Just in Time, TQM and SCM approaches and their effects on the business performances. The work of Kannan & Tan (2005), although it is conducted at organizational level, is significant because it shows that QM and SCM have a distinguished advantage over JIT on the business performance.

### **1.2.2 Commonality between the Practices of Quality and Supply Chain Management**

Due to close links between QM and SCM, it is sometimes difficult to differentiate between practices of QM and SCM. In the literature of both management approaches, it is possible to observe a practice

which is considered as a QM practice in one study, but in another study same element might be accepted as a SCM practice.

One of the early studies, which has accomplished to produce an organised and synthesised approach for QM is Saraph et al. (1989) titled as 'An Instrument for Measuring the Critical Factors of Quality Management'. This study has become guidance for many researchers who work in the QM field. Kaynak (2003; 2008) and Lin et al. (2005) are some of the researchers who employed Saraph et al.'s (1989) QM measurement instrument to examine the relationships between QM initiatives, quality and financial performance of an organization. An instrument developed through this research has been used to evaluate QM level for organisations regardless of the sector they operate, i.e. manufacturing or service industry. The critical areas in QM which are proposed as a result of this research are: the role of top management leadership and quality policy, role of the quality department, training, product/service design, supplier quality management, process management, quality data and reporting, and employee relations. The Malcolm Baldrige Award model identifies six factors for ensuring better competence and business results: leadership, strategic planning, customer and market focus, measurement / analysis / knowledge management, human resource management and process management (Kuei et al., 2008). Ahire et al.'s (1996) results demonstrate that there is a high correlation between product quality and the rigorous implementation of Total Quality Management practices such as top management support, customer focus, employee empowerment, supplier quality management, supplier performance, and internal quality information usage.

An increased number of outsourcing activities, national and/or international, is one of the main causes of existence of global supply chains. As a management approach, the application of Supply Chain Management (SCM) is of enormous extent in these global environments. The factors which have an influence on the successful application of SCM have been studied by different authors. Fawcett & Magnan (2002) associate SCM with advanced information technologies, rapid and responsive logistics service, effective supplier and customer management. Lee & Kincaid (2003) consider SCM with six major dimensions which are: partnership, information technology, operational flexibility, service and performance measurement, management commitment, and knowledge of demand characteristics. Romano & Vinelli (2001) have studied SCM from a broader and more coordinated perspective and consider the following mechanisms as its basics: communication/decision/negotiation mechanisms, social coordination and control, integration and link-pin roles/units, common staff, hierarchy/authority relations, planning and control systems, incentive systems, selection systems, information systems, public support and infrastructure. Burgess et al.'s (2006) structured literature review in the area of SCM results in a set of seven constructs, namely leadership, intra- and inter-organisational relationships, logistics, process improvement orientation, information system and

business results and outcomes. Taken together, these studies prove that some of the factors identified as SCM factors are also discerned as QM factors by other studies.

Table – 1.1 below offers a sampling of quality practices from the literature which is implemented by an organisation for both internal and external purposes. As Table – 1.1 illustrates, even traditional quality enablers include management commitment, effective supplier and customer management, information systems and data analysis, intra- and inter-process management. Furthermore, quality practices such as training, cross-functional teams, teamwork, empowerment, and job satisfaction can impact any one or all of the SCM dimensions mentioned above. It is apparent that QM and SCM are closely inter-related, in the sense that achieving the objectives of one depends on the role played by the other.

Table - 1.1 A Sample of Internal and External Quality Practices, A Review of the Literature

Quality Management Practices					
Internal					
Practice	Author(s)	Practice	Author(s)	Practice	Author(s)
<b>Top Management</b> (The Role of Management Leadership and Quality Policy, The Role of Quality Department; Leadership; Top Management Commitment; Management Structure; Quality Programs, Policies and Attitudes)	Saraph, 1989; Kaynak, 2003; 2008; Lin et al., 2005; Flynn et al., 1995; Flynn & Flynn, 2005; Ahire et al., 1996; Zu, 2009; Robinson & Malhotra, 2005; Garvin, 1983	<b>Product Design</b> (Product Service /Design; Design Quality into Product; Design Quality Management; Product Design;	Saraph, 1989; Kaynak, 2003; 2008; Lin et al., 2005; Flynn et al., 1995; Zu, 2009; Tan et al., 1998; Ahire et al., 1996; Garvin, 1983	<b>Process Management</b> (Process Management; Strategic Planning; Strategic Planning and Leadership; Statistical Control and Feedback; ISO Implementation; QM Implementation; Inspection; Process Control; Statistical Process Control Usage; Production and Workforce Policies	Saraph, 1989; Kaynak, 2003; 2008; Lin et al., 2005; Flynn et al., 1995; Flynn & Flynn, 2005; Zu, 2009; Flynn & Flynn, 2005; Robinson & Malhotra, 2005; Flynn et al., 1995; Yeung, 2008; Tan et al., 1998; Ahire et al., 1996; Garvin, 1983
<b>Employee Relations and Training</b> (Employee Relations; Human Resource Development and Management; Training; Learning; Human Resource Focus; Workforce Management; Work Attitudes; Employee Empowerment; Employee Training; Employee Involvement; Empowerment and Teamwork; Continuous Improvement and Learning; Employee Satisfaction)	Saraph, 1989; Kaynak, 2003; 2008; Lin et al., 2005; Flynn & Flynn, 2005; Robinson & Malhotra, 2005; Flynn et al., 1995; Zu, 2009; Madu et al., 1996	<b>Data Analysis</b> (Quality Data and Reporting; Information and Analysis; Internal Quality Information Usage; Information Systems)	Saraph, 1989; Kaynak, 2003; 2008; Lin et al., 2005; Flynn & Flynn, 2005; Ahire et al., 1996; Zu, 2009; Garvin, 1983	<b>Continuous Improvement Tools</b> (Process Improvement; Quality Tools; Benchmarking)	Tan et al., 1998; Robinson & Malhotra, 2005; Lin et al., 2005; Ahire et al., 1996
External					
Related to Suppliers			Related to Customers		
Supplier Quality Management; Supplier Participation; Supplier Selection; Supplier Relationship; Supplier Performance; Supplier Support; Vendor Management	Saraph, 1989; Kaynak, 2003; 2008; Lin et al., 2005; Ahire et al., 1996; Lin et al., 2005; Flynn et al., 1995; Zu, 2009; Robinson & Malhotra, 2005; Garvin, 1983	Customer Focus; Customer Relations; Customer and Market Focus; Customer Satisfaction; Employee Service Quality	Kaynak, 2008; Ahire et al., 1996; Robinson & Malhotra, 2005; Lin et al., 2005; Flynn et al., 1995; Zu, 2009; Flynn & Flynn, 2005; Madu et al., 1996		

### 1.2.3 Supply Chain Quality Management

The synergy between SCM and QM largely determines the development of Supply Chain Quality Management (SCQM). SCQM is different from SCM, it is an extension of SCM that is designed to prepare firms to build supply chain competencies through tailored quality management practices

(Kuei et al., 2011; see in Madu&Kuei, 2004; Kuei et al., 2008). SCQM is defined by Robinson & Malhotra (2005) as *the formal coordination and integration of business processes involving all partner organisations in the supply channel to measure, analyse and continually improve products, services, and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace*. Robinson & Malhotra (2005) have discerned the compatibility between SCM and QM and suggest that traditional quality programs focusing on approaches such as TQM, the Malcolm Baldrige National Quality Award (MBNQA) and ISO 9001 (International Quality Management System Standard) must transform to a supply chain perspective in order to simultaneously make use of supply chain partner relationships and quality improvement gains essential to market-place satisfaction. By categorising the existing literature based on their similarities and common features, Robinson & Malhotra (2005) propose five different groups of themes which exist both in QM and SCM. They are: communication and partnership activities, process integration and management, management and leadership, strategy, and best practices. Kuei & Madu (2001) define SCQM with three simple equations where each equation represents the letters that make up SCQM. They are: *SC: a production –distribution network; Q: meeting market demands correctly, and achieving customer satisfaction rapidly and profitably, and M: enabling conditions and enhancing trust for supply chain quality*. This study identifies customer focus, supplier relationship, and IT-driven change as critical factors of SCQM. Kuei & Madu's (2001) findings support the view that the implementation of QM does work in a broader supply chain context and claim that supplier participation is the critical element to ensure the success of SCQM. The study by Lin et al (2005) recognises QM practices, supplier participation, and supplier selection as the key factors of SCQM and investigates the relationship between these factors and their effects on the firm performance. The findings of Lin et al. (2005) support the notion that SCQM programs should include traditional QM practices which are top management leadership, training, product / service design, supplier quality management, process management, quality data reporting, employee relations, customer relations, and benchmarking learning along with operational items such as supplier selection and supplier participation in order to achieve superior performance. Some of the early studies (Curkovic et al., 2000; Kuei & Madu, 2001; Saraph et al., 1989) consider supplier participation and supplier selection as part of QM activities though Lin et al. (2005) place these practices separately from QM activities on the conceptual model developed by using SEM approach. Unlike Tan et al. (1998), Flynn & Flynn (2005) and Kannan & Tan (2005), the results do not support the direct relationship between QM practices and organizational performance as well as that of between supplier selection activities and organizational performance. Lin et al. (2005) argue that because QM is seen as management tool rather than operational tool, and full implementation of it requires long term commitment, it does not have a direct impact on the organizational performances of the sample companies taken from Hong – Kong and Taiwan. In addition to that, the authors state that supplier selection can only have an impact

on the organization's performance measures through supplier participation which plays a mediator role because performance of supplier selection activity can only be evaluated after conducting relationships with suppliers. Therefore, among the three activities, supplier participation is the most critical factor for ensuring the higher business performance for organizations through the implementation of SCQM.

Although there has been substantive research on SCQM, particularly the positive effects of the simultaneous implementation of quality and supply chain practices, the existing research focuses on the performance of individual firms regardless of their position in the chain whether it is a supplier, manufacturer, retailer, or any other tier in a supply chain. This research aims to identify the factors of supply chain design which enable an entire supply chain to achieve integration, hence, to deliver a desired outcome.

#### **1.2.4 Performance Evaluation in Supply Chains**

As the management of supply chains evolves, the assessment of their success becomes a more-developed art as well. Studies provide evidence to suggest that sustainable competitiveness of a supply chain lies in the satisfaction of all the members via a commitment to common goals (Gunasekaran et al., 2004; Jayaram et al., 2011; Lee, 2004). Firms should take responsibility for the entire supply chain instead of focusing on their own interests alone (Lee, 2004). In fact, the development of modern supply chains, in which intra-firm (functional, departmental) and inter-firm boundaries are minimised, and greater integration of firms with their suppliers and customers are promoted, benefited significantly from the success of cross-functional teams within single organisations (Gunasekaran et al., 2004; Narasimhan & Nair, 2005). Through closer alliances with suppliers and customers, firms are able to reduce uncertainty and enhance the control of supply and distribution channels (Gunasekaran et al., 2004). According to Narasimhan & Nair (2005), the promise of synergy is the main rationale for the existence of collaborative supply chains. Satisfying final customers can only be achieved when the whole chain commits, integrates, and coordinates to pursue coherent and innovative practices (Sabbaghi & Vaidyanathan, 2007). Eventually, whatever the intended targets are, supply chain integration is necessary to attain those targets.

In the 1980's, the emphasis was on the product quality (Ahire et al., 1996). Given that Total Quality Management (TQM) philosophy was at its peak in its popularity and perceived as a cure for all problems, firms gained competitiveness by producing a superior quality product at a lower price (Ahire et al., 1996). Being competitive for any supply chain requires more than producing a product with required quality (Kuei & Madu, 2001; Lee, 2004; Melnyk et al., 2010). Sabbaghi and Vaidyanathan (2007) talk about the advanced collaborative planning, forecasting and replenishment (CPFR) which is a structural formation between members of supply chains. In the work, it is

mentioned that if CPFR is achieved it will enhance the partnership in a supply chain. This would lead to lower costs, improved product or service quality, better customer service, quicker project results, reduced cycle time / lead time, and improved value to customers. Effective integration of manufacturing, design engineering and marketing appears to be critically important in engendering both product and service quality (Curkovic et al., 2000). Lee (2004) identifies three factors in order supply chains to remain competitive in the market. They are: agility, adaptability, and alignment of supply chains. As opposed to solely focusing on being low-cost and high speed supply chains, being responsive to short term changes in demand or supply quickly (agility), keep adapting the supply chain according to the internal and external changes (adaptability), and most importantly aligning incentives for the entire supply chain for better performance (alignment) are critical factors for the supply chain success. Similarly, Melnyk et al. (2010) state that supply chains need to deliver varying degrees of outcome in order to be competitive in the market. In addition to the traditional cost-related performance measures, today's supply chains should be excelled at responsiveness, security, sustainability, resilience, and innovation depending on their key customers' needs. However, it is also pointed out that over-focusing only on one of these outcomes might be disadvantageous for a supply chain (Lee, 2004; Melnyk et al., 2010). For example, if a firm is too focused on cost; it is likely to outperform any competitor as long as the customer demands the lower price above everything else; however, the same firm might underperform if the customer is sensitive to the level of responsiveness to its requirements. Therefore, Melnyk et al. (2010) suggest that supply chains are likely to remain competitive with a blend of outcomes without over-focusing a single one of them. Furthermore, in order to deliver specific outcomes, the design and management of a supply chain is of particular significance. The structure of activities within and between companies is a critical cornerstone of creating unique and superior supply chain performance (Hakansson and Snehota, 1995 see in Lambert & Cooper, 2000, p. 76). The analysis of Melnyk et al.'s work indicates that design of a supply chain should embody some common characteristics in order to achieve any outcome. Being from cost effective to innovative supply chains, visibility and transparency through integrated information systems and integrated supply chain planning and management is must. Furthermore, emphasis on controlling the suppliers via a variety of means such as extensive supplier development programs, supplier assessment systems, extensive auditing, supplier prequalification, and certification is another main feature of the design of those supply chain which have as their goal the specified outcome. Therefore, focusing on any single performance measure or a set of measures regardless of what they are is of less significant for the supply chain competitiveness than forming a supply chain whose design and management is able to deliver any specified outcomes.

### **1.2.5 Aims and Objectives**

The purpose of this research is to provide an exploratory first step to build theory in order to address some gaps in the supply chain management literature. Furthermore, this study offers a framework and guidelines for practitioners of supply chains especially senior and top managers to design their supply chains in order to achieve supply chain integration. Due to the increasing importance placed on meeting the objectives of an entire supply chain as opposed to maximising an individual performance of any firm in a supply chain, it is important to discern whether the supply chain structure has an effect on the supply chain integration ultimately overall supply chain performance. This research explores how the supply chain structure based on three main dimensions, namely centralisation, formalisation, and communication affects the supply chain integration and ultimately performance of the overall chain, in other words, supply chain quality.

### **1.2.6 Research Questions**

One of the aims of this research is to investigate whether Supply Chain Quality provides a useful concept or not. Specifically, the need for conceptual frameworks in the area of Supply Chain Quality Management which is a new research field made up by the synthesis of SCM and QM, to transcend the concept of quality from where it has traditionally been associated at the level of the firm to the next level: across many firms within the supply chain and as part of the transition from upstream product to downstream services is clear. The overarching exploratory research question driving this study is *'How does the structure of a supply chain affect supply chain integration?'* A qualitative research design is used to address this question. Intuitively, an answer should be that the better the structure, the higher the performance. However, the findings shed new light on a much more complex picture of the relationship between each variable of the supply chain structure and supply chain integration, and supply chain performance. The following secondary research questions are proposed in the scope of this research.

The secondary research questions:

1. Does 'supply chain structure' provide a useful concept to both practitioners and academics?
2. How does each variable of supply chain structure affect supply chain integration?
3. What are the most important variables of supply chain structure in order to achieve supply chain integration?

## **1.3 Thesis Design**

An overview of the thesis chapters is given as follows:

Chapter One provides an overview of the research. The second section of this chapter consists of a broad analysis of the synergy between Quality Management and Supply Chain Management, followed by a brief overview of Supply Chain Quality Management. The following subsection presents the changes in the performance assessment of supply chains. Research problems are addressed and the aims and objectives of the research with the identification of the research questions are provided in the last part of the second section. Section three provides the structure of the thesis.

Chapter Two presents a literature review for the research undertaken. The first section presents information on supply chains and Supply Chain Management (SCM). Quality, its management and Supply Chain Quality are reviewed in the second part of the chapter. In response to the question of how Supply Chain Quality is achieved is explored via the concept of Supply Chain Integration and Supply Chain Structure. The review of the relevant literature aims to establish a theoretical foundation for this research and to show the needs of carrying out this study. In the third section, a conceptual model is presented based on the gap in the literature. Specific supply chain performance measures corresponding to each dimension of supply chain structure are identified so that complete guidelines can be provided especially for practitioners

Chapter Three describes how this research is conducted. The reasons for employing exploratory research approach and case study method constitute the first two sections of this chapter, respectively. The steps of structuring rigour in this research are provided in the third section. The last section of this chapter provides information in respect of data analysis methods employed in this research.

Chapter Four presents the findings from each supply chain subjected to the research questions.

Chapter Five consists of a within and cross-case analysis of the individual case findings, and the questioning undertaken to support / deny the proposed conceptual model. The major findings of the thesis form the summary of this chapter.

Chapter Six aims to compare the analysis' findings with the relevant literature. The proposed model with the final modifications based on the reflections from the case study analysis is presented in the first section of this chapter. In the second section of this chapter, the answer to the question of '*What do the findings of the analysis mean in theory*' is given. All the research questions are answered in section three. In the fourth section, theoretical implications of this research are presented. The last section explains the possible reasons why the proposed model of this study may not work in other supply chain settings.

Chapter Seven concludes the research providing information on the following topics. Firstly, the contribution to the theory is reported. The second section provides recommendations for practice.

Limitations of the research undertaken and the suggestions for the future work form section three and four, respectively.

#### **1.4 Summary**

This chapter provides an introduction to the conducted research including the research background, the research problems and questions to be addressed, the research objectives to be achieved. An overview of the structure of the thesis is provided at the end of this chapter.

A preliminary study was carried out to develop a background and capture a preview of the subject of the research. The study mainly involved initial references to the literature and original studies in the area of Supply Chain Management in general, and Supply Chain Quality Management in particular. Some background of the research was established, and the problems to be addressed and the questions to be answered were identified by recognising the gaps in the research area.

The research focuses on a new theoretical area, Supply Chain Quality Management which is derived from the synergy between Supply Chain Management and Quality Management approaches. An exploratory research approach is employed to open the way for a new understanding of the relationship between Supply Chain Structure and Supply Chain Integration and how this relationship links to the concept of Supply Chain Quality. A conceptual model is verified and validated by qualitative data collected through case studies. The following chapter will provide both a literature review on the concepts which establish the basis of the proposed framework and the description of the framework.

## CHAPTER II – LITERATURE REVIEW

### Introduction

This chapter consists of five sections. It begins with defining the supply chain within the context of this research. Following a clear insight into supply chain which constitutes the core aspect of this research, the first sub-section presents supply chain management (SCM) in its broader meaning.

The second section explores quality concept in great detail. It consists of information on Quality Management (QM) philosophy and the significance of Supply Chain Quality. The second sub-section of this part is concerned with supply chain integration with a focus on the 'reasons why integration is necessary for a supply chain and the main features of an integrated supply chain'. Last part of this section explains the term supply chain structure with its primary elements and discusses the previous work in the literature related to both 'organisation structure' and 'supply chain structure'. In addition, in this sub-section takes place 'how the supply chain structure affects the integration level of supply chains'. The following section presents the proposed model which was developed based on the extant literature review in the area of SCM. In the fourth section, possible performance outcomes which are likely to be attained by the application of supply chain structure's variables are presented. Finally, the chapter concludes with a brief summary of what has been interpreted out of the findings from the relevant literature. In this framework, the main focus is on reflecting the effort to explore what aspects of the subject matter have been missing or underestimated in the relevant literature. The research itself, therefore, can be designed accordingly and directed toward the gaps that have been found out in the literature.

### 2.1 Supply Chain

In today's market, due to the effects of globalisation on the manufacturing/service industry, most individual companies do not operate independently as they have become parts of supply chains in order to remain competitive. Under the current market conditions, it is becoming increasingly more difficult and less economical for companies to produce their needs on their own (Gunasekaran et al., 2001; Lambert and Cooper, 2000). In response to global pressures, many manufacturing organisations have realised that concentrating on their core competencies while subcontracting out non-core operations is the way to survive the competition (Christopher, 1992; Liker and Choi, 2004; Krause, 1997). An increased number of outsourcing activities, national and/or international, is one of the main causes of existence of global supply chains. In addition, with an ever-increasing rate of diversity in customers' requirements, companies are forced to collaborate with other firms in order to meet the requirements of end customers while remain competitive.

A supply chain consists of all parties participating, either directly or indirectly to satisfy a customer request (Chopra and Meindl, 2010). In fact, the main purpose of any supply chain is to fulfil the customer requirements, and in return, create profit for itself (ibid). Based on the often cited definition by Christopher (1992), supply chain is defined as *“the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the eyes of the ultimate consumer”*. This definition emphasises the primary purpose of a supply chain which is to create value for the ultimate customer. In addition, it can be rightly deduced from Christopher’s definition that a form of a supply chain including the linkages is key to its existence. According to Chopra and Meindl (2010), the combination of two words, supply and chain, connotes a product flowing from suppliers to manufacturers to distributors to retailers to customers is only a part of a supply chain but does not reflect the complete picture. In a real world situation, a typical supply chain manages the information flows, fund flows, and relationships apart from product flows and it, most of the time, exists as a network in which a manufacturer might receive products from several suppliers and send these products to several distributors or customers (ibid; Bozarth et al., 2009). According to Bales et al. (2004), the strength of a whole chain depends on the integrity of these flows.

There are different approaches to the representative sketch for a supply chain in the literature. According to Dudek (2009, p.7), an appropriate level of detail to sketch for a supply chain depends on the business context and managerial level. Dudek (2009) observes that if a supply chain is considered from a stage of raw material to a stage of final product, one has to deal with a very complex and unmanageable network. In order to decrease the complexity of a supply chain, different approaches have been suggested by researchers. Some authors propose to consider only two tiers in the up- and downstream direction (the suppliers’ suppliers and the customers’ customers), whereas others consider only the critical business partners to the company of interest. In this thesis, the term supply chain will be used in its broadest sense to refer to all companies who supply product to the final assembler. However, for the purpose of simplicity during the data collection stage, only final assemblers and their first tier suppliers are included to explore supply chain structure and its effects on supply chain integration, and how this relationship contributes to the understanding of Supply Chain Quality. Whatever approach taken to represent a particular supply chain, the appropriate management of the flows is the most important aspect of any supply chain to be considered successful, in other words profitable (Chopra and Meindl, 2010). Hence, the following sub-section will discuss the principles underlying SCM.

### 2.1.1 Supply Chain Management

Quite frequently, the definition of Supply Chain Management (SCM) is mixed-up with the definition of a supply chain. Croom et al.'s work (2000) highlights a sample of definitions associated with the concept of SCM (table-1, p.69). As their study presents, six out of nine definitions of SCM actually denote a supply chain instead of SCM (table-1, p.69). In the literature, SCM is also confused by another term, supply chain orientation (Mentzer et al., 2001). According to Mentzer et al. (2001), supply chain orientation is defined as *'the recognition by an organisation of the systematic, strategic implications of the tactical activities involved in managing the various flows in a supply chain'*. The firm with a supply chain orientation may implement individual, disjointed supply chain tactics such as Just-In-Time delivery, or electronic data interchange with the suppliers and customers, though this is not considered SCM unless they are coordinated (a strategic orientation) over the supply chain (a systemic orientation) (ibid). In order to elucidate the difference between the two terms, Mentzer et al. (2001) provide an analogy. In that analogy, a supply chain is considered as a river in which products and services flow like water. Mentzer et al. (2001) state that river exists under all circumstances whether anyone recognises the potential of creating and managing a water basin with a systematic and strategic orientation. Unless all the states through the river recognise the requirements which are necessary to create and manage the water basin, there is no systematic and strategic implication of utilising resources. Similar to the river example, with or without a systematic and strategic management approach to a supply chain, it exists. SCM can solely result in a managed supply chain when several companies directly linked in the supply chain choose to pursue collective interest over individual company interest. Similar to this view, Kuei et al. (2002) perceive SCM as a holistic and a strategic approach to demand, operations, procurement, and logistics process management. A sample of definitions of SCM is given in Table 2-1.

As a management philosophy, many fields in the operations management literature claim the ownership of SCM (Burgess et al., 2006; Croom et al., 2000, Harland, 1996). As Tan (2001) observes, some researchers have conceptualised SCM from the perspective of purchasing and supply functions, defining SCM as a set of decisions or activities of purchasing and supplier management. In comparison with the traditional approach to the purchasing function of firms which is perceived as solely clerical task, today, many firms acknowledge it as a competitive weapon achieved through buyer-supplier relationship (Tan et al., 1998). Importance of supplier relations, supplier participation and particularly management of supply base for the overall success for supply chains as well as for individual firms are recognised by many researchers (Lambert and Cooper, 2000; Lin et al., 2005; Tan et al., 1998; Yeung, 2008). Yeung's (2008) research focuses on Strategic Supply Management (SSM) and its impact on the organisational performance. In his study, SSM is defined as *'a long-term, planned effort to create a capable supplier base and leverage the benefit of supply management'*. In

addition, new manufacturing paradigm techniques such as Lean Manufacturing, Mass Customisation, and Agile Manufacturing, developed or adopted by many firms, also require close supplier relationships. Therefore, establishing a quality supply base and managing few key suppliers strategically become very important for gaining competitive advantage for the companies. In addition to the supplier perspective, there is also customer side, downstream side of the chain. Today, the internet has created more sophisticated consumers who demand many attributes from the product and service they receive such as decrease in response time, increase in variety and innovation of products, etc (Sabbaghi & Vaidyanathan, 2007, p. 144). Various factors in relation to culture, religion, environment, population distribution, etc. have played a key role in determining the consumers' expectations. Hence, understanding the needs of consumers as well as those of suppliers becomes essential in order to achieve target values of supply chains. In addition to its purchasing perspective, SCM has also been regarded as a synonymous term for integrated logistics management. In 1986, the Council of Logistics Management (CLM) defined logistics management as an interchangeable term for SCM. In the revised definition which was released in 1998, the logistics management is defined by CLM as being only part of SCM. As has happened for purchasing management, in time, logistic management has been approached strategically. Tan (2001) observes that logistics management is more than a physical removal of parts from one place to another; rather, it is about efficient physical distribution of final products from the manufacturers to the end users in an attempt to replace inventories with information. That is to say, information provides visibility for products in the system which allows the movement of them to be performed in the right quantity, to the right place and on the right time.

Today, the idea is to consider and manage the entire supply chain including internal, external functions in a collaborative manner (Zhang et al., 2011); in other words, the supply chains should be strategically managed as a single system in contrast to individually optimising separate systems or sub-systems (Vickery et al., 2003). The change in SCM's scope from transactional methods to collaborative approaches is well-accepted and has gained significant recognition in both the academia and industry. In order to identify the potential improvement opportunities in the field of SCM, the concept of 'integration and collaboration of business processes along the supply chain' has been the main focus for researchers working in this area; important questions are being raised as to how this integration should be achieved and which variables should be focused on. Stadtler, H. (see Dudek 2009, p.8) defines SCM as *'the task of integrating organisational units along the supply chain and coordinating material, information, and financial flows in order to fulfil (ultimate) customer demands'*. According to the Global Supply Chain Forum, SCM is defined as *a management philosophy that involves the management and integration of a set of selected key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders through the collaborative efforts of supply chain members*

(Ho et al., 2002). SCM must exist and have recognition in all the parts and processes of a business. Just as 'quality' is not owned by a TQM department, similarly the supply chain is not owned by any named SCM department (Emmett and Crocker, 2006, p.110). For the effective implementation of SCM, across chain, horizontal integration of vertically managed organisations is needed. According to Tan (2001, 2002), technically the supply chain is too complex to attain a full integration of all business activities within it, arguing against the notion that "all organisations within a chain will act as one single organisation, and as 'the holistic people'. In line with Tan's (2001, 2002) work, Lambert & Cooper (2000) and Lambert et al. (1998) observe that SCM does not necessarily aim at a holistic integration of all business processes along the entire SC; much rather, an appropriate level of integration has to be chosen based upon the specific situation of the supply chain and its environment. Table - 2.1 consists of a small number of definitions of Supply Chain Management found in the literature.

The following section will provide information in respect of the concept of Quality in general and the significance of Supply Chain Quality and the relationship to Supply Chain Integration and Supply Chain Structure in particular.

Table - 2.1 A Sample of Definitions of Supply Chain Management

Authors	Definition
Benton and Maloni (2005)	Supply chain management involves the strategic process of coordination of firms within the supply chain to competitively deliver a product or service to the ultimate customer.
Tan et al. (1998)	Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilise their suppliers' processes, technology and capability to enhance competitive advantage. It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimisation and efficiency.
Harland (1996)	Supply chain management is about managing business activities and relationships (1) internally within an organization, (2) with immediate suppliers, (3) with first and second-tier suppliers and customers along the supply chain, and (4) with the entire supply chain.
Berry et al. (1994)	Supply chain management aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to a particular OEM (original equipment manufacturer) so as to release management resources for developing meaningful, long term relationship.
Jones and Riley (1985)	Supply chain management is an integrative approach to dealing with the planning and control of the materials flow from suppliers to end-users.
Stadtler, H (see Dudek, p.8)	Supply chain management is the task of integrating organisational units along the supply chain and coordinating material, information, and financial flows in order to fulfill (ultimate) customer demands.
Global Supply Chain Forum	Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders
Council of Supply Chain Management Professionals	Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies ( <a href="http://www.cscmp.org">http://www.cscmp.org</a> ).
Li (2007) (see in Zhang et al., 2011, p. 87)	Supply chain management is a set of synchronized decisions and activities utilized to efficiently integrate suppliers, manufacturers, warehouses, transporters, retailers, and customers so that the right product or service is distributed at the right quantities, to the right locations, at the right prices, in the right condition, with the right information, and at the right time, in order to minimize system-wide costs while satisfying customer service level requirements.

## 2.2 Quality as a Holistic Concept

Quality being a sophisticated concept is a main reason why there have been different perceptions and interpretations by academics and practitioners in reference to a number of parameters in measuring its strengths and weaknesses as well as to the difficulties in its implementation.

Quality, in its basic meaning, is used in almost every aspect of our daily lives with reference to various contexts. From a broader perspective, quality is defined as the degree of goodness or worth. Usage of quality in the academia and industry is almost countless (e.g. product quality, quality department, quality policy, quality assurance, quality plans, quality control and quality performance). Similar to its various uses in daily life, quality has been framed differently by many academics. Crosby, a guru on quality, believes that quality is not comparative and that there is no such thing as high or low quality, or quality in terms of goodness, feel, excellence and luxury (Crosby, 1979). He believes that a product or service quality either exists or not. This approach of quality has gained recognition especially by practitioners since broader categorisation which measures only the cost of conformance and the cost of non-conformance has enabled the quality costs to be estimated at company-wide and focuses on the cost of doing things right as well as the costs of getting them wrong (Dale et al., 2007). In contrast to Crosby's belief, quality concept as a whole has a staged effect; it starts with small improvement steps and aims to establish a culture within a company that focuses on continuous improvement. Amid multiple meanings given to the word 'quality', the most commonly used one is called 'market-place quality' referring to *'the degree to which a specific product (or service) satisfies the wants of a specific consumer'* (Juran et al., 1962). In other words, quality is defined as *the product's or service's 'fitness for purpose/use'*. Juran defines quality as the product's or service's 'fitness for purpose/use' (Juran, 1988). Dale argues that open-ended definitions such as 'fitness for purpose' admit too many intangibles and make calculating the costs of quality more difficult. He gives an example to explain the situation further. If, say, 'fitness for purpose' is the quality objective, it must be met through suitable specifications and detailed requirements, and the 'cost collectors' must not be left in the difficult situation of trying to decide what parameters affect the product's or service's suitability for its purpose (Dale et al., 2007). Therefore, when defining quality of a product, an organisation or a supply chain, the emphasis is on setting out a clear path to what objectives are required and how they are to be attained as opposed to focusing on specific performance measures regardless of their levels and/or types, i.e. strategic, tactical, operational and/or financial, operational.

With whatever meaning quality is used, it needs to be evaluated based on some pre-determined measures in order to find its true meaning. Pre-determined measures or standards are important criteria for feedback about the efforts put in the organisation to achieve quality. For example, quality of a single product/service is evaluated based on the pre-determined customer specifications;

efficiency of the Quality Management system in the organisation is assessed according to some standards such as ISO 9000, Malcolm Baldrige National Quality Award for Performance Excellence (2005) and European Foundation for Quality Management (EFQM) excellence model (2006), etc.

Since its introduction into the manufacturing environment, the concept of quality has proved itself to be one of the most popular subjects for both researchers and practitioners. There have been many studies performed in the academia to study quality at the organisational level. Among them, the effects of Quality Management (QM) implementation on the organisation's performance have attracted great interest of practitioners and academics. In the related literature, many studies have proved the positive direct or indirect effects of successful implementation of QM principles on the organisation's performance (Flynn & Flynn, 2005; Kannan & Tan, 2005; Kaynak, 2003; Kaynak & Hartley, 2008; Kuei et al., 2001; Lin et al., 2005; Sroufe & Curkovic, 2008; Tan et al., 1998; Yeung, 2008). On the other hand, studies have also highlighted the failure of QM implementation in delivering the desired performance benefits (Nair, 2006). As Nair argues, some researchers have concluded that rational comprehensive quality data analysis and information processing are of limited use or even counter-productive under conditions in which multiple problem definitions are possible, goals are ambiguous, or uncertainty is great ( Lord & Maher, 1990). In addition, there has also been widespread criticism from academics and practitioners toward using QM standards to achieve the quality goals of an organisation.

The literature on QM includes an extensive set of studies about the adverse effects of ISO registrations on the organisations' overall performance due to its registration costs and extra paperwork with no compensating benefits (Sroufe & Curkovic, 2008; Yeung, 2008). Study results reveal that some organisations adopt these standards only because they are stipulated by customers, and that is the main reason for the failure of these standards; they do not use the standards as a foundation leading to the development of a quality system in which goals are well defined for all levels of organisation. However, literature in the QM area provides efficient evidence to believe that when these standards are perceived as the minimum requirement for a greater quality system which surpasses the standards' requirements, with new improvement elements built into the system, they improve the overall performance. Therefore, being familiar with the standards and motivation for the registration becomes crucial. Not knowing the strengths and weaknesses of a particular standard might create an adverse effect on the performance measures. A study conducted by Flynn and Saladin (2002) shows that there are clear differences in the strength of the Baldrige constructs regarding national cultures, providing support for the idea that the Baldrige award is more appropriate in some national cultures. It is indicated that the Baldrige constructs will be stronger in cultures typified by driving for results under a strong leader, rules and structures for working together, groups working under a respected leader, rules and structures for striving for results, groups striving for visible results

and the well-oiled machine analogy (ibid). The objective of any QM standard is to give purchasers an assurance that the quality of the products and/or services provided by a supplier meets their requirements (Dale et al., 2007).

### **2.2.1 Significance of Supply Chain Quality**

In recent years product recalls show that there is a lack of coordination to ensure the quality performance in the global supply chain (Zhang et al., 2011, p. 88). For example, in early 2010, Toyota, the Japanese automotive manufacturer recalled cars sold all around the world. Recalls of another Japanese automotive manufacturer, Honda have, no doubt, caused loss in terms of profit. Examples from the industry show that supply chains, operating in both manufacturing and service, are still experiencing problems. As for the service dimension of the problem, Eurostar experienced delays and cancellations in the UK and France due to severe weather conditions in winter 2010, and the recent global banking crisis can be seen as a chain reaction of the lack of common rules over the national and international financial regulatory norms.

Product recalls indicate that manufacturing companies are particularly vulnerable to quality related problems when they source via a global supply chain with poor visibility (Li & Warfield, 2011, p. 1). Clearly, any supply chain needs to find ways to eliminate the risk coming from this kind of sourcing and supply structure which threatens the supply chain integrity (Huo et al., 2014; Lee, 2004; Li & Warfield, 2011; Melynk et al., 2010). Thus, constructing an effective quality co-ordination system to provide lasting and stable quality assurance is crucial for supply chain quality management (Zhang et al., 2011, p. 88). According to Zhang et al (2011, p. 88), quality co-ordination and assurance in global supply chains need theoretical paradigms and innovative research ranging from social factors to technologies, from the policy level to operational practice. There are a few studies which have provided comprehensive supply chain quality assurance models to ensure quality in multi-layer supply chains (Huo et al., 2014; Li & Warfield, 2011, p. 1).

The literature review in the areas of SCM, QM and SCQM leads this research to conclude that Supply Chain Quality is not yet sufficiently defined in the academia. In the existing literature, supply chain quality is associated mainly with a single performance measure of a supply chain which is the quality performance. Although Huo et al.'s study (2014) is significant in the sense that it emphasises the importance of integration to achieve quality in supply chain environment, focusing mainly on the quality related performance measures, namely product quality, delivery, cost of quality, and flexibility is a restraint on attaining competitive supply chains, in other words supply chain quality since the competitiveness of today's supply chains depends on their ability/capability to deliver any specific outcome or a blend of outcomes which are determined based on the key customers' needs. These performance objectives varies such as cost-effective, responsive, adaptable, secure, sustainable,

innovative, and many others. It is clear that over-focusing on one performance measure, quality, is insufficient to achieve competitive advantages in today's global world. This research aims to fill this gap from both academic and practical perspective. Specifically, the need for new frameworks for the increase in supply chains, who achieve their desired outcomes regardless what they are is obvious. This research aims to provide a useful and complete framework which can be used especially in the manufacturing industry to help the managers of supply chains to reach the desired outcomes, in other words, to achieve supply chain quality based on the link between supply chain structure and supply chain integration. Furthermore, by developing a framework, this study aims to contribute to the current knowledge of supply chain quality in the area of Operations Management research.

### **2.2.2 Supply Chain Integration**

Today it is not simply enough to optimize internal structures and infrastructures within a company to be competitive in the market (Frohlich & Westbrook, 2001). With the effective SCM implementation, supply chains pursue to gain competitive advantage by carefully linking the internal functions within a company with the external suppliers, customers, and other channel members in the chain (Flynn et al., 2010; Frohlich & Westbrook, 2001; Kim, 2009; Vickery et al., 2003). According to Gunasekaran et al. (2004, p. 334), the development of cross-functional teams aligns organisations with process oriented structure, which is needed to realise a smooth flow of resources in a supply chain. In addition, the deployment of these teams within organisations and across supply chains has a considerable influence on the minimisation or elimination of departmental, functional or inter-firm boundaries which promote a greater integration of organisations with their suppliers and customers (ibid).

Frohlich and Westbrook (2001) acknowledge supply chain integration as an essential element of manufacturing strategy in this millennium, and define it as '*a set of activities that manufacturers use to integrate their internal processes with both suppliers and customers*'. The study of Flynn et al. (2010) also focuses on the importance of supply chain integration which is defined as '*the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organisational processes, in order to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer at low cost and high speed*'. Building upon the existing literature on the supply chain integration construct, Flynn et al. (2010) classify supply chain integration into three categories: Internal Integration (manufacturer; II), Customer Integration (CI) and Supplier Integration (SI). Utilising both contingency and configuration analysis methods, Flynn et al. (2010) demonstrate the significance of internal integration within an organisation on improving both operational and business performance of an organisation. This study further concludes that CI and SI could only be established and developed

on the foundation of internal integration. In line with this study, Lambert & Cooper (2000) emphasise the importance of coordinating activities within a firm for successful SCM implementation.

Karapetrovic and Willborn (1998) (see Dale, 2007, p.314) believe that integrating systems within an organisation should always lead to a more efficient system. Not all but some of the benefits include: improved operational performance, internal management methods and cross-functional teamwork, higher staff motivation, fewer multiple audits, enhanced customer confidence and reduced costs. Similarly, in the supply chain context, many studies show that higher business performance is attained via integration in a supply chain (Cousins & Menguc, 2006; Flynn et al., 2010; Frohlich & Westbrook, 2001; Kim, 2009; Narasimhan & Kim, 2002; Romano & Vinelli, 2001; Stevens, 1989; Tan, 2001; Tan et al., 1998; Vickery et al., 2003). The researchers, Wong and Boon-itt (2008) and Lee and Billington (1992) recognise that many problems facing manufacturing such as parts shortages, excess inventories, delivery and quality problems, and cost increases are rooted in the lack of effective internal and external supply chain integration. Nevertheless, achieving the supply chain integration still remains as a challenge for both academics and practitioners.

Integration is not a simple process, rather a difficult and complex task (Cousins & Menguc, 2006; Kim, 2009). According to Cousins and Menguc (2006), it occurs at several levels, probably beginning with improvements in communications and ending up, as Vickery et al. (2003) demonstrate, with improvements in both financial and service performance. Grandori and Soda (1995) suggest the following mechanisms for inter-firm cooperation: communication/decision/negotiation mechanisms, social coordination and control, integration and linking-pin roles/units, common staff, hierarchy and authority relations, planning and control systems, incentive systems, selection systems, information systems, and public support and infrastructure. Although Grandori and Soda's (1995) categorisation can be very useful to link organisations in a supply chain context, unnecessarily made distinctions between related groups such as decision mechanisms and hierarchy/authority relations, and/or communication mechanisms and information systems reduce the level of focus to the most important dimensions to achieve supply chain integration.

By the analyses of the following three important studies (Hewitt, 1994; Lee, 2000; Bowersox et al., 2000), Dudek (2009) suggests that decision authorities, in other words, how and by whom decisions are drawn, is one of the important dimensions of integrated businesses in a supply chain. Decisions made on every level from operational to strategic clearly influence supply chain effectiveness and efficiency. Particularly, strategic level decisions which are taken by the top management of organisations such as determining target market, utilising or building of distribution centres, factories and support organisations, product design and development activities have a considerable effect on supply chains' competitiveness in the market. Hence, achieving thoroughly an integrated supply chain especially at strategic level processes is critical for its success (Gunasekaran et al., 2004; Kim, 2009).

Other dimensions that Dudek (2009) suggests for supply chain integration are as follows: the work structure (how and by whom processes are operated), information flows (how and to whom data is communicated), and the underlying relationships between supply chain partners. With the work structure, the emphasis is on the control of the processes throughout a supply chain. Control of processes in a supply chain is crucial in improving performance (Gunasekaran et al., 2004). Well-defined and controlled processes are essential for an effective supply chain management (ibid, p. 334). In order to control intra and inter-organisational processes, clarity of how and by whom these processes throughout the supply chain are conducted should be known to all the pertinent members of the supply chain. Based on the work of Cousins and Menguc (2006), which considers both socialisation and integration as forms of control between the relationship of a buyer and supplier, in a wider view, the integration in a supply chain ensures that all entities in the chain are informed and hence be aware of their rights, responsibilities, and obligations (Kim, 2009). In the work of Kim (2009), it is proved empirically that the integration in a supply chain is positively affected by a structural factor which includes formalisation of SCM practices through exclusive organisation. Last but not least, without a lack of well-established communication among member organisations of a supply chain, none of the above mentioned activities can be attained. Improved communication could be perceived as a key element of successful supply chain integration (Cousins & Menguc, 2006; Dudek, 2009; Romano & Vinelli, 2001; Vickery et al., 2003). The scope of communication is wide, and it is easier to be said than done because in most respects achievement of closer communication requires a significant attitudinal shift for firms, especially for large-size firms towards their suppliers. It is essential that the buyer with high level of tangible and intangible resources perceives its suppliers as a capability not as a cost in order to form a close and long term relationships with them (Stevens, 1989; Kumar, 1996). Moreover, all organisations in a chain should change from seeing themselves as independent organisations in a market to being participants in a net-chain. To achieve a required level of commitment from all parties, it is important that the benefits derived from the supply chain integration are equitably distributed to the entire supply chain (Chopra & Meindl, 2010; Kumar, 1996; Lambert & Cooper, 2000). Communication in the scope of this research primarily concerns generating an environment in which learning and exchange of ideas and technologies are facilitated so that firms within a chain are able to communicate quickly and efficiently with each other. Based on the review of the literature in the field of supply chain, it is proposed that an integrated supply chain has a strong link with supply chain structure whose dimensions are aligned with the requirements of supply chain integration.

### **2.2.3 Supply Chain Structure**

The relationship between the organisation structure and successful integration within an organisation was previously proposed by Wilkinson and Dale (2000). In their work, one of the research methods

was to hold a seminar in regard to the issues for system integration. The list of issues was classified by the researcher into four themes, one of which was organisation. Under the organisation theme, two questions were about analysing the impact of organisation structure and that of changes in organisation structure on the integration process.

Traditionally, a structure has been studied for a single organisation (Child, 1972; Dale et al., 2007; Hall, 1962; Pugh et al., 1968; Tse, 1991; Wang, 2001). In the context of SCM, the structure refers to the grouping of firms, suppliers and customers (Chen & Paulraj, 2004). Regardless of its form, whether it is an organisation or a supply chain or even a community, the purpose of a structure is to enable and encourage the organism to act for an ultimate aim. In today's global economy, whether national or international, companies are willing to change their organisational structures and relationships formed within this structure in order to serve their customers in the most efficient way and to maximise their profit (Dale et al., 2007, p. 310).

In order to characterise the structure of a supply chain, firstly, literature in organisation structure and organisation design has been reviewed. One of the definitions of an organisation structure is presented by Rosenfeld and Wilson (n.d) as *'the established pattern of relationships between the component parts of an organisation, outlining communication, control, and authority patterns. Structure distinguishes the parts of an organisation and delineates the relationship between them'*. According to Chen and Paulraj (2004, p. 124), the topics that should be managed under the structure issue are task, authority, and coordination mechanisms across distinct firms or organisational units that enhance the supply chain performance. Since a supply chain is a collection of organisations (Choi & Hong, 2002, p. 470), same activities, namely communication, control, and authority patterns in supply chains should be satisfied through its structure. Choi et al. (2001) define the supply chain structure similar to the Rosenfeld and Wilson's definition of the organisation structure as *'the patterns of relationships between organisations that belong to supply chain'*. Another definition of the supply chain structure was carried out by Hur et al. (2004) as *'the processes that control and co-ordinate the objectives and activities of independent organisational units that comprise the supply chain'*. For the purpose of this study, Choi and Hong's (2002) definition of supply chain structure is adopted. Hence, the structure of a supply network (or chain) can be viewed as *'the patterns of relationships among firms engaged in creating a sellable product'*.

One particularly important aspect of the structure which is supported in this research was previously proposed by Mintzberg (1979). He asserts that the structure of an organisation ultimately emerges regardless of the intended design. Similar to this view, Dale et al. (2007) suggest that the organisation structure is concerned with the issues emerging from the way in which a business is structured and includes functions, roles, responsibilities, hierarchies, boundaries, flexibility, and innovation. In the line with the studies on organisation structure, the structure of a supply chain emerges with no one

firm deliberately orchestrating the exact shaping, form or design as the desired target becomes explicit (Choi et al., 2001; Choi & Hong, 2002; Choi & Kim, 2008).

There has been a great deal of research particularly on the organisation structure (Child, 1972; Hall, 1962; Pugh et al., 1968; Tse, 1991). In most of these studies, the 'structure' was considered as an independent variable, and it was needed to be operationalised in order to measure its effects on various dependent variables, such as organisational performance and behaviour in organisations. Different studies adopted different perspectives when they atomized structure into component parts, referred to as structural dimensions (Dalton et al., 1980). For example, while Pugh et al. (1968) considered specialisation, formalisation, standardisation, centralisation, and configuration as the dimensions of an organisation structure, Child (1972) used documentation, standardisation, and specialisation as the dimensions of the organisation structure. Although there is still no consensus on the dimensions of the organisation structure which should be considered the most proper and exact ones, an useful distinction which was made between 'structural' and 'structuring' characteristics of organisations has helped in better categorisation of possible dimensions. According to Campbell, Bownas, Peterson, and Dunnette (1974) (see in Dalton et al., 1980, p. 51), the 'structural' properties of an organisation are its physical characteristics, such as size, span of control, and flat/tall hierarchy, 'structuring' qualities refer to policies and activities occurring within the organisation that prescribe or restrict the behaviour of organisation members. For the purpose of simplicity, no such distinction in the possible constructs of supply chain structure is made for this study. Although they are not the only factors affecting supply chain structure, the following dimensions of the supply chain structure are considered as playing the most pivotal role in achieving the required amount of integration among supply chain members. Thus, based on the review of the relevant literature, formalisation, centralisation, and communication are determined as the most significant dimensions of supply chain structure which are likely to have a positive effect on supply chain integration. The following diagram illustrates this relationship between supply chain structure and supply chain integration and linking this to Supply Chain Quality.

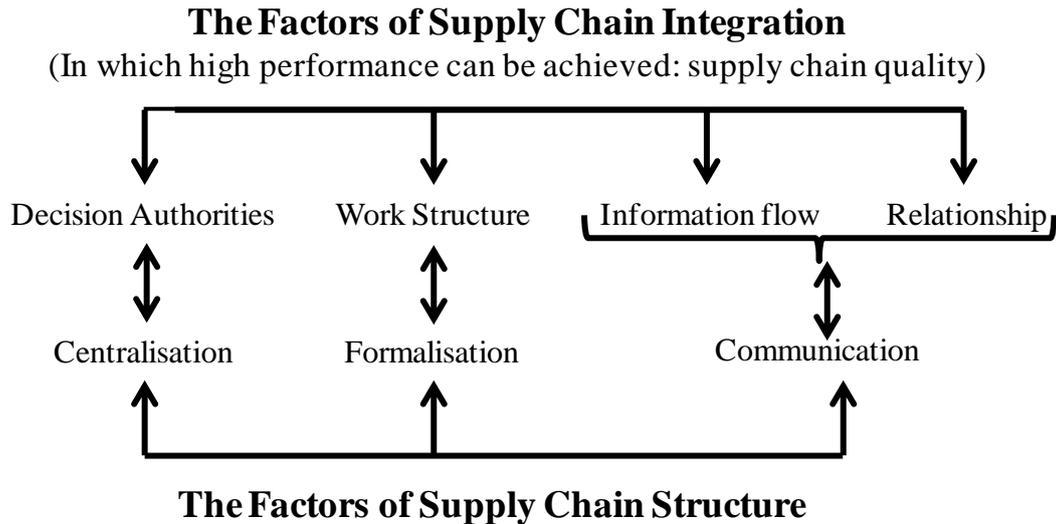


Figure – 2.1 Relationship between Supply Chain Structure and Supply Chain Integration

Figure – 2.1 relates Supply Chain Quality to supply chains’ attainment of high performance values via Supply Chain Integration.

### 2.2.3.1 Formalisation

The word ‘formalisation’ first appeared in the literature of organisation structure in the 1960s (Walsh & Dewar, 1987). At the beginning it was treated simply as rules. However, studies conducted since then have proved that ‘formalisation’ is more than simply concerning about rules (Child, 1972; Choi & Hong, 2002; Pugh et al., 1968; Walsh & Dewar, 1987; Wang, 2001). Wong and Boon-itt (2008) use a similar term to formalisation, which is the institutional norm referring to *the expectations of behaviour that are acceptable within an institutional environment* and suggest a direct relationship between these norms and supply chain integration. Walsh and Dewar (1987) define formalisation as *the process through which the desired behavioural standards of one actor (or set of actors) for the other(s) become reified in such a way that they are easily remembered and understood over time without the need for the first actor(s) to repeat them, or for the other even to know that the first actor originated them*. In this definition, reification denotes that the expectation is either written or repeated verbally a sufficient number of times so that it is remembered and understood over time by a relatively large number of people. In a nutshell, formalisation is an expected feature of an interaction (Walsh & Dewar, 1987). Not all expectations of an interaction are formalised (ibid). In order for any expectation to be considered formalised, they should be repeated sufficient number of times so that clearly understood by all the participants involved. Moreover, written rules or regulations may not be considered formalised if they are little-used or long-forgotten (ibid). As a result, regardless of written or unwritten and explicit or implicit, the salient quality of formalisation stems from its ability of generating a clear understanding.

The definition of formalisation in a supply chain context which is presented by Choi and Hong (2002, p. 470) is acknowledged to be the most suitable one for this study. Based on their definition, formalisation in supply network refers to *'the degree to which supply network is controlled by explicit rules, procedures, and norms that prescribe the rights and obligations of the individual companies that populate it'*. Even though the word explicitness is used in the definition, Choi and Hong (2002), at the end of their case study research, acknowledge the significance of implicit understanding between two firms, especially if the relationship between the focal firm and the supplier is a long-lasting one. Whether written or unwritten, formalisation requires rules, procedures or other behavioural guidelines to be understood clearly so that it can bring about precision and fairness (ibid). Based on the accepted definition of formalisation, whether it is for a single organisation or a supply chain, the underlying purpose of it is to achieve consistent results from the system. This is attained through controlling the elements of the system with an effect on the final output through explicitly written (documents) and/or explicitly or implicitly understood unwritten norms (work norms/behavioural guideless) (ibid). The implementation of this term in supply chain context is not totally but mainly related to the activities of the upstream of the supply chain. According to Choi and Hong (2002), it would not be possible for any one firm, a focal firm in the context of this research, to impose rules, procedures, and norms to the supply chains at the system level; formalisation can only be implemented at a dyadic level (firm to firm). In order to analyse the level of formalisation in a supply chain, the interview questions utilised for this research attempt to investigate whether or not multiple supply base revolving around a buying firm rely on rules, procedures, and norms to achieve consistency of output via generating clear understanding throughout the supply chain.

### **2.2.3.2 Centralisation**

Second dimension is related to the power of the people both within the organisation and throughout the supply chain. Emmett and Crocker (2006) state that power is rooted in organisations' structures. Mintzberg (1979) comments that centralisation and decentralisation have been the most confused topics in the organisation theory due to their fundamentally different ways of use in the literature. Besides explaining other meanings of these terms, Mintzberg provides a description of centralisation exclusively in terms of power over the decisions made in the organisation. According to Mintzberg, *'when all the power for decision making rests at a single point in the organisation -ultimately in the hands of a single individual- the structure is called centralised; to the extent that the power is dispersed among many individuals, the structure is called decentralised'*. Kim (2007) evaluates the questions such as who has the authority, power and position to make decisions in the organisation as an important structural organisational property and calls it centralisation.

Centralisation in the supply chain context is directly related to how much authority or power the final assembler exerts over the suppliers (Choi & Hong, 2002). Therefore, in a centralised supply chain

decisions are made by the final assembler, whereas in a decentralised supply chain individual suppliers autonomously make decisions (ibid). Nevertheless, Choi and Hong (2002) also demonstrate the awareness of the impossibility for the final assembler to involve in decision making for all suppliers in a real world situation due to lack of strategic management approaches and limited resources such as time and human-resource. Another reason for the final assembler not being able to make decisions for an entire supply base is given by Choi and Kim (2008). They propose that any relationship between a buyer and a supplier is bound to be affected by the existing relationship that particular supplier has with other suppliers and/or customers in the larger network. Due to these kinds of limitations encountered in the real world situations, a buyer does not always have a direct control over the supplier's suppliers and/or the supplier's customers. As a result of the above arguments, depending on the size of a supply base, the final assembler selectively engages with the suppliers; its relationship with the suppliers in most respects starts with the first tier supplier and then goes to the supplier's supplier, and so on, occurring as a dyadic relationship each time (Choi & Hong, 2002). Therefore, centralisation in a supply network is defined as '*the numbers of the tiers that the final assembler actively manages by selecting them, engaging them in product development, or helping them solve problems*' (ibid). Based on Choi and Hong's description of centralisation in the supply chain, for the purpose of this study, if a final assembler exercises direct control of the above mentioned processes over the first tier supplier, second tier supplier, and so on, that chain will be called centralised; if a final assembler exercises direct authority over only the top-tier supplier and allows the top-tier supplier to work with its supplier, and so on, that supply chain will be called a decentralised supply chain.

### **2.2.3.3 Communication**

Dale et al. (2007) have designated 'communication' as a factor of an organisation structure. In their work, communication is examined to understand the way information flows throughout the organisation, from up to down and across the organisation. One of the typical questions brought up in their research is that whether business objectives are communicated in order the business plan to be understood at all levels of the organisational hierarchy. Undoubtedly, raising this kind of question is aimed to investigate whether the organisation has a system to communicate its objectives. More importantly, however, it attempts to explore the organisation's environment to understand if it is conducive to the involvement of all its employees to achieve business targets. In the research conducted by Robinson and Malhotra (2005), communication is combined with partnership activities, and together is designated as one of the five themes of supply chain quality management. The primary aim of the 'communication and partnership activities' theme involves organisations working closely together and nurturing relationships with other members of the supply chain in order to share goals, coordinate activities, and improve performance (ibid; Chopra & Meindl, 2010). Several researchers

such as Chopra & Meindl (2010), Emmett & Crocker (2006), Fynes et al. (2005), Kumar (1996), Narasimhan & Nair (2005) and Hofstede (2007) emphasise the significance of the trust building phase among supply chain members in order to achieve close communication across a supply chain. Without a degree of trust, even huge investments in coordination activities such as information technology (IT) in a supply chain will not provide the benefit it would otherwise do (Chopra & Meindl, 2010).

In order to exploit competitive advantages by forming strategic alliances and partnerships and facilitating these relationships, companies must exchange information through increased communication and cooperation (Sabbaghi & Vaidyanathan, 2007, p. 151). Similar to the single organisation case, studied by Dale et al (2007), in a supply chain environment establishing an effective communication, coordination, and collaboration mostly lies in the degree of information sharing. Via information sharing, the level of uncertainty is reduced within a firm and across a supply chain. Zhou and Benton (2007) categorised information sharing into three groups. They are: information quality, information content, and information sharing support technology. In their study, the definition of information quality '*an assessment of the degree to which the information exchanged between organisations meets the needs of the organisations*' is taken from the study of Petersen (1999); the nine aspects of information quality are identified as accuracy, availability, timeliness, internal connectivity, external connectivity, completeness, relevance, accessibility, and frequently updated information (Zhou & Benton, 2007). Buyers and suppliers must commit a greater amount of information for mutual benefits (Carr & Pearson, 1999) and be willing to share process information in order to collaboratively find solutions to material problems (Giunipero, 1990).

According to Cousins and Menguc (2006), and Narasimhan & Nair (2005), communication should be established through both formal and informal links between buyers and suppliers. Regarding formal links, regular supplier meetings, joint conferences, joint steering committees (buyer and supplier) are employed for managing the collaboration. Informal linkages are also considered to be significant such as ad hoc telephone conversations, exchanges of information, and general regular contact. In addition to the work of Cousins and Menguc (2006), Chen and Paulraj (2004) indicate that effective inter-organisational communication between buying and selling personnel has the features of being frequent, genuine, and involving personal contacts. Although the involvement of personality aspect in effective communication has a valid point, the importance of information technologies in information sharing has been widely acknowledged and researched by academics (Chopra & Meindl, 2010; Zhou & Benton, 2007). Manufacturers increasingly rely on IT to streamline their business processes (Sabbaghi & Vaidyanathan, 2007, p. 150). By integrating business processes across the supply chains, companies can quickly move information and materials to their trading partners and respond quickly to market changes (ibid, p. 150). The level of integration companies strive for now and in the future can only be accessible through significant advances in information technology, which in the past, has

been costly and available only to larger companies with budgets that could support such endeavours (ibid, p. 151). Modern information technology, through its power to provide timely, accurate, and reliable information, has led to a greater integration of modern supply chains than possible by any other means (Benjamin & Wigand, 1995; Zhang et al., 2011). IT helps improve coordination by utilising the visible information to make decisions related to inventory, production, transportation, sourcing, and pricing (Chopra & Meindl, 2010, p.506).

### 2.3 Proposed Model based on the Gap in the Literature Review

Supply Chain Quality is considered as a relatively unexplored area of research in the field of SCM. A contribution to the literature would be possible by developing a theoretical model which will explain the most important factors of a supply chain structure which have an effect on integration process of a supply chain. In order to achieve any specific outcome, the relationship between supply chain structure and supply chain integration is central to this research. Based on the purpose and convenience of conducting this research, Figure – 2.1 shows the initial conceptual model of supply chain quality with its variables.

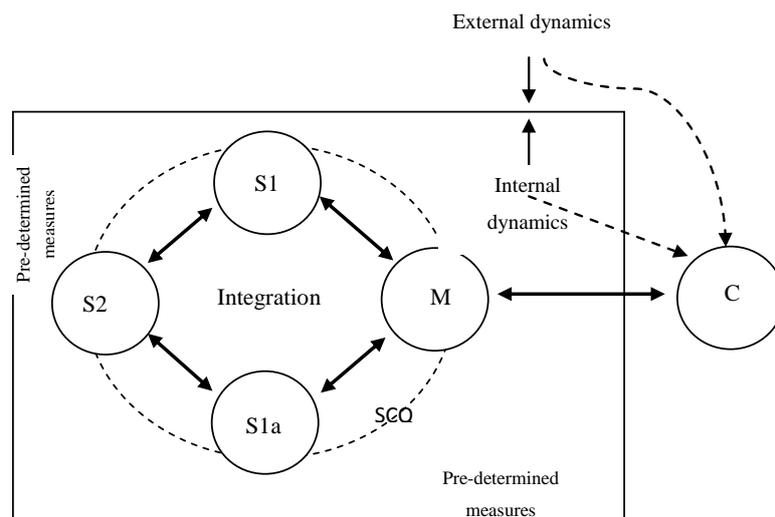


Figure – 2.2 Proposed Initial Conceptual Model

(C: Customer; M: Manufacturer; S1: First-level supplier 1, S1a: First-level supplier 2; S2: Second-level supplier 1;  $\longleftrightarrow$ : Relationship;  $\longrightarrow$ : Primary effect,  $--\blacktriangleright$ : Secondary effect)

Figure – 2.2 illustrates a supply chain of a manufacturer with a customer and two levels of suppliers. The purpose of any supply chain is to achieve its pre-determined performance measures, which are directly or indirectly and positively or negatively affected by external dynamics.

Based on the definition of ‘external environment’ by Wheelan and Hunger (2001), external dynamics consist of variables (opportunities and threats) that exist outside the organisation or the supply chain and are not typically within the short-term control of top management or SCM. As shown in figure -

2.2, while an external dynamic can have a positive or negative effect on the whole supply chain, the effect of the same external dynamic on the customer is likely to be in the same direction but at a different level (differentiated with the dashed line). For example, the ash cloud from the volcanic eruption in Iceland from April to May 2010 interrupted airline operations all over Western and Northern Europe. Hence, the service level of the air transport industry was affected dramatically by this natural event, which is typical for the external dynamic. However, it did not cause a sharp decrease in the customer demand for airline customers; most part of this demand was transferred to another supply chain, the Euro-star train company. Based on the definition of ‘internal environment’ by Wheelan and Hunger (2001), the internal dynamics of a corporation consist of variables (strengths and weaknesses) within the organisation itself that are also not usually within the short-term control of top management. Wheelan and Hunger’s definition is based on independency of two environment variables. An initial categorisation of external and internal dynamics is shown in the following table.

Table-2.2 Internal and External Dynamics of Supply Chain

External Dynamics (enablers or constraints at the supply chain level)	Internal Dynamics (enablers or constraints at the individual organisation level)
Natural Events	Contingency Plans
Quality Management System Requirements	Quality Tools
Regulations, Laws	Quality Management Approach

The example above, disruption in the airline services caused by the Icelandic ash cloud, proves how important for a supply chain to respond effectively to the changing circumstances. This is due to the fact that in the competitive market economies, such external or internal dynamics can easily cause crisis situations for the supply chains in which the customers and income shift into rival companies.

Another example for natural events with negative effects on supply chain operations is that in winter 2010, Euro Star, the multi-national train service provider, could not react well to severe weather conditions. Due to the long-lasting blockage in the Channel Tunnel between England and France, the company lost both money and prestige. So, the wintery weather conditions could be considered as a constraint for that specific supply chain’s performance. It is interesting that any external effect (volcanic ash cloud in the example above) can bring out positive outcomes regarding any supply chain (Euro-star) while having a negative effect on another (airliners). The disruption in air transport traffic has led to a sudden increase in demand for Euro Star trains. As for the internal effect, say reduction of process variations in any stage of the supply chain will increase the overall performance of the chain. New manufacturing paradigms such as lean manufacturing, agile manufacturing, and mass customisation will help to reduce the waste in the manufacturing environment and response time to the customer along with an increase in customer satisfaction. Only very recently, a new treaty in

response to a Eurozone financial crisis has been proposed by the previous French President Nicolas Sarkozy in conjunction with the German Chancellor Angela Merkel. In the announcement made on the first week of December of 2011, the French President says that they want to have an equal Europe, a Europe on the same footing and playing field; they do not want to make the mistakes of history where perhaps too many decisions were taken without really taking the consequences into account (Hewitt, 2011). As a resolution to the ongoing Eurozone debt crisis, a higher level integration which is effectively controlled through strict rules and measures, and strengthening co-ordination among the Eurozone countries are proposed by the leaders of these countries. It is interesting to observe that inequalities among the Eurozone countries' financial status and lack of control over the decisions taken by the individual Eurozone countries are suggested to be the primary causes of this catastrophic crisis. Same principles which are about to be undertaken to resolve the Eurozone debt issue are readily finding their places in the supply chain environment.

## **2.4 Supply Chain Performance Measures**

Supply Chain Management (SCM) is an effort to achieve a higher level of co-ordination (Zhang et al., 2011). Hence, coordination has become the critical part of an effective supply chain management (Xue et al., 2005). Coordination refers to *the integration of different parts of an organisation or of different organisations in a supply chain to accomplish a collective set of tasks and to achieve mutual benefits* (ibid). Recent research has suggested that supply chain performance depends on how well supply chain partners work together and not on how well each partner firm performs individually (Jayaram et al., 2011; Martin & Patterson, 2009). Similarly, there are other studies which emphasise the importance of collaboration between supply chain partners for successful chains ( Lin et al., 2005; Kuei & Madu, 2001).

Given the diverse ways in which different companies might achieve their supply chain objectives, there is no monolithic approach to a set of supply chain outcomes (Melnyk et al., 2010, p. 36). Similar to the variety of the approaches to how the objectives of the supply chain could be met, there is a diversity of the targets to be reached. Typically, a firm should measure the performance of the supply chain in terms of inventory investment, service level, throughput efficiency, supplier performance and cost (Stevens, 1989). According to Melnyk et al. (2010), on the other hand, when properly designed and operated, the traditional supply chain has offered customers three primary benefits: reduced cost, faster delivery and improved quality. However, more outcomes are expected from today's supply chains such as cost, responsiveness, security, sustainability, resilience, innovation (ibid). Evaluation and monitoring of performance metrics are key aspects of the integration process, partnerships, and strategy (Sabbaghi & Vaidyanathan, 2007, p. 147). The following subsections presents the literature review on the performance measures related to the dimensions of supply chain structure which are considered in this research.

### **2.4.1 Performance Measures Related to Communication**

It can be rightly claimed that there is broad consensus on the significance of communication for intra and inter-firm relationships in the operations management literature. While the research provides unanimous support on the importance of communication for supply chain integration, there is, however, little agreement on how communication should be systematically approached in the literature. The investigation of communication solely in terms of information sharing is rather few (Fynes et al., 2005). Most of the research containing this dimension combines communication with various other components such as relational (i.e. trust, adaptation, commitment, etc) and infrastructural (i.e. information technology support systems and supply chain proximity) (Narahimsan & Nair, 2005; Robinson & Malhotra, 2005; Van der Vaart & Van Donk, 2008; Zhou & Benton, 2007). Based on the review of the relevant literature, the most critical features of communication are determined as information sharing, information technologies, and trust.

Several researchers have shown the significance of information sharing among the supply chain partners and inter-firm cooperation ( Lee et al., 2000; Lee et al., 2012; Fynes et al., 2005; Narasimhan & Nair, 2005; Sanders, 2008; Wang, 2001). There have been numerous studies proving a positive direct or indirect link between information sharing and a variety of performance measures (Chen & Paulraj, 2004; Das, 2010; Fynes et al., 2005; Lee et al., 2000; Narasimhan & Nair, 2005; Tan, 2001). Mediated by strategic alliance construct, the study of Narasimhan and Nair (2005) provides empirical support for the positive effects of information sharing and trust construct on the key performance measures of a supply chain: market share, return on assets, price competitiveness, overall product quality, and overall customer service. In a two-stage supply chain consisting of a manufacturer and a retailer, Lee et al.'s (2000) study suggests that sharing demand information with manufacturer could provide significant inventory reduction and cost savings to the manufacturer. In response to these savings made by the manufacturer, the retailer can negotiate different arrangements with the manufacturer such as price reduction and lead time reduction. Sharing information with suppliers, especially long lead time suppliers improves the supply chain planning capability (Zhou & Benton, 2007, p. 1353); that of with critical suppliers and customers improves customer service and makes the supply chain more responsive (Melnik et al., 2010; Zhou & Benton, 2007) as in the Dell's and Cisco's case. The study of Zhou and Benton (2007) investigates the effects of information sharing on the delivery performance of the supply chain. All the three aspects of information sharing, namely information quality, information content, and information sharing support technology are claimed to be positively related to the delivery performance of the supply chain. However, the results of the study illustrate that only information quality has a strong positive effect on the delivery performance of the supply chain; the effects of other two dimensions are found to be insignificant. While Handfield

and Bechtel (2002) include the construct of human-specific assets which is evaluated on the basis of whether certain activities are present in a buyer-supplier relationship including sharing production schedules and sensitive information in their model, the study's findings suggest that information sharing in inter-organisational relationships which lack trust has no influence on supply chain responsiveness. On the other hand, the same study finds out that the level of trust between buyers and suppliers alone has a positive direct effect on the same performance measure.

In this network economy, information technologies (IT), digital networking, and communication infrastructures provide a global platform over which people and organisations interact, communicate, collaborate, and search for information (Sabbaghi & Vaidyanathan, 2007, p. 144). While gaining increasing importance, there are different viewpoints on the effects of IT utilisation at the organisational level. In Wang's (2001) empirical study, it is proved that the impact of IT at organisational level is primarily driven by the level of information intensity an organisation faces from internal and external sources such as an organisation's innovativeness and competitive pressure. Investment in IT systems without a consideration of the load of information needed to be scanned, filtered, transmitted speedily and effectively may be one of the reasons why it does not bring the anticipated benefits to the organisations. The research indicates that IT investments must be done in a certain way in organisations or supply chains to result in positive outcomes (Lee et al., 2012; Sanders, 2008). According to Lee et al. (2012), it is only when IT is utilised in a manner to increase the understanding of a customer (e.g., integrating a firm's computerised reordering system with a customer's inventory management system such that past trends and future order forecasts can be established and more accurate and timely predictions on a customer's needs and preferences can be made), then the quality of the relationship between the parties is established, resulting in increased firm performance. In line with the above view, Handfield and Bechtel (2002) support the proper implementation of IT and suggest that if the implementation of IT creates an environment which is conducive to information sharing, it reduces paperwork and supply chain cycle time, and improves communication. Sanders's study manifests the usage of IT by a supplier for the purpose of both exploitative and explorative reasons and shows the positive links between these intentional usages of IT and the supplier's operational and strategic benefits. Although the study of Sanders only considers suppliers' perspective and fails to include that of buyers, it provides significant implications to both practitioners and academics. Contribution to the literature lies in the fact that unlike the majority of the studies completed in this area which consider the effects of communication, collaboration, coordination on operational performance, Sanders's study investigates the effects of coordination activities on both operational and strategic performance. In terms of managerial implications, particularly for suppliers, it offers invaluable direction emphasising that IT usage achieves both operational and strategic collaboration which enable suppliers to gain both short term, operational benefits, and long term, strategic benefits. Therefore, compared to large size buying firms with bigger

budgets, suppliers do not hesitate to invest in IT and skills provided that it is used in a correct way. The following table shows the review of literature on the performance measures affected by communication.

Table – 2.3 Performance Measures Related to Communication

Communication	Related Performance Measures	Authors
Information Sharing	market share, return on assets, price competitiveness, overall product quality, overall customer service	Narasimhan & Nair (2005)
	inventory reduction and cost savings for manufacturer; Price reduction and lead time reduction for retailer	Lee et al. (2000)
	quality performance (only design quality) and customer satisfaction	Fynes et al. (2005)
	customer satisfaction, productivity, financial results	Kuei & Madu (2001)
Trust	supply chain responsiveness	Handfield & Bechtel (2002)
	market share, return on assets, price competitiveness, overall product quality, overall customer service	Narasimhan & Nair (2005)
	quality performance (only design quality) and customer satisfaction	Fynes et al. (2005)
Information Technologies (IT)	firm performance	Lee et al. (2012)
	reduction in paperwork and supply chain cycle time; improvement in communication	Handfield & Bechtel (2002)
	operational benefits (improved customer service, process improvement, cost efficiencies); strategic benefits (improved financial performance and market share)	Sanders (2008)
	facilitate the adoption of performance measurement systems for day-to-day operations	Sharma and Bhagwar (2007) (see in Martin and Patterson)
	customer satisfaction, productivity, financial results	Kuei & Madu (2001); Kuei et al. (2002)
	reduction in production and distribution cost	Croom (2001)

#### 2.4.2 Performance Measures Related to Formalisation

Daft and Lengel's study (1986) pose a question of why organisations process information. And, they suggest that equivocation meaning *ambiguity* and uncertainty meaning *absence of information* are the main forces for the need for information processing. Because high equivocation creates confusion and lack of understanding, and the completion of a task is inhibited by a lack of information, they are the two important forces which needed to be reduced in any environment. In the organisational context, role ambiguity is a problematic situation and results in various unfavourable personal outcomes such as stress, low levels of performance, and a desire to leave the job which are likely to prove dysfunctional to the firm (Marginson, 2006). But, role ambiguity is countered by the acquisition of sufficient and certain information about expected role behaviours, and Marginson's study highlights the significance of written and numeric documents as ambiguity reducer.

One of the other ways to increase understanding in organisations begins with standardisation. Companies participating in standardisation may benefit from cost advantages, greater knowledge, and advantages from influencing the content of the standard (Swaan, 2000, see in Rodon Modol, 2007). Through standardization and systemization as a result of ISO 9000 adoption, the operational procedures of the adopting company should be more efficient; many companies perceive that implementing ISO 9000 can improve operational performance (Lo et al., 2009). The following table shows the review of literature on the performance measures related to formalisation.

Table – 2.4 Performance Measures in Related to Formalisation

Formalisation	Related Performance Measures	Authors
Clarity of Understanding	increase in personal outcomes: low level of stress, commitment to the job, high performance <i>through role clarity of personnel</i>	Marginson, 2006
	cost advantage, greater knowledge, and chance to influence the standard <i>through standardisation</i>	Swaan, 2000 (see in Rodon Modol, 2007)
	operational efficiency <i>through standardisation</i>	Lo et al., 2009

### 2.4.3 Performance Measures Related to Centralisation

In today's global environment where parts are acquired through integrated supply base including smaller second, third level suppliers, the management of further upstream suppliers besides the first level ones becomes critical for the performance of supply chains (Choi & Kim, 2008; Wathne & Heide, 2004). Termed as *structural embeddedness* by the same authors, it denotes having a direct or indirect, unwitting or intentional connectedness with other firms (buyers and/or suppliers) in the larger network when any single firm forms a dyadic relationship in a particular supply chain. The study of Choi and Kim (2008) provides three distinct examples to illustrate how a buying company's various performance measures such as quality, delivery, and profitability depend on its immediate suppliers' extended business network. Other authors (Carr & Pearson, 1999; Maloni & Benton, 1997; Yeung, 2008) also articulated supply base management as a strategic approach to enhance organisations' and supply chains' competitiveness.

Strategic management of suppliers including processes of evaluation, selection, qualification, development, and certification provides both tangible and intangible benefits to organisations. Carr and Pearson's (1999) results suggest that organisations can improve their financial performance through increased emphasis on strategically managed buyer-supplier relationships. More specifically, mediated by buyer-supplier relationships, the process of strategic supplier evaluation which enables a buying firm to identify potential suppliers who warrant further business has a positive indirect effect on the organisation's financial performance. The evaluation of suppliers normally includes a review of the suppliers' processes such as suppliers' financial stability, technological capability, production

capacity, and quality management status (Krause et al., 2000). Wathne and Heide (2004) recognise supplier qualification as one of the two components of the governance mechanism that is deployed in an upstream supplier relationship. The findings of this research support the proposition that the manufacturer's ability to respond to the uncertainty coming from the downstream customer is related to the manufacturer's supplier qualification process.

Supplier partnerships and strategic alliances refer to the co-operative and more exclusive relationships between organisations and their suppliers and customers (Gunasekaran et al., 2004, p. 334). The objective to form this kind of relationships is to reduce the uncertainty and enhance control of supply and distribution channels (ibid). These alliances are usually created to increase the financial and operational performance of each channel member through reductions in total cost and inventories throughout the supply chain and increased sharing of information (Maloni & Benton, 1997). Involving suppliers early and giving them influence over design is associated with greater contributions of suppliers to cost reduction, quality improvement, and design for manufacturability (Liker et al., 1998). Developing and engaging in a true partnership relationship in supply chains, suppliers become more proactive in design and development activities; hence, this type of collaborative buyer-supplier relationship will have a positive impact on design quality (Fynes et al., 2005). Wong and Fung (1999) emphasise the significance of collaborative and structured relationship, especially with long-term suppliers in meeting quality requirements of the customers. Supplier involvement promotes better resource utilisation, the development and sharing of technological expertise, and network effectiveness (Birou & Fawcett, 1994). The work by Kuei and Madu (2001) identifies supplier participation as a critical factor to achieve supply chain quality. In addition, the same study highlights the significance of supplier development for individual organisations to achieve high performance in customer satisfaction, productivity, and financial results. Table – 2.5 presents the performance measures in relation to the centralisation structural dimension.

Table – 2.5 Performance Measures Related to Centralisation

Centralisation	Related Performance Measures	Authors
Supplier Selection (includes supplier evaluation)	financial performance (mediated by buyer-supplier relationship)	Carr & Pearson (1999)
	flexibility of the manufacturer	Wathne & Heide (2004)
Supplier participation (Strategic partnership and alliances)	supply chain quality, customer satisfaction, productivity, financial results	Kuei & Madu (2001)
	reduction in total cost and inventories increased information sharing	Maloni & Benton (1997)
	meeting quality requirements	Wong & Fung (1999)
	improving design quality	Fynes et al. (2005)
	cost reduction, quality improvement and design for manufacturability	Liker et al. (1998)
	reduction in uncertainty enhanced control of supply and distribution channels	Gunasekaran et al. (2004)
Supplier Support	flexibility of the manufacturer	Wathne & Heide (2004)

## 2.5 Conclusion

The relationship between supply chain integration and supply chain performance has been the subject of many studies. Indeed, there have been a considerable number of researchers who show the clear link between them. This chapter presents a review of the literature on the relationship between supply chain structure and supply chain integration, and is based on the premise that the higher the integration among a supply chain, the better the performance of that particular supply chain. In the context of this study, any supply chain which achieves its desired outcomes regardless of what they are, it is considered a successful supply chain. Again, this research focuses on neither a specific performance measure nor a set of outcomes.

*How can a supply chain achieve its desired outcomes? Which variables play an important role in supply chain integration?* This research primarily addresses the above questions. Based largely on the review of the literature and partly on the previous industrial experience, it is suggested that supply chain structure with the dimensions of centralisation, formalisation and communication is a strong enabler to supply chain integration, ultimately to desired outcomes for any supply chain. Although organisation structure or supply chain structure is represented by one or the combination of any two of the above mentioned dimensions, based on an extensive review of the relevant literature, it is believed that the present study considering the combination of all three dimensions to represent the supply chain structure will enhance the understanding of the relationship between supply chain structure and supply chain integration in the field of Operations Management (OM). Hence, the proposed conceptual model includes the structural dimensions, namely centralisation referring to *power*, formalisation referring to *a clear understanding among the supply chain members* and communication

referring to *enabling the information exchange*, and links them to supply chain integration in which desired outcomes of a supply chain are met.

A number of companies operating in several sectors of manufacturing are specified as sources of data collection. The reasons for the selection of the exploratory approach and qualitative research methodology are provided in the following chapter in great detail. As the data is gathered, simultaneous analysis is performed, and the results are reflected in the conceptual model in order to achieve the best fit between the data and the model. Originality of the study comes from its contribution to both literature and industry. Based on the results of the data analysis, the initial conceptual model of this study takes its final form and presented in the Discussion chapter of this thesis. In the same chapter, the findings of this study are under examination in respect of the viewpoints of the large volume of the relevant literature. Finally, the Conclusion chapter presents both the emerging new knowledge for the facilitation of theory building in the field of OM, and practical implications for managers in supply chains, particularly those of buyers or the power holders, so that they can extend and reshape current views about how supply chain integration process must be managed.

## CHAPTER III – RESEARCH METHODOLOGY

### Introduction

This chapter explains the research methodology adopted for this study, and it is divided into four main sections. The chapter begins by discussing the research approach to provide the reasons why it is appropriate for the chosen research subject. The second section presents the reasons for choosing the case study method for this research. The third section deals with the research design, and it is analysed under five headings, namely construct validity, content validity, internal validity, external validity, and replicability. Among these, the construct, content, and external validity sections are further divided into several subheadings. In-depth information in respect of the development of the case study instrument, the determination of the research questions and unit of analysis, the advantages of conducting multiply case studies and the data collection stage of the study are provided. In section four, the approach to data analysis is explained. The chapter concludes with a brief summary.

### 3.1 Research Approach (Exploratory Study: building theory from case studies)

One of the major aims of any research is to generate scientific knowledge (Handfield and Melnyk, 1998). There are basically three ways to do this in academia. The first is to develop new theories, the second is to extend old theories, and the third is to reject existing theories or those specific elements which can be proved wrong through empirical evidence (ibid). Determining the specific way to pursue scientific knowledge is an essential step in research. With this achieved, researchers are able to choose the most advantageous methods among others to conduct the specific research.

Choosing a suitable research approach for attaining scientific knowledge is mostly based on the maturity level of the research field in terms of a theory. A comprehensive literature review is carried out to investigate whether or not there are prior theories in an area of study. If a research field is in development, as in this research, the existence of theories is unlikely. Focusing on the theory aspect of the research field is essential since only a good theory transforms empirical data to scientific knowledge (ibid). Hence, at the outset of the study, it is important to determine the need of that specific research field in terms of a theory point of view.

Many fields such as Quality Management (QM), Purchasing and Supply, Logistics and Transportation, Operations Management, and Organisational Theory have contributed to the explosion of Supply Chain Management (SCM) literature (Chen and Paulraj, 2004). Although there has been a great deal of research which helped to understand the essence of SCM, there is still a growing need for developing conceptual frameworks and reliable constructs in order to advance the field. Since the end of 1990's, synergies between QM and SCM have been the main focus of some researchers (Flynn & Flynn, 2005; Kaynak, 2003; Kaynak and Hartley, 2008; Tan et al., 1998; Yeung,

2008) who work in the area of organisational theories such as excellence in organisational performance and inter-organisational relationships. These prior studies were conducted to find out the potential synergies between QM and SCM, and launched in the manufacturing/service environments. It is especially necessary to conduct more exploration of the quality concept in this new environment and analyse it at the level of supply chain.

As Meredith (1998) points out, ‘understanding’ is directly related to asking ‘why’ questions instead of ‘what or how’. He stresses that in order to develop or extend a theory, we must form questions starting with ‘why’, that is, understanding (ibid, p. 445). For the topics in which the existing knowledge base may be poor, in other words, where there are no priori theories, and the available literature will provide no conceptual framework or hypotheses, as in this research, any new empirical study is likely to assume the characteristic of an ‘exploratory’ study (Choi and Hong, 2002; Yin, 2009, p. 37). Sometimes, as Eisenhardt (1989) states, new perspectives might appear during a theory-testing stage of a study, in these situations, again an exploratory type of study is needed to understand these new perspectives.

‘Understanding’ in this research, as Meredith (1998) notes, can be only evaluated as knowledge within the framework of assumptions, beliefs and perspectives specified by the author. Yin (2009) explains that every research method (experiment, survey, archival analysis, history and case study) can be used for all three purposes: descriptive, exploratory and explanatory. Although each method has its distinctive characteristics, there are large overlaps among them. Yin stresses that the goal should be to avoid gross misfits: that is, one should plan to use the method with most advantages. Again, the ‘understanding’ in this research context has a vital importance in order to establish a correct link between an ‘exploratory’ approach and any empirical research methods.

### **3.2 Rationale for Using Case Studies**

This research aims to generate scientific knowledge via exploratory research which builds on existing theory. While researchers (Yin and McCutcheon & Meredith among others) frequently point out that every research method can be used to develop a theory, over the years researchers have noted that there is no common series of events that unfold in the scientific process (Handfield and Melnyk, 1998). One of the useful references to explain the process of developing a new theory was introduced by Wallace (1971) (see in Handfield and Melnyk, 1998, figure 1). According to Wallace’s map, there are six stages in generating a theory: observation, empirical generalization, turning empirical generalizations into theories, hypothesis generation, hypothesis testing and logical deduction.

As subgroups of Operations Management, Quality Management (QM), SCM and the synthesis of these two management approaches, Supply Chain Quality Management (SCQM) are strongly linked to the ‘real world’. In order to develop or extend a theory for a contemporary event, understanding of

it becomes more significant than description or explanation of an event. Being a common research paradigm in the field of Operations Management, rationalism includes the beliefs of positivism and some forms of empiricism and focuses on explaining or describing the phenomenon (Meredith, 1998). On the other hand, case study is one example of the alternative research paradigm, known as interpretivism, is interested in understanding of the phenomenon (ibid). Understanding of the event requires the researchers interested in differences as well as similarities. This is done with the case studies which are one of the well-known research methods to enable researchers to work in the natural settings of a phenomenon without little or no control over the settings. With the availability of a variety of data collection methods (from qualitative to quantitative) and the utilisation of multiple investigators and multiple case designs, case studies are one of the well-known research methods for enabling researchers to implement replication logic across different cases to increase the confidence in the findings (Eisenhardt, 1989; Yin, 2009). Therefore, for this study, natural settings that consider temporal and contextual aspects of supply chain quality (SCQ) should be explored without experimental control or manipulations (Meredith, 1998) in order to increase our understanding of quality at the supply chain level.

Certainly, having no manipulative control over the events will help researchers to adopt more accurate parameters and variables of an environment they observe. Hence, it is likely that initial conceptual model will develop simultaneously as the observation of the events continues. At the beginning of this study, research questions are tentative though this is acceptable for exploratory type of research. Eisenhardt (1989) indicates that although early identification of the research question and possible constructs is helpful, it is equally important to recognise that both are tentative in exploratory type of research; no construct is guaranteed a place in the resultant theory, no matter how well it is measured. This requirement of an exploratory type of research is fully met by a case study method which is naturally flexible in terms of the research scope (McCutcheon and Meredith, 1993). Hence, the scope of the research may be expanded in the exploratory type of research if found necessary (Eisenhardt, 1989; McCutcheon and Meredith, 1993).

In his case study research design and methods text, Yin (2009, p.8) reviewed five different research strategies (experiment, survey, archival analysis, history and case study) against the form of research question and whether contemporary or historical events are being studied and whether control is required over behavioural events (Brophey, 2007). Yin argues that using the case study method is appropriate when the questions asked are how and why, no control is required over behavioural events (i.e. no proactive experiment is being conducted) and the research focuses on contemporary events. This is summarised in the following table.

Table – 3.1 Relevant Situations for Different Research Methods (Yin, 2009, p.8)

Method	Form of Research Question	Requires Control of Behavioural Events	Focuses on Contemporary Events
Experiment	How, Why?	Yes	Yes
Survey	Who, What, Where, How many, How much?	No	Yes
Archival Analysis	Who, What, Where, How many, How Much?	No	Yes / No
History	How, Why?	No	No
Case Study	How, Why?	No	Yes

In general, the case study is appropriate for this research based on the following main reasons: the form of the research questions, having no behavioural control over the events, research subject being a contemporary event. Furthermore, other supporting reasons for choosing the case study are given as follows:

***Naturalistic versus Positivist paradigms***

As has been mentioned in the previous section, the aim of this research is to reach and possibly increase the level of ‘understanding’ of the concept, supply chain quality. Unlike the beliefs of positivism which are concerned with explaining what happens and how, the naturalistic paradigm known as interpretivism helps to understand the phenomena (Meredith, 1998). Hence, prediction and control over a single reality which are expected outcomes in positivist paradigms (Guba and Lincoln, 1982) are unlikely results for this research. As Guba and Lincoln state in their work, naturalistic paradigm suggests that realities are multiple, constructed and holistic, that only time and context-bound working hypotheses are possible, and that all entities are in a state of ‘mutual simultaneous shaping, so that it is impossible to distinguish causes from effects. The proposed conceptual model is context-bound at one level or another, and that the research method used should include the ability to capture the temporally dynamic and multi-characteristic nature of the supply chain (Brophey, 2007, p. 103). Furthermore, the phenomena we deal with cannot be touched, seen, tasted, smelled, or heard (Guba and Lincoln, 1982). In short, there is a closer match to naturalistic inquiry. Case studies are one of the well-accepted methods of operationalising naturalistic inquiry.

***A need for new frameworks and constructs in this field***

Building a theory from a case study research is most appropriate in the early stages of research on a topic or to provide freshness in perspective to an already researched topic (Eisenhardt, 1989). SCM is still considered a developing field (Burgess et al., 2006; Chen and Paulraj, 2004). Hence, there is still huge need for developing new frameworks in various parts of the field. As many authors agree (see

Chen and Paulraj, 2004, p. 119), SCM needs to develop clearly defined constructs and conceptual frameworks to advance the field.

One of the aims of this research is to investigate whether SCQ provides a useful concept or not. Specifically, the need for conceptual frameworks in the area of Supply Chain Quality Management (SCQM) which is a new research field made up by the synthesis of SCM and QM, to transcend the concept of quality from where it has traditionally been associated at the level of the firm to the next level: across many firms within the supply chain and as part of the transition from upstream product to downstream services is clear. Hence, case studies are an appropriate method to learn about quality practices at supply chain level.

### ***Recent industrial problems occurring in supply chains***

From the researcher's point of view, news on recent quality failures in any organisation and/or in a supply chain from any industrial background normally evoke an initial interest in gaining an access to that specific company and examining a problem and its causes on site. Cases are apparent, occurring in very recent time and real life events. The strength of a developing a good theory stems from its establishment on a strong empirical reality. Observing real cases and validation of a theory are necessary to finalise the research. Contribution of the case studies to the research field is not limited to being a conceptual one. The relevance of the proposed model to the existing industrial problems is highly important as well. Hence, in order to search for the answer in terms of both theoretical and practical reasons, case studies are the most appropriate method for this research.

Siggelkow (2007) categorises the primary reasons for employing a case study method as follows: motivation, inspiration, and illustration. While only one of these three reasons can suffice to conduct a case research, a study might include a combination of these reasons when pursuing a case study (ibid). In his paper, it is explained that in general, cases are a great way to motivate a research question. Having worked as a quality engineer at two major manufacturing companies in Turkey, I have had first-hand experience of the effects of organisation structure on quality. During my work experience, I was involved in various parts of quality including management systems and operational practices. The first company I worked for had a well-established and managed quality department under the overall organisational structure, whereas the second company's structure was far from being steady and providing a stimulating environment in which the requirements of quality could be met. The inevitable comparison between the structures' of the two organisations leads me to believe that the way an organisation is formed has an influence on its application of quality. It is obvious that achieving quality becomes more complex for any manufacturing company operating in global environment because it needs to regularly deal with issues coming from up-stream (suppliers) and down-stream (customers) of the chain. Therefore, the simple understanding of the relationship

between quality and organisation structure based on the observations of the manufacturing environments contributed to the development of a research question of '*how does the structure of supply chain affect supply chain integration*'. In order the outcome to this research question to be more appealing and persuasive for its readers, a case study which is grounded in a real-life situation is the most appropriate method among other research methods.

Once conceptual model is developed based largely on the extensive literature review and partially on industry experience, the significance of case studies emerges again. If the claim of Siggelkow (2007) with respect to utilisation of case studies is to be recapitulated, any one study might include a case study which can be initiated by any combination of the above mentioned reasons. For this research, in addition to its motivational aspect, a case study was employed for its illustrative capability. Through illustration, the elements of the conceptual model were defined in real life terms; in other words, the conceptual model was made easy to be imagined by its reviewers. For example, one of the dimensions of the supply chain structure specified in the conceptual model is centralisation. This dimension was redefined and attempted to be captured by the following real life applications in the chosen cases' environment: supplier selection, supplier participation, and helping suppliers. Observing a concrete example of a dimension which is used in a conceptual model helps readers to image how the same model can be applied in one or more empirical settings (ibid). Finally, supporting a conceptual model with illustration of real world data (facts, evidence) ensures research findings to be convincing. That is why a case study is an effective and justifiable research method for researchers who are involved in a qualitative type of research.

***Due to the required resources: time, personal attributes of a researcher, availability of cases, etc.***

In the field of SCM where existing literature is spread over a wide-range of research area, appropriate time is required for a proper literature review. Once the gap in the literature is identified and a theoretical framework is established, time should be spent to check the formulated theoretical framework through real world data in order to develop a good theory (Gummesson, 2000). Having had an easy and continuous access to the selected companies through a variety of means has enabled this research to be efficient in terms of time.

The other issue which has often been neglected is the ability of an investigator who wants to do a rigorous case study. Yin (2009, p. 16) mentions that there is a way of testing of the ability of people who cannot play music, do mathematics beyond a certain level, or other skills though the skills for doing good case studies have not yet been formally defined. Gummesson (2000) suggests that personal characteristics such as intuition, creativity, vitality, and human understanding are essential for a researcher of a case study. In addition, the researcher's general knowledge about the theories, models, techniques, methods, and tools and his/her specific knowledge about the conditions of the

chosen industry and the pre-understanding of the existing social pattern in the chosen company are prerequisite for conducting a successful case study (ibid). Having previously worked in companies may contribute to the researcher's pre-understanding of corporate environments and the relevant issues (ibid).

### **3.3 Design Rigour in the Research**

It is an ultimate aim of any research including this one to be convincing for its readers. In addition to the lengthy discussion of the reasons why the proposed conceptual model on its own is plausible, case studies are employed as additional justification for this conceptual argument.

The complete research design should embody an 'understanding or theory' of what is being studied, states Yin (2009). In order to ensure the trustworthiness of findings, complying with the guidelines of the following criteria is suggested when establishing a qualitative research design including case studies (Flynn et al., 1990; McCutcheon and Meredith, 1993; Voss et al., 2002; Yin et al., 2009).

#### **3.3.1 Construct Validity**

Construct validity is principally attained by the definition of Supply Chain Quality in terms of the relationship between the specific concepts. Based on the extant literature review, these specific concepts, namely supply chain structure and supply chain integration were identified. It is suggested in this research that in order to achieve supply chain quality, the emphasis is on supply chain structure which is related to the following dimensions: centralisation, formalisation, and communication. All the interview questions to explore these specified dimensions were based largely on the literature review and partly on the observations made during the case studies. Hence, it was ensured that appropriate questions in relation to each dimension were raised during the interviews (Flynn et al., 1990; Voss et al., 2002). With a constant analysis of the data from the case studies and feedback from the academics, the case study instrument, interview questions, were enhanced via reductions in the number of the questions and modifications of the content of the questions. Hence, it was ensured that the direction of the research was reflective of the new aspects emerging from the evolution of the study.

##### **3.3.1.1 Case Study Instrument: Interview Questions**

The design or structure of both an organisation and supply chain has been a subject of a great amount of research (Choi et al., 2001; Choi and Hong, 2002; Kim, 2007; Stevens, 1989). Although concepts, namely centralisation, formalisation, and communication have been individually studied in the literature, to the best of our knowledge the combination of these three concepts as the factors of a supply chain structure has not been previously studied. Concerning the interview questions, they are

primarily based on the extensive literature review. Once the characterisation of the supply chain structure is established based on the critical review of the literature in organisation structure and design, and supply chain structure, those articles are largely used to extract the interview questions. Some of the questions employed for the analysis of the structural dimensions of an organisation are adapted to suit the supply chain context. Until the framework of the literature review becomes certain, the refinement of the interview questions is continued. In addition, questions devised by the supervisors and the researcher based on literature and the feedback from case studies including the pilot study are utilised during the interviews. The following paragraphs explain the reasons why the selected questions have been raised to explore these factors: centralisation, formalisation, and communication, respectively.

On the basis of the definition of centralisation provided in the literature review, the interview questions were developed to understand centralised management in the two specified supply chains. The questions were formed around the following areas for this structural dimension. The first area of centralisation explored via interviews was the supplier selection process of the focal firms implemented in the chains. Once the supplier selection process was understood, the management of the activities occurring between the focal firms and their suppliers including first, second, third, and so on tier suppliers was examined. In this part of the exploration, as a subordinate feature of centralised management, the further questions were raised to understand how and on which processes the focal firms were particularly influential on its supply base. The second area of centralised management investigated in the scope of this research relates to understanding how and what extent the focal firms allow their suppliers to engage in their processes regardless of the suppliers' position in the network. Finally, the approach of the focal firms towards their suppliers' needs and requests was identified. While exploring the centralisation aspect of the supply chain structure via the chosen cases, it has been both inevitable and useful to notice the structure of the organisation itself in general regardless of an organisation being a focal or supplier. Therefore, gaining the knowledge on the structure of the individual organisation, centralised or decentralised, was considered as a second subordinate feature of centralised management in the supply chain context.

Based on the accepted definition of formalisation in the scope of this research, it can be concluded that a firm formalises its activities to ensure consistency of output over time. In order to understand how and to what extent both of the chosen focal firms formalise their supply chain, the interview questions for this dimension of the supply chain structure were developed. A proposition made by Choi and Hong (2002) with regard to the implementation of formalisation in the supply chain context is of the essence in the formation of the interview questions. The proposition asserts that it would not be possible to impose rules, procedures and norms to the supply chains at the system level; formalisation can only be implemented at a dyadic level (firm to firm). Therefore, the interview

questions are divided into three groups. The first group of questions are about assessing the level of formalisation between the focal firms and its supply base; the second group deal with understanding the level of formalisation between the focal firms and its customers; finally the last group of questions address that of within the focal firms. Although some of the interview questions for the formalisation dimension of the supply chain structure are distinct meaning they only seek answers to the one of the three groups mentioned in the previous sentence, there are some questions belong to more than one group in the interview list.

The last dimension of supply chain structure considered for this research is communication. The interview questions were divided into three main parts to explore this dimension. They are: communication means, information content, and relationship. In the first aspect of communication, the mode of communication across the case studies was attempted to be understood. In the second part, the type and level of information shared across the chosen supply chains were explored. As a last dimension of communication, the relationship between the focal firms and the suppliers in terms of trust was explored. Hence, in the framework of this research, the interview questions for exploring the factors of the supply chain structure are listed in the Appendix of this chapter.

### **3.3.2 Content Validity**

Content validity is an approach to provide insight into the research questions (Davis and Mentzer, 2006, p. 56). Flynn et al. (1990, p. 266) define content validity as *a judgement, by experts, of the extent to which a summated scale truly measures the concept that it intended to measure, based on the content of the items*. The authors of the same study comment that content validity cannot be determined statistically, but only determined by experts and by reference to the literature. For this study, the determination of the area of research and direction of its focus was based on the literature review, feedback, and guidance received from the supervisors during the meetings. Hence, it is believed that the subject of this study has a content validity. As suggested by Flynn et al. (1990, p. 266), content validity can be improved over time by theory building and theory verification. Hence, the responses to research questions which are presented in the Discussion chapter will also ensure the content validity by presenting the new knowledge and more sophisticated understanding of the content. The determination of the research questions and unit of analysis was the means to attain the content validity for this research.

#### **3.3.2.1 Research Questions**

Case studies are distinguished from other similar research methods such as ethnography and grounded theory in one important point. Researchers who conduct case studies are bound to have some pre-understanding about their area of research, whereas scientists who employ other related research

methods deliberately avoid making any propositions before collecting any empirical data (Eisenhardt, 1989; Gummesson, 2000; Suddaby, 2006; Yin, 2009). As suggested by Siggelkow (2007), “*being an open-minded is good when conducting a case study; however, being an empty-minded is not*”. Both Siggelkow (2007) and Suddaby (2006) argue that observations during case studies are guided and influenced by some initial feelings and reference; this characteristic of case study is both inevitable and indeed useful. They both, however, state that one should also has a capacity to be surprised when conducting a case study. In support of the above arguments, Eisenhardt (1989) and Gummesson (2000) highlight that based on extant literature and observation, stating the research problem and potential important variables is helpful, particularly at the beginning of the study as long as this pre-understanding will not create bias and limit the research findings. Moreover, having a research focus and defining the research question are essential in order to collect only necessary data (Eisenhardt, 1989). Therefore, as Yin (2009, p. 10) comments that patient and efficient time should be given for determining the research question(s) since this task is probably the most important step to be taken in a research study. Based on the presentation of the gaps identified in the literature and the motivation of the research in the introduction chapter, it is aimed to find an answer to the following primary research question with the proposed model:

*How does the structure of a supply chain affect supply chain integration?*

Secondary research questions are as follows:

1. Does ‘supply chain structure’ provide a useful concept to both practitioners and academics?
2. How does each variable of a supply chain structure affect supply chain integration?
3. What are the most important variables of a supply chain structure in order to achieve supply chain integration?

### **3.3.2.2 Unit(s) of Analysis**

The problem identified in the scope of this research is the need for developing a new approach to achieving supply chain quality. Hence, based on the defined problem it is only reasonable for this study to assume the whole manufacturing supply chain as a unit of analysis (the details of the selection of manufacturing supply chains over service supply chains are provided in section 3.4.4.1). However, manufacturing supply chains are very large and complex, and it is almost impossible to access all members of a particular supply chain. In addition to this major difficulty, the resource constrains of the research undertaken in terms of the time and a number of researchers, only dyadic relationship in the chosen cases were examined. It is the belief of the researcher leading this study that as long as the exploration of the research aim is performed rigorously, data collection in relation to the interested constructs of the research can be gathered from the dyads involved. Moreover, the significance advantage of this study in terms of data collection is that the variables under study were

sufficiently abstract (Kaufmann and Whu, 2011) and, thus required data about the whole chain's working can be accessed from the firms involved without any significant data loss. Hence, it would be appropriate to call the unit of analysis of this study is the dyadic relationship in a manufacturing supply chain in which the relationship between the focal firms (buyer or final assembler, used interchangeably) and the first tier suppliers were explored in the scope of this research. The concepts identified and illustrated in the proposed framework largely determined the focal firm as an essential partner in these dyadic relationships. Once the determination of the unit of analysis was completed, searching for the appropriate cases took place.

Selection of cases is an important part of building theory from case studies (Eisenhardt, 1989). Solely manufacturing supply chains were targeted mainly because of the need to define the limits for generalising the research findings and help to reduce the effects of extraneous variation (ibid; Yin, 2009). In addition, in contrast to the statistical sampling in which random selection is performed from the larger populations, a case study type of qualitative research relies on the theoretical sampling advocating a selection of the cases which are likely to replicate or extend the emerging theory (Eisenhardt, 1989; Meredith, 1998; Siggelkow, 2007). Moreover, due to the difficulty in access to real cases for a variety of reasons, it was only logical to carry out the exploration with the available cases.

### **3.3.3 Internal Validity**

Meredith (1998) divides the factors of interest of a study regardless of whether it is rationalist or interpretivist into three sets, namely parameters, independent variables, and dependent variables. In his study, parameters are called the group of factors, which define the population of interests and held constant during the research. While in rationalist studies, parameters are simply fixed to certain numbers, in case studies, the researcher controls or monitors these factors via the selection of the situation or site to be studied. For the other two sets of factors (independent variables and dependent variables), we attempt to observe how the independent variables influence dependent variables by utilising manipulation in rationalist studies and by controlling or monitoring in case studies (ibid, 446). In his study, internal validity is given as *the correctness of the conclusion of a relationship* between these two sets of factors, independent and dependent variables (p. 447). As a solution to overcome the difficulties with internal validity, Meredith suggests that the ability to draw accurate conclusions from the study regardless of whether it is rationalist or interpretivist depends on how well we correctly identify and allocate the factors between parameters and independent variables. Yin (2009, p. 43) in his book explains that internal validity is not applicable to an exploratory type of research whether the study is a case study, survey or experiment. The reason for this is that in an exploratory study, the primary aim is to understand the phenomenon undertaken by identifying the variables it involves, as opposed to attempt to establish relationship between variables. Even though this approach of Yin seems to be plausible for this research which employs an exploratory approach, it

might still be likely to claim that at a very high conceptual level, this study examines the relationships among supply chain structure, supply chain integration and supply chain quality. Hence, by both providing the reasons for selecting specific industries, the details are given in the later section (section 3.4.4.1), and identifying the independent variables based mainly on the review of the relevant literature and partly on the observations of the case studies undertaken, it is believed that the distinction between the parameters and independent variables were performed correctly. Hence, the relationships that were deduced or inferred by using logic (Meredith, 1998, p. 447) between the independent and dependent variables are likely to be accurate, leading to suggest that this study ensures the internal validity.

### **3.3.4 External Validity**

External validity deals with the question of whether a study's findings can be called for new populations (Kaufmann and Whu, 2011). Kaufmann and Whu, however, underline that it is not the researchers' task to transfer the findings of the study undertaken to other contexts; their only responsibility is to provide sufficient database to make this transfer possible. Hedrick et al (1993) (see in Meredith, 1998, p. 449 and Handfield and Melnyk, 1998, p. 332) define external validity as *the 'extent to which it is possible to generalise from the data and context of the research study to broader populations and settings'*. In contrast to statistical generalisation in which a sample is intended to generalise to a larger universe, case studies rely on theoretical sampling in which an already existing theory or a new theory can be applied to other similar situations, in the sense that having same parameters (Meredith, 1998, p. 449), or different situations in which the theory still can be applied but predict different results (ibid; Yin, 2009, p. 43). Generalisability answers the question of whether 'the findings of the research undertaken make sense beyond the specific case'. Handfield and Melnyk (1998) suggest that theory extension/refinement involves applying the theory and the hypothesis in different environments to assess the extent to which the results and outcomes indicated by the hypothesis are still realised. They also add that the greater the range of settings in which a theory can be successfully applied, the more general the theory and the more powerful it is.

In order to ensure the external validity for the proposed conceptual framework of this research, the following steps are performed. Firstly, multiple case studies are chosen, as opposed to a single case study to collect the widest possible range of data so that the readers of this study can readily be convinced that the findings can be applied to other contexts (Kaufmann and Whu, 2011). In addition, the data collection stage was detailed in terms of how and what sorts of data was employed for the analysis to derive the list of categories of the study. Those categories were provided in the Analysis chapter of the thesis. Moreover, according to Kaufmann and Whu, if the research findings are sufficiently abstract as they are in this research, their likelihood to be valid in other contexts is higher.

Final point for the external validity was completed when the theoretical and managerial implications of the study were summarised in the Conclusion chapter (ibid).

#### **3.3.4.1 Multiple Cases versus Single Case**

Yin (2009) suggests that conducting and documenting single case study are worthwhile especially if the phenomenon occurs very rarely. Very unique cases occur; for example, in clinical psychology, where a specific injury or disorder may be so rare that any single case is worth documenting and analysing. The research problem which is investigated in this thesis cannot be considered as a rare or unique case. In contrast, due to the effects of globalisation, supply chains and issues evolving around them are very common phenomena. For this reason, multiple cases are chosen.

Single case studies are appropriate when the purpose of the research is to confirm, challenge, or extend the existing theory, whereas multiple cases are desirable when the aim of the research is description, theory building or theory testing (Benbasat et al., 1987, p. 343). Therefore, for this research, in order to develop the emergent theory, empirical findings corroborating the proposed model from more than one case are needed. This will increase the generalisation of the research findings based on a stronger theoretical framework (Benbasat et al., 1987; Miles and Huberman, 1994; Voss et al., 2002). That is the main reason why multiple cases have been chosen over a single case for this study.

Multiple cases reduce the depth of the study by allowing simultaneous access to the chosen cases, while longitudinal case studies which allow a group of subjects to be followed over an extended period of time, often several years. This attribute of multiple case designs is important, especially when resources such as time and number of researchers are limited (Voss et al., 2002). The final reason for choosing multiple case designs over a single case is due to the development need of the SCM in terms of new theories. As it is stated earlier, only good theories can transfer empirical data into scientific knowledge. That is why many researchers in the area of SCM are encouraged to reach as much as real-world data as possible. This can be attained through multiple case studies.

#### **3.3.4.2 Data Collection**

Data is linked to scientific knowledge via the theory. As is mentioned in the section of research questions, having a research focus from the beginning of the study is essential in order to gather only necessary data. Hurdles for a researcher when he/she collects data in a case study type of research can be considered in two groups: First is to collect too much data that was not later used in any analysis; second is to collect too little data that prevented the proper use of a desired analytic technique (Yin, 2009, p. 34). A wide range of information-gathering methods can be used for case studies (Gummesson, 2000). The purpose of using multiple means is to achieve triangulation so that both

objective view of events and the subjective interpretations of the participants can be gathered (Benbasat et al., 1987, p. 382). In addition, data sources and the way they contribute to the findings of the research should be clear to increase the reliability and validity of the findings (ibid, p. 381). The evidence may be qualitative (e.g., words), quantitative (e.g., numbers), or both (Eisenhardt, 1989, p. 534). Case studies typically combine data collection methods such as archives, interviews, questionnaires, observations, informal discussions, and documentation reviews in which the researcher had extensive contact with the research phenomena (Schwarz and Nandhakumar, 2002). Once data is collected and organised in a rigorous manner, the theory acts as a vehicle to transform this load of data to scientific knowledge by analysing the level of fitness between the data and the theoretical framework. For this study, interviews and on-site observations were the primary resource for the data collection. The following section will provide detail information with regard to the interviews conducted.

### ***Interviews***

For the purpose of this research, an oral history approach, one type of qualitative interview, is chosen. According to this type of interview approach, respondents are questioned in the context as witnesses to the historical events that occurred during their lifetimes (Warren and Karner). The form of contact may be through a variety of means such as face-to-face, telephone, or on the Internet. Thus far, a large part of the interviews took place were a face-to-face one which is described by Kvale (1996) (see in Warren and Karner, p. 116) as follows:

*'Face-to-face interview is a conversation that has a structure and a purpose. It goes beyond the spontaneous exchange of views as in everyday conversation, and becomes a careful questioning and listening approach....[It] is not a conversation between equal partners, because the researcher defines and controls the situation. The topic of the interview is introduced by the researcher, who also...follows up on the subject's answers to his or her questions (Kvale 1996, 6).*

This study consists of two data collection stages: pilot interviews and formal interviews. The pilot interviews are designed to test the viability of the research and improve the interview questions (Zhou and Benton, 2007). During the pilot stage of data collection, both manufacturing and service companies were targeted. Although the interview questions were at the development stage at the time of the pilot study, the researcher was able to explore the main concepts of the research theme such as the buyer-supplier relationship, power exertion in a supply chain, formalisation, quality, and communication in general sense. At the end of the pilot study, it was understood that all the buyers contacted were well aware of these concepts individually, and they mostly employed them for their own advantage. However, it seems that the understanding of the role of these concepts in a supply

chain environment to maximise the overall performance of a supply chain is missing. The names of the companies and the positions of the interviewees during the pilot study are shown in Table – 3.2.

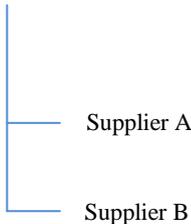
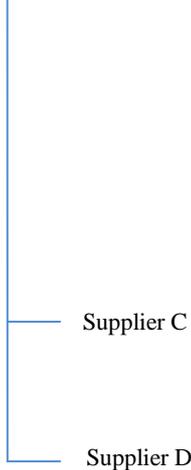
Table – 3.2 Participants of the Pilot Study

<b>Pilot Study</b>	
<b>First Stage</b>	
<b>Company</b>	<b>Positions of the Interviewees</b>
Household Goods Store: Service, Retailer	Owner (1 time)
MAN Turkey Incorporation: Manufacturing, Buyer	Engineer – Inspection Quality Control (1 time)
Club Bizim Cati Hotel and Restaurant: Service, Buyer	Manager (1 time)
<b>Second Stage</b>	
AGRICO: Manufacturing, Buyer	Supply Chain Manager (1 time)
Turkish Aerospace Industry: Manufacturing, Buyer	Utility Helicopter Program Manager (1 time)
MILCO: Manufacturing, Buyer	Purchasing Manager (1 time)
Kucukpazarli Aviation: Manufacturing, Supplier	General Manager (1 time)
MILSOFT: Software, Supplier	Acquisition and Proposals Manager (1 time)
MAN Turkey Incorporation: Manufacturing, Buyer	Supplier Development Manager (1 time) Manager of Materials Management (1 time) Logistics Group Manager (1 time)

With the knowledge gained from the pilot study, the literature review has been finalised, and the more specific questions were formed for the main study. One of the important observations made during the pilot phase of the data collection was that the manufacturing companies had a broad range of applications with their suppliers, and the relationship with them was mostly a close and long-term one in comparison with those of the service company. This is mainly due to the design of the service company's establishment which has relatively a high number of outdoor capacities to indoor capacities. That is why the operations of the restaurant are highly affected by the seasons, having much more customers during spring and summer than autumn and winter. Undoubtedly, the noticeable change in the restaurant's service capacity causes the firm to work with its suppliers more closely during the busy times and leave them independently for idle times. Therefore, for the main part of the data collection, the manufacturing firms and their supply chains were included in the study. Table – 3.3 shows the names of the companies and the positions of the interviewees for the formal study. For the formal study, the original names of the companies are not disclosed and treated as

confidential. Both Table – 3.2 and 3.3 illustrate industry in which each company operates, the position of the companies in the supply chain, and the number of interviews with the occupant of each position.

Table – 3.3 Participants of the Formal Study

Formal Study	
The Focal Firms and Their Suppliers	Position of the Interviewees
<p>MILCO: Focal Firm, Manufacturing</p> 	<p>Purchasing Manager (6 times)            Chief Engineer, Supplier Quality Control (1 time)            Chief Engineer, Purchasing (1 time)            Chief Engineer, Production (1 time)</p> <p>General Manager (1 time)            Import and Export Manager (1 time)</p> <p>General Manager (2 times)            Production Director (1 time)</p>
<p>AGRICO: Focal Firm, Manufacturing</p> 	<p>Supply Chain Manager (1 times)            Indirect Material Purchasing and Supplier Development Manager (1 time)            Quality Assurance Manager (2 times)            Receiving Inspection Manager (1 time)            Research and Development Manager (1 time)            Assembly Method Supervisor (1 time)            Supplier Quality Engineer (1 time)            Direct Material Purchasing Specialist (1 time)            Material Procurement Supervisor (1 time)            Technical Training Responsible (1 time)</p> <p>General Manager (1 time)            Investment Coordinator (1 time)            Cost Analyst (1 time)            Quality Management Representative (1 time)</p> <p>Assistant General Manager (1 time)</p>

Since the case firms were in Turkey, all interview questions were translated into Turkish before the interviews. Most of the interviews were conducted in a dyad style in which an interviewer and a respondent are present. In few occasions, there were more than one respondent subjected to the interview questions. Thus far, including the pilot interviews, a total of 41 interviews were conducted for this research. Duration of the interviews was from twenty minutes to four hours. In most respect, notes were taken during the interviews. For some interviews, in addition to note taking, a recorder was used to prevent data loss. Before using a recorder, each interviewee was asked about his / her approval for it. Memos in other words, a detail summary of the interviews, were written right after the each interview to highlight the impression of the interview on the researcher and to describe the situation. Memos were used to refresh the researcher’s memory during the transcription of the original writings taken during the interviews. Since it would not be possible to visit all the companies in the supply

chain, the information with regard to second, third, so on level suppliers was taken from focal companies (buyers) and their first tier suppliers.

Most of the interviewees hold a senior or a top management position. Few of them from both pilot and formal studies hold an engineering position although these people have work experience of more than 10 years in manufacturing. Especially the interviews took place at the supplier premises were carried out mostly with owners of the companies or second generation of the owners who automatically hold top management positions such as general manager and general manager assistant. For the sake of receiving reliable information in response to the interview questions, it is important to contact people who are the originators and/or managers at their companies of the strategies, practices, and tools related to the structural dimensions that are investigated in the scope of this research. Therefore, the background of the people interviewed is appropriate for the purpose of this study.

### **3.3.5 Replicability**

Opposite to the rationalistic studies, in case studies each case is unique and thus, it is almost impossible to repeat the same case conditions; hence, only a theory or framework is applied in the similar environment (in the sense of having the same population parameters), or different environment in which similar or different results are expected (Meredith, 1998, p. 449). Thus, even though the prediction is different, the same theory or framework is being tested (Meredith, 1998, p. 449). This study provides a later investigator with all the necessary guidelines mainly the proposed framework and interview question list to duplicate the study in similar or different environments.

### **3.4 Data Analysis**

Data analysis of case studies is an important factor to enable research to be rigorous. In contrast to the rationalist studies, in which mathematics or statistics are used to infer meaning, in case studies, logic is used to make sense of the data collected (Meredith, 1998, p. 447). The analysis of the case evidence includes two elements. The first is within-case analysis in order to understand individual cases by presenting the essence of each case. Within-case analysis typically includes detailed case study write-ups for each site (Eisenhardt, 1989). Although there is no standard format to do such analysis, in fact there are as many approaches as researchers; the main purpose is to become intimately familiar with each case as a stand-alone entity (ibid). This understanding of each case, in turn, provides the researcher with the depth of understanding which is necessary for cross-case analysis (Voss et al., 2002). Hence, for this study each case was firstly examined individually to understand the structural form in terms of the centralisation, formalisation, and communication dimensions. The relationships between these dimensions and integration in each individual supply chain were also analysed. In

addition, the above mentioned structural dimensions and their effects on the performance of the supply chain were explored for both supply chains.

The second is a cross-case analysis in order to compare and contrast the results of cases to discover the patterns of behaviour if there is any. This analysis is defined as the logical analysis in the study by McCutcheon and Meredith (1993, p. 244). They emphasise the significance of this method of analysis in theory development. To develop a theory, a researcher seeks logical connections among observed events, relying on knowledge of how systems, organisations and individuals work (*ibid*). It is also stated that theory must not only be logical, but must also fit the observed 'facts', at least as accurately as rival ones (*ibid*). In this study, the selected cases were cross-analysed in order to understand their similarities and differences in their structural dimensions and how these differences may affect the integration in the relevant supply chain.

### **3.5 Summary**

The research methodology as a whole is designed to focus on increasing an understanding of the relationships among concepts, namely supply chain structure, supply chain integration, and supply chain quality in the manufacturing industry context. The lack of immediately relevant prior research, hence a need for new theories and frameworks justified the employment of an exploratory approach and case study method for this research (McCutcheon & Meredith, 1993, p. 241).

With the chosen case studies, the rigorous data collection, observation, and logic rather than mathematics or statistics to make our deductions and inferences were employed (Meredith, 1998). For this study, data collection was centred on interviews (Knight & Harland, 2005). Data collection was performed in two phases: pilot study and formal study. In the pilot phase, drawing mainly on the knowledge gained from the literature, the managers of both service and manufacturing firms were contacted to acquire their understanding of the concepts which were the interest of this study. The data gained from the pilot study was utilised finalising the initial framework of the study and improving the case study instrument. In addition, the knowledge obtained and analysed from the pilot study prompted the researcher to narrow the scope of the study by focusing only the manufacturing supply chains. In the formal study, the aim is to apply the proposed framework to the chosen two manufacturing supply chains: one operating in the military industry and the other in the agricultural industry. All interviews were semi-structured providing the interviewee an opportunity to explain their own experience on the subject of interest and introduce issues they conceive important (Flynn et al., 1990, p. 259; Stephens, 2007) while they also ensure the researcher has a specific agenda to discuss all the necessary topics. In total, 41 in-depth interviews in twelve companies were conducted. The questions were raised to the people who hold mostly managerial and relevant engineering positions and knowledgeable about the functions and processes relevant to the research subject. The interviews

range from twenty minutes to four hours. Analysis was interpretive and iterative, and informed by the pertinent personnel of the case firms and academics.

In the following chapter, the findings of the cases are presented.

## CHAPTER IV – RESEARCH FINDINGS

### Introduction

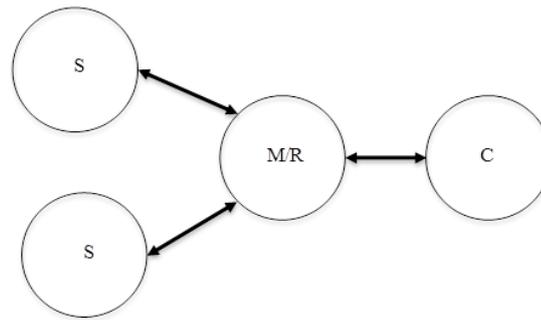
This chapter presents the findings of the exploratory case studies which were conducted to examine three structural factors of a supply chain, namely centralisation, formalisation and communication. The first section of this chapter aims to illustrate the applicability of the proposed model of this study. The pilot study is presented in two stages. In the first stage, the interview questions were unstructured and more general, which were employed to introduce the present research's framework to the firms visited and to understand their existing supply chain activities. In the second stage of the pilot study, the interview questions were in continuous development and better structured. Overall, the information gathered during the pilot study has a significant contribution to the development and finalisation of the interview questions and the proposed model.

In the scope of this research, the two manufacturing dyads operating in the military electronics industry and tractor industry are designed to collect data on the above mentioned dimensions during the formal study. For each supply chain, the interviews were carried out with the personnel of the focal firms and their two first tier-suppliers. Hence, the second section of this chapter presents the findings of the military electronics firm and supply chain and the third section demonstrates that of the tractor firm and supply chain. For simplicity, each structural dimension is dealt with separately although in practice they are closely interrelated. In addition, the perspectives of the focal firms and their first-tier suppliers on each dimension were evaluated independently in order to point out the differences between them. A table which illustrates these differences is displayed at the end of the first three sections of this chapter. Finally, the chapter concludes with a brief summary.

### 4.1 Pilot Study

Pilot study is divided into two phases.

In the first phase, more general questions were asked to explore the perception of the firms of concepts such as supply chain quality, supply chain success, supplier and customer relationships, and communication in a supply chain. The interview questions at this stage were unstructured, and a simple diagram, shown below, was used / drawn to illustrate what we mean by a supply chain during the interviews.



S: supplier; M: manufacturer; R: retailer; C: customer

Figure 4.1 A Simple Supply Chain

In the first phase, two service and one manufacturing companies were visited.

***Household Goods Store: service, retailer***

The owner of the household goods store which is a retailer store and located in a small town of Turkey was contacted during the visit. With regard to quality, he suggested that having a Quality Management certificate is of insignificant. Instead, achieving quality depends on several other factors such as meeting customers' after-sales requirements, ensuring product variety, price policy, and trust-based relationship. The owner suggested that the relationship with the suppliers depends on the mutual benefit gained by being the part of the same supply chain. When he was asked about which measures of success he employs to assess the supply chain, he replied that an increase in the number of customers (or market share) and an increase in the level of customer trust are good indicators to illustrate whether or not that particular supply chain is successful.

In terms of customer satisfaction, the owner provided following information. Due to the location of his store which is a small town in Turkey, most people know each other personally; hence, even in the business activities, the personal relationships and cultural acceptances are highly important. For example, it is quite common to offer a cup of tea to the customer to allow him/her to spend more time in the store and has conversations. He added that the performance of after-sale service is of significant importance for his business in order to gain the customer's trust, particularly in such a small town since most of its customers are the local residents. Finally, the owner also added that they are in contact with their suppliers (manufacturers of the household goods) via an information system.

***MAN Turkey Incorporation: manufacturer***

For the first visit to MAN Motor Company, a Quality engineer was contacted. He gave brief information with regard to MAN Motor's supply base management activities.

Once the Purchasing Department completes the evaluation of a potential supplier in terms of price, the Supplier Development team begins the assessment process of that supplier. This team consists of four members from the following departments: Quality, Purchasing, Logistics, and Technique/Development. The measures and processes such as PPM (Parts per Million), return rate from production line and/or customer, FAI, Cp, Cpk, Audit, liquidity, profit, investment, etc. are employed/investigated by this team to assess the potential supplier. If the total score of the supplier is found to be less than 60, this supplier is included in MAN's Supplier Development Program. It was suggested that MAN supports the suppliers in a variety of ways such as providing financial support to the suppliers in their tool investment and/or making payments to them in advance. He added that in MAN's relationships between the suppliers, not everything needs to be written. If the supplier needs something, they help them.

MAN Motor works with 1000 suppliers, with some of whom MAN signs a special agreement. This condition arises particularly for critical parts, and it is performed due to the need for the mutual cost sharing in case the project fails.

The Quality engineer drew the following figure in order to explain their supplier policies in more detail. The x axis indicates the criticality of the supplier and the y axis shows the accessibility of the supplier. The areas called with numbers from 1 to 4 present the groups of suppliers who are in the follow of MAN's supplier development team. The Quality engineer said that the suppliers forming the area of number 4, who perform critical work for MAN and located closely, need to be always in frequent contact and under the continuous development programme.

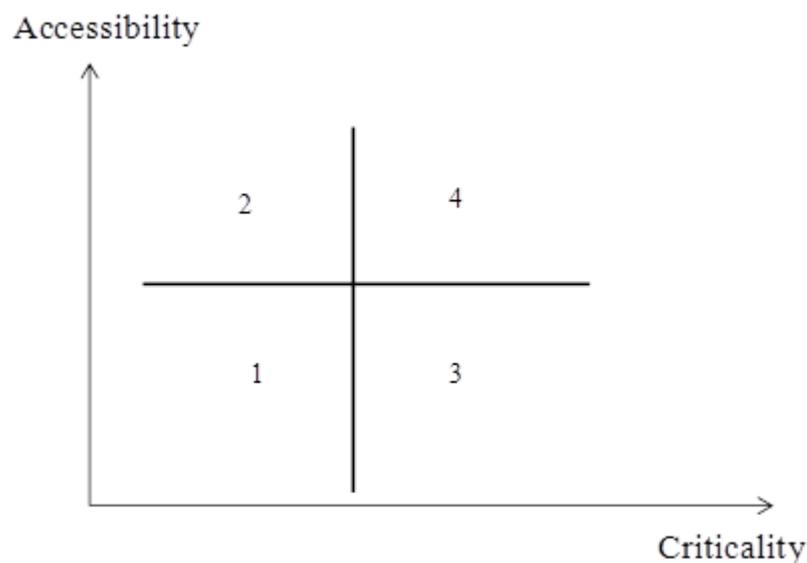


Figure 4.2 Accessibility and Criticality

As a last comment, the interviewee stated that when a problem between a supplier and buyer occurs due to the difference in their organisation structure, both parties need to work their own organisational form in order to solve this problem. His suggestion was that the alignment of the organisations' structure is the solution to this kind of problem.

### ***Restaurant: service***

The restaurant operates in a way day that does picnic and a la carte. The manager was contacted during the interview. When a restaurant with both indoor and outdoor capacities, does purchasing, they firstly perform price search and investigate the payment options for the potential suppliers.

Most of the time, they work with the suppliers on a temporarily basis. They look for an average cost when they buy product. In their stock policy, they always apply the principle of *'first in, first out'*. When they purchase the product (vegetables, food type of products), they consider the quality as the product being inexpensive and whether the supplier can allow them to make payments in partial terms not at the one-time basis.

In the supplier relationship, they give importance to the personal relationships. They want to be in contact with the same personnel. They want to develop a trust-based relationship with the suppliers.

In terms of customer relationship, the interviewee stated that for some customers, even if you offer the best service, they find something to complain about. In the relationship with the customers, the problems occur intermittently. They inform suppliers on the issue. Also, via internet and/or survey, they receive customer feedback. Also, the manager makes the evaluation and he/she informs the employees. And, whatever the lessons from these events are attempted to be learned and mistakes are not to be repeated. The different methods to persuade the customers are used.

This restaurant is quite busy during April, May and June. During the busy times, the total number of the personnel is 50, and during the winter when there is a limited number of customers, the total number of personnel are 18. This restaurant belongs to the group which has operations in different sectors such as security, thermal tourism, medical.

At the end of the above interviews, it was decided that the manufacturing organisations in comparison to the service firms visited, household goods store and restaurant are more suitable for the purpose of this study due to their various numbers of applications with the suppliers.

***In the second phase***, the interview questions were more structured even though they were still in further refinement. At this stage, they were in excessive number. The original interview protocol was shown in Appendix I. Due to the time limit at the interviews, not all the questions on this list could have been asked. Also, the feedback from the supervisors led me to reduce the number of the

questions to a reasonable size. In addition, in order to reflect the differences in each case regarding the company visited, department involved, position of an interviewee contacted, a separate question list distinct from the one provided in Appendix I was employed. On all the question lists used at this more developed stage of the pilot study, the concepts of centralisation, formalisation and communication were separately visible.

Five manufacturers and a software company were visited.

The following initial model, which is also illustrated in the Literature Review chapter, was employed during this phase of the pilot study. Through the end of the pilot phase, the below model was modified based on the literature review which was still continuing at this stage of the study. The knowledge gained from the pilot cases contributed to the finalisation of the model along with the literature review.

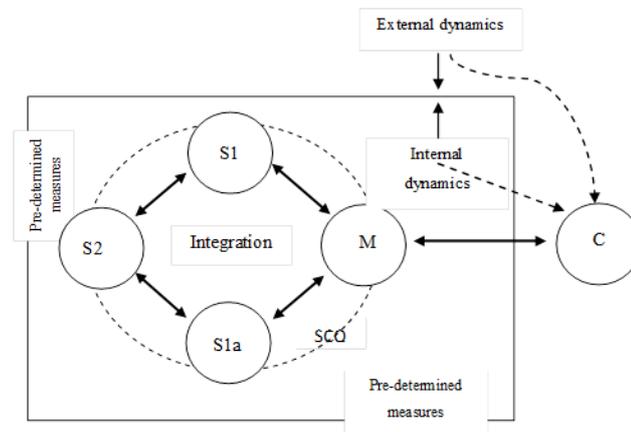


Figure – 2.2 Proposed Initial Conceptual Model

(C: Customer; M: Manufacturer; S1: First-level supplier 1, S1a: First-level supplier 2; S2: Second-level supplier 1;  $\longleftrightarrow$  : Relationship;  $\longrightarrow$  : Primary effect,  $\cdots\cdots\longrightarrow$  : Secondary effect)

## ***AGRICO, Agricultural Firm: manufacturer***

### **1. Data Collection**

#### ***Interview 1 at AGRICO***

*Date of the interview:* 01 March 2011

*Interviewee:* Supply Chain Manager

*Duration of the interview:* 13:00 to 14:30

During the initial interview at AGRICO in March, the manager of Supply Chain department was interviewed. In AGRICO's organisation schema, the Supply Chain department directly reports to the General manager of the firm. Its primary task is to bring the outsourced parts to AGRICO. Therefore,

at AGRICO, Supply Chain department focuses on more of a logistic side of supply chain activities than purchasing side of it.

### *Highlights of the Interview*

#### **In relation to AGRICO's perspective of the suppliers:**

The Supply Chain manager stated that AGRICO works with both foreign and local suppliers. Having had an integrated management system which consists of ISO 9001: 2008, ISO 14001: 2004, and BS OHSAS 18001:2007 management standards whose name are the followings: quality management system standard, environmental management standard, and occupational health and safety assessment standard, respectively, AGRICO encourages the suppliers to have any type of quality management standard. The Supply Chain manager briefly mentions an ironic situation regarding AGRICO's position. AGRICO has been certified by a third party firm only very recently (September 2010). Before that time, even though AGRICO did not have any management standards, they required from their suppliers to have one. In addition to the realisation of the benefits of having these management standards, the Supply Chain manager implied that top and senior management have been enforced to take initial steps to implement these standards in the face of this ironic situation.

The Supply Chain manager suggested that, in most cases, AGRICO works with the first-tier suppliers. Unless a critical product is manufactured, AGRICO never participates in any operations of the second-tier, third-tier, and so on tier suppliers. Even under the circumstances of the critical part production, firstly, AGRICO informs the first-tier supplier that it would contact directly with the second-tier supplier. From this information, it is understood that the supply chain in which AGRICO is the manufacturer can be called a de-centralised supply chain since AGRICO only manages the first-tier supplier, but not the further upstream level suppliers.

Communication with the suppliers is done via e-mail, phone, and face-to-face meetings, respectively. The Supply Chain manager stated that when the financial climate of the company is doing well, all the relevant personnel are encouraged to have face-to-face meetings with the suppliers either at their premises or at AGRICO's. Unfortunately, for the last couple of years, due to the financial bottlenecks, particularly visiting foreign suppliers has been restricted.

AGRICO pays special attention to have the same personnel to contact with the potential suppliers during the selection phase. The primary reason for that is claimed to be able to transfer same information regarding the requirements of an outsourced part to the different suppliers so that standardisation can be achieved for that specific part. A further argument in support of this policy is contended that more advantageous bargaining positions can be created for AGRICO if the propositions of the one supplier (let's call it: first candidate) are shared with the rival one (let's call it:

second candidate) in order to impose certain conditions on the second supplier. This situation is certainly unethical, and in the long run, it might damage the very existence of the suppliers. With regard to the relationships with the supplier, the Supply Chain manager was asked whether or not the supply chain that AGRICO is part of could be perceived as a family union; he responded the question that any supply chain cannot be considered as a family union. He stresses that AGRICO's relationship with the suppliers can be the most called 'partners'. He mentions that in family relationships, individuals are linked to each other with blood; in a supply chain, firms are linked to each other with financial means. Due to the type of relationship AGRICO has with the suppliers, the Supply Chain manager acknowledges the fact that there is a high possibility of suppliers seeking alternative customers which might offer them better business options. Nevertheless, it is stressed by the Supply Chain manager that AGRICO never damages the relationships with the suppliers on the basis of personnel conflicts; the only reason why AGRICO might give up working with any of them could be due to financial disputes.

When AGRICO awards a contract/work to the suppliers, meetings are held between two parts. After the introduction of the project in which primary aims are explained to the supplier, the supplier is left alone to decide whether or not the project is worth being involved in. The Supply Chain manager states that AGRICO does not share the performance targets of any projects with the outsiders including the suppliers.

**In relation to AGRICO's perspective of the customers:**

The Supply Chain manager states that customers' only contact point is AGRICO; none of the upstream suppliers have any responsibility towards to the end customers which are local tractor distributors, and PP. The main reason for that is the warranty certification which can only be issued between AGRICO and the customers. Therefore, if a problem is found in the final product, the customer directly informs AGRICO even though the cause of the problem is linked to any of AGRICO's suppliers.

***Turkish Aerospace Industry (TAI): manufacturer***

Similar to other national defence companies of Turkey including MILCO, the sole customer for Turkish Aerospace Industry (TAI) is the Undersecretariat for Defence Industries of Turkey (SSM) which acts as a Turkish Arm Forces' Procurement Agency. In addition, by being an owner of 45% of TAI's shares, SSM is an important partner. This situation of SSM which is both being a main customer and partner creates a problem according to the interviewee. The rest of 54 % of TAI's shares are owned by the Turkish Armed Forces Foundation.

The interview at TAI was one time visit, conducted with the Program Manager, and it lasted four and a half hours. The interview questions at this stage were both prepared in Turkish and English and provided in Appendix I. When TAI was visited, the initial proposed model existed (shown in Figure 2.2). In line with the model, the interview list largely consists of the questions of how integration within the supply chain can be achieved via communication. Although there were separate questions for the exploration of power, formalisation, relational factors, structure, they were not in any systematic order; in other words, supply chain structure had yet been defined in this part of the data collection as the form of a supply chain which builds on three structural factors, namely centralisation (the exertion of power), formalisation, and communication.

The Program manager was working on a new project which was at the contract stage at the time of the interview. The project is to build the Utility Helicopter, which is mainly planning to be used for fire extinction and rescue operations, with an international partner which is to be either Sikorsky or Agusta. The realisation of this project will bring several benefits to the Turkish defence sector in general, to TAI in particular such as international business share, employment and technological advancement. The manager said that the final decision for choosing the supplier has not been made yet, and choosing either potential supplier has the advantages and disadvantages from TAI's point of view. The advantage of choosing Sikorsky is that it is already the customer of TAI for this helicopter, and they are happy working with TAI. But, TAI's role is limited to being part of only in the production process. When it comes to Agusta as a potential partner, on the other hand, TAI would have a chance to be involved in the design and development process since this kind of helicopter is just at the development stage at Agusta. This is a critical point for TAI in terms of its role in the supply chain.

The Program Manager commented that TAI's role, power, or significance in the supply chain changes from project to project. When TAI is a main subcontractor in a particular project, that is to say, it has design responsibilities it plays a significant role in the decision making process regarding the supply activities. On the other hand, when TAI is only a supplier/manufacturer without any participation in the design and development activities, its impact on the management of the suppliers is largely limited.

Being an only customer and an important shareholder of TAI, the Program manager suggested that SSM exerts an authority to entail TAI accepting the requirements which are not initially specified in the contracts between them. An example with regard to SSM's exploitation of the power was given by the Program manager. For the project called ATAK, SSM did not provide TAI with information on a particular system from whom it needs to be supplied, but it held TAI responsible for the lateness of the production. The Program manager used the following terminology for SSM in this regard:

*‘SSM applies the law of the jungle. It uses the power on TAI in a negative way. SSM asks TAI to meet all its requirements even the unreasonable ones’*

With regard to the management of the further level suppliers, SSM has all the influence on them. There are cases when SSM can communicate the further level suppliers without consulting TAI. In addition, SSM limits TAI to work with certain firms but not others. Hence, in respect of the exertion of power in Turkish Aerospace’s supply chain, it was observed that as the Purchasing Power of the Turkish Army, SSM can have a large level of control over the national defence companies including TAI and MILCO.

The Program manager was asked about his opinion of the concept of formalisation. He described formalisation as *‘the situation where the system works without depending on people’*. The Program manager said that formalisation is about process planning. It needs to have a quality measures for each process which assess its success. As TAI, they do not share any information with their suppliers. Information sharing occurs between TAI and the suppliers on a basis where TAI shared only the information that they believe then need to share.

The Program manager said that for the ATAK project, there was a team called Integrated Product Team (IPT). This team consists of members from each tier of the supply chain and the people are from Engineering, Manufacturing, Logistics and Quality. This team comes together in certain period as determined in the contract and they publish coordination memo.

### ***MILCO, military electronics industry: manufacturer***

Data Collection

*Interview 1 at MILCO*

*Date of the Interview: 04 March 2011*

*Interviewee: Investment Manager of MILCO who became Purchasing Manager later on*

*Duration of the Interview: 8:45 to 10:19.*

#### ***Interview Questions and Answers***

1. *What are the variables that your organisation’s supplier management based on? Does your organisation approach differently to the foreign and local suppliers?*

MILCO works with 170 approved suppliers selected by either MILCO or the customers. When selecting a potential supplier, two main performance measures are considered: delivery and quality. MILCO carries out audits particularly for the suppliers they select. On the other hand, the customer-selected suppliers are not evaluated as much. During the audit, the suppliers are asked questions from different aspects such as quality, management, production, purchasing, and design. At the end of the

examination of the suppliers, based on the individual firm's needs, MILCO organises training programs to help the suppliers to make improvements in the areas that are most needed. It also supports the suppliers financially when the investment is evaluated as feasible. Furthermore, when MILCO has machines or workbench that is not used, MILCO encourages the supplier to utilise it. Since MILCO is owned by the Turkish Armed Forces Foundation, idle machines cannot be given to the suppliers for free of charge; therefore, MILCO sells them to the suppliers with a discount.

2. *Does your organisation manage the suppliers by itself, or are your customers also involved in your relationships with the suppliers?*

Based on the conversation with the Investment Manager, it was deduced that ensuring quality and/or delivery target of a supplied part is the responsibility of MILCO. Even though some of the suppliers are determined by a customer without consultation to MILCO, managing the supply base with foreign and local suppliers is MILCO's responsibility in every project. Although MILCO controls the suppliers, it does not have any effect on the suppliers' human resource management policy.

3. *Can you talk about formalisation in your supply chain? In other words, how do you ensure formalisation which is achieved for a single organisation across a supply chain?*

MILCO has several quality management certificates such as ISO 9001:1994 (Model for Quality Assurance in Design, Development, Production, Installation and Servicing), AQAP-110 (NATO Quality Assurance Requirements for Design, Development and Production), MIL-STD-1535 (Supplier Quality Assurance Program Requirements). The Investment Manager's implication was that MILCO is a formalised organisation in the dealings with both the suppliers and customers has been proved as it has these quality management standards. Having these standards enables MILCO to receive and produce consistent results in terms of its products.

4. *How do you describe the 'power sharing' in the supply chain?*

The answer may not fully satisfy the question, though the Investment manager briefly mentions the power issue in the supply chain. The manager stated that MILCO is a respectable firm in both national and international market. Based on the list published by American defence newspaper, Defence News, MILCO is the 80<sup>th</sup> defence firm in the world in year 2011. This list is generated based on the previous year's defence sales of the firms. MILCO has a variety of products providing to the Undersecretariat for Defence Industries of Turkey (SSM) and international market. It has capabilities from design to assembly. Therefore, especially from the local suppliers' point of view, MILCO is a very powerful defence firm whose long term contract is the main factor for the survival of many small and medium size firms in the national military sector.

5. *Is there cross-functional team working in the supply chain?*

He did not have any response to this question.

6. *Does your organisation convey the targets of the project throughout the supply chain?*

The manager points out that when they convey the targets of a specific project to the suppliers, MILCO manipulates the real target values to attain its self-determined performance measures. It can be deduced that there is no relationship which is based on trust and transparent communication between MILCO and the suppliers. On the other hand, the Investment manager adds that if a supplier participates in any projects, they seem to certainly make profits from MILCO's point of view.

### ***Findings of KUCUKPAZARLI: manufacturer, supplier***

Although there is a set of question list each time an interview occur, this list of questions was not followed strictly due to the way the conversations lead during the interviews.

Kucukpazarli is the supplier of Turkish Aerospace Industry (TAI), and its other customers are Airbus, LockheedMartin, Northrop Gruman, Bombardier, Embrae. Kucukpazarli and TAI have a close relationship. The General manager said that they are really grateful to TAI due to the business they provided to them. On the other hand, Kucukpazarli is growing, it needs to find other customers.

TAI made an agreement with the firm GTD in order to inspect parts at the supplier premises.

The General manager said that there are some communications problems occur within the supply chain. Even with TAI, when they request something, they need to wait three days. And for Boeing connections, they do not know their contact details. For the requests that go to Boeing they need to wait sometimes two months. Kucukpazarli itself is a family firm, for this reason, the decisions are taken quickly comparatively to TAI.

He asked what he understands of the concept of formalisation, he said that the people should comply with the roles and responsibilities described in the organisation structure.

TAI uses Kucukpazarli as a training site when it wants to introduce a new application with a supplier. TAI believes that if this new application becomes successful when it is applied at the system of Kucukpazarli, only then it applies to other suppliers.

Even though Kucukpazarli is awarded contracts from other firms, and even if they reduce their share of work for TAI, they still spare some capacity for the contracts of TAI.

### ***Findings of MILSOFT: software company, supplier***

The interview at MILSOFT was performed with the Acquisition and Proposals manager. MILSOFT is a software company, working mainly for national defence firms such as MILCO and TAI. In addition, it also work with international firms. It is a 100% private firm and its main success criterion is to make profit. Unlike its national customers such as MILCO and TAI, MILSOFT has a limited budget and the companies' sustainability depends on whether it makes profits at the end of projects. The manager stated that they particularly underline this point to TAI, but TAI does not seem to understand MILSOFT's point of view.

With regard to formalisation, the Acquisition and Proposals manager stated that when they work, they use contracts for different type of projects. There are all the required documents and work description clearly written in contracts. In addition, documents, standards, job description and reports are shared with the suppliers. In the supply chain, there is also Integrated Project Team which consists of people from different departments and includes suppliers work to realise the projects in the required standard. The manager stated that the problems occur in their supply chain occur mainly with 80% due to external reasons and 20% due to the internal factors.

When MILSOF selects the suppliers, firstly, it evaluates the potential supplier list and a number of suppliers in this list is reduced down to the shortlist of the suppliers. The suppliers are selected from this shortlist. On the other hand, it is a private company and making profit at the end of each project is their ultimate aim and important performance criterion. Because they write software programs and each software program is different from each other, they work with their suppliers on mostly one-time basis.

The Acquisition and Proposals manager stated that in general, software companies work with the suppliers on a single time basis. The main reason for this stems from the fact that each time the customer requires different products; hence, as a firm, they need to work with a different supplier who can meet the requirements.

The Acquisition and Proposals Manager stated that they do not want their suppliers to contact to their customers directly without consulting firstly to MILSOFT. The targets of the project might have been explained to the supplier in a different way; hence MILSOFT always requires their suppliers to be contact with them not to MILSOFT's customers. They are in contact with their suppliers in a number of ways. In the supply chain, the Acquisition and Proposals manager mentioned about Integrated Project Team (IPB).

CMMI is one of the standards employed in the software sector.

At the end of the pilot study, it was decided that the manufacturing firms with their various number of applications with their suppliers in comparison to the service firms would be more suitable for the purpose of this study. In addition, it was observed that MILCO and AGRICO among other manufacturing firms are willing to be part of the research by providing further support along with their suppliers were chosen to be the cases for this research.

During the formal study which is explained in detail in the following sections, new suppliers are contacted. Due to the reasons for confidentiality, the name of these manufacturing suppliers are called as supplier A and B for MILCO, and supplier C and D for AGRICO.

#### 4.2 Findings of the Military Electronics Firm and Supply Chain

An overview of a military electronics firm, MILCO, and suppliers, supplier A and supplier B, which are considered for this research, is depicted in figure – 4.2. The Undersecretariat for Defence Industries of Turkey (SSM) is the main customer for most Turkish defence firms including MILCO. This research investigates previously explained structural factors of the supply chain up to the SSM level (SSM is not included). Therefore, as shown in figure – 4.2, MILCO is the focal firm while supplier A and supplier B are the first tier suppliers.

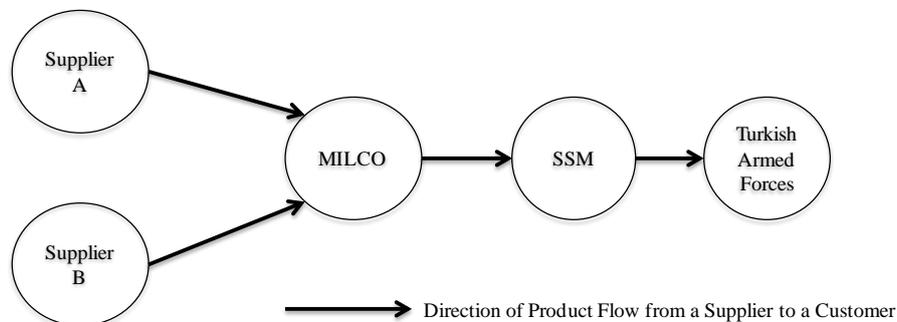


Figure – 4.2 An Overview of the Supply Chain

##### 4.2.1 Centralisation

Choi and Hong (2002) extend the definition of centralisation for a supply chain on the basis of its definition for an organisation. Centralisation in supply network (supply network and supply chain used interchangeably) refers to ‘*the numbers of the tiers that the final assembler actively manages by selecting them, engaging them in product development, or helping them solve problems*’ (p. 471). Therefore, depending on the description of centralisation provided in the study of Choi and Hong

(2002), the supply chains explored for this study will be considered centralised if the focal firm exercises direct control over the first tier supplier, second tier supplier, and so on; if the focal firm exercises direct authority over only the first-tier supplier and allows the first-tier supplier to work with its supplier, and so on, that supply chain will be called decentralised. The term ‘direct control’ is associated with the following activities of the focal firm: selection of a supplier, involving suppliers in product development and helping the suppliers when they encounter problems.

In the following sub-section, firstly, the centralisation dimension of the supply chain structure is explored from the perspective of the focal firm which is a military electronics company. Next, the suppliers’ view of the focal firm’s application of power is investigated, and findings are presented.

### ***Focal Firm’s Perspective***

In line with the definition of ‘centralisation in a supply chain context’ which is acknowledged for this research, the supply chain of which MILCO is the focal firm is considered a ‘centralised supply chain’ if MILCO performs the following activities:

1. Selection of its own suppliers, including first tier, second tier, third tier, and so on,
2. Involving suppliers in product development activities,
3. Helping suppliers when they encounter problems.

In a very general sense, firstly, the question of how much power MILCO wields over its suppliers is explored. The Purchasing manager at MILCO stated that MILCO is a respectable firm in the both national and international market. According to the list published by an American defence newspaper, Defence News, MILCO is ranked 80<sup>th</sup> defence firm in the world in year 2011. This list is generated based on the previous year’s sales of the defence firms. Especially from the national suppliers’ point of view, MILCO is a very powerful defence firm whose long term contract is the main factor for the survival of many small and medium size firms in the national military sector. This information alone might be a powerful indicator of MILCO’s desire for a centralised control over the supply chain. Indeed, one of the observations made in the case research of Choi and Hong (2002) is that the supply chain becomes more centralised as the suppliers’ reliance on the focal firm increases (p. 477).

The Purchasing manager at MILCO stated that MILCO currently works with more than 400 suppliers including 170 approved suppliers. The suppliers are determined either by MILCO or the customers. The Purchasing manager stressed the nuances of meanings of the following two terms in respect of outsourcing activities. The first one is the *subcontractor* referring to a supplier which is selected by MILCO’s customer, in most cases this customer is the Undersecretariat for Defence Industries of Turkey (SSM), which acts as a Turkish Arm Forces’ Procurement Agency. The second term is the *supplier* denoting a firm which is selected by MILCO. The Purchasing manager commented that customer chosen subcontractors are not controlled as strictly as the suppliers. This information is a

vivid example to demonstrate the fact that in the 'real world', a focal firm cannot select all of the suppliers because of intervention by public organisations or policy (Choi and Hong, 2002; Choi and Kim, 2008). Hence, MILCO is selectively involved with the supply base, and this does not impede it from exerting a centralised control over the supply base. Concerning the selection process of the suppliers, the detailed information is provided in the following paragraph.

Before starting outsourcing any process, MILCO conducted in-house research in order to identify the most appropriate areas of the business to be outsourced. 25 different areas of activities in relation to manufacturing including design were determined for this purpose. Each potential supplier is audited by a team from MILCO to assess the supplier's technical strength in the production activities. In addition, the same candidate supplier is examined in other areas such as quality, administration, and financial status. The audit team includes at least three engineers from the following departments: purchasing, quality, and production or design. Once the team completes the examination, the supplier's performance is appraised by combining the performance of each activity area, namely technical capability, quality and administration. Once the supplier is approved, an offer letter for the related project is acquired from that supplier. Offer letters received from approved suppliers are evaluated and compared to select a supplier with the best offer. In addition to the price criterion, quality and delivery performance are considered when a contract is awarded to the approved supplier. The Purchasing manager added that MILCO also has a strategic partnership scheme. In addition to the above performance criteria, when a firm is considered becoming a strategic supplier of MILCO, previous experience and observations of MILCO's personnel with regard to this specific supplier are taken into account to make this decision. Overall, however, the final decision of awarding contracts to any supplier is made by the top management, the interviewee concluded.

The chief of the Quality Inspection Department at MILCO provided further information with regard to MILCO's position in controlling the activities of the suppliers. It was stated that MILCO does not perceive the suppliers as the first level or second level or third level suppliers. On the contrary, MILCO's viewpoint on the supply base is to consider all suppliers as firms which provide required products and/or services for them. The main reason for this approach stems from the fact that MILCO prefers to work with a small number of suppliers in order to reduce the management cost of the supply base and to assure a consistent product quality. It was also added that when MILCO outsources any process to the immediate supplier, in most respects that work does not require any other supplier involvement. Rarely, the participation of another level supplier which is not a first tier supplier is needed. When that happens, the Quality Inspection chief commented that MILCO directs the immediate supplier to work with the specific second level supplier which is also approved by MILCO. This data suggests that there is a centralised influence of MILCO on the supply chain structure. In order not to distort the data supplied, it is important to include the further comment made by the

Quality Inspection chief. She drew attention to the reluctance of MILCO to work with second level suppliers; they expect the completion of all the required work by the first level suppliers. Regarding the selection of raw material suppliers, MILCO is highly sensitive. The reason for this is due to the very high standard of raw materials in the defence industry. As the evidence grows, it seems apparent that by selectively choosing the first tier suppliers and imposing a list of approved suppliers on the immediate suppliers, MILCO fulfils the first requirement of managing a centralised supply chain.

As the largest electronic product provider for the Turkish military, MILCO aims to create its own national defence supply base according to the Purchasing manager. Unlike in the past when all the work was manufactured either by MILCO or was bought from foreign suppliers, today, MILCO outsources all the activities which can be performed by the national suppliers. This is a strategic direction that MILCO and other large-size national defence firms have taken under the guidance of the national defence procurement policy, the Purchasing manager commented. In fact, SSM imposes a policy on the primary defence firms to allocate certain percentage of the workload of each new project to the small and medium-sized firms. Another reason mentioned for investing in the development of the small and medium-sized firms is that MILCO solely wants to focus on the projects which require core technology. The processes outsourced to the suppliers can vary based on the individual requirements of the work. The Purchasing manager stated that including design activities, MILCO currently outsources the activities consisting of 25 diverse areas of production. As a result, it is concluded based on the provided evidence that some of the suppliers with whom MILCO works perform design activities for them.

Based on the definition of a 'centralised supply chain' adopted for this research, the last element of centrally-managed supply chain is attained through helping suppliers when they encounter problems. MILCO attempts to support the suppliers in a variety of ways, the Purchasing manager stated. Depending on the individual firm's needs pertaining to production issues, MILCO organises training programs to help the suppliers to improve their processes. In addition, it helps them to develop their infrastructure. For example, MILCO encourages the suppliers to utilise machines that are no longer in use at MILCO. The Purchasing manager commented that MILCO prefers to give these idle machines to the suppliers for free of charge though they cannot do that due to the company's regulations. Hence, MILCO sells these machines to the suppliers with a discount. In terms of financial support to suppliers, if requested, advance payments can be made to them. Moreover, MILCO has recently started to negotiate with banks to facilitate credits to a specific supplier if that firm is awarded a contract by MILCO. Consequently, as far as MILCO is concerned, it also meets the last requirement for forming and managing a centralised supply chain by helping the suppliers in many various ways.

### *Suppliers' Perspective*

Both of the immediate suppliers of MILCO who were included in this research are not content with working with MILCO due to the following reasons. Firstly, both firms claimed that MILCO prioritises price over quality and delivery performance for an outsourced part even though the opposite is declared. Mainly due to the reason mentioned in the preceding sentence, supplier A and B stated that they always find themselves in an unfair competition with firms which enter the sector recently and lack adequate infrastructure in terms of technical equipment and know-how, management standards, and financial capability. Both suppliers drew attention to the fact that MILCO's approach of prioritising price over other measures generates detrimental effects for both MILCO and themselves in the long term. Supplier A explained this situation further. Supplier A has to work with second level suppliers which are imposed on them by MILCO for some processes such as coating, heat treatment, and painting. The manager of supplier A claimed that MILCO's approved supplier list for these processes is inadequate. Due to the years of experience in the sector, the manager argued that they can find firms which are able to perform the same operations with higher performance in terms of quality and cost compared to the ones enforced by MILCO. Because of MILCO's bureaucratic way of working and unwillingness of considering the supplier's side of the argument, suggestions of these kinds from local suppliers are not taken into account by MILCO. In addition, the manager of supplier A questions the appropriateness and quality of the evaluation system of MILCO for proposed offers as far as both personnel and a method are concerned. It was highlighted that working with an incompetent second level supplier which is imposed by MILCO might provoke an increase in the overall costs of supplier A, which MILCO never compensates them for. At this point, it will be relevant to mention about a criticism raised by supplier B to support the information given by the manager of supplier A. The manager of supplier B also questions the capability of MILCO in terms of awarding contracts to the suppliers. He acknowledged the fact that MILCO handles the raw material suppliers with great sensitivity due to the high material standards in the defence industry. However, he stated that the same level of consideration is not shown when selecting manufacturing suppliers. This evidence provided by both of the suppliers supports the suggestion made by Choi and Kim (2008). They propose that each potential supplier brings advantages and/or disadvantages into the relationship they form with the buyer due to their existing relationships with other suppliers and customers in the larger network. In order to fully exploit the opportunities a single supplier may bring to the network, MILCO needs to be responsive to the suggestions coming from the suppliers.

The data collected from supplier A and B in respect of MILCO's suppliers selection process overlaps; hence, the evidence is considered reliable. As a result, from the suppliers' perspectives, MILCO's way of working with an approved supplier list across the supply chain is not beneficial for all the members of the supply chain, certainly not for the immediate suppliers. Choi and Hong (2002)'s observation that in order for a focal firm (Honda in their case studies) to centrally control the supply

chain, the focal firm's relationship with its immediate suppliers should be well established is a strong point to be considered by MILCO. Certainly, continuous emphasis on the price of an outsourced part while considering other factors as of secondary importance and creating a feeling of unfairness among the suppliers deteriorate MILCO's relationship with the immediate suppliers causing to obstruct a long term relationship with them.

Supplier A and B acknowledged that working with defence firms such as MILCO and other national defence firms enables them to advance in a variety of areas from design to production. Due to the high standards in defence industry, primary firms like MILCO require the suppliers to be at certain level. Both suppliers stated that they have made a significant investment in areas such as technical and administrative knowledge of personnel, management and quality standards, and equipments so that they can satisfy their customers' needs. Although both suppliers are a golden supplier of another national defence firm, this feature does not ensure being a part of long term contracts with MILCO. Both suppliers emphasised that they are unable to make long term plans with MILCO as it solely awards short term projects to the suppliers. This is surprising information to receive especially from supplier A, who is a strategic partner of MILCO. The manager of supplier A claimed that the primary reason for MILCO to implement such partnership is to keep the suppliers under control so that they can only develop up to a certain level but not become another MILCO in the sector. Evidence from the suppliers is convincing that MILCO does not award long term contracts to the immediate suppliers. Therefore, it can be claimed that the relationship between MILCO and its immediate suppliers is not really conducive to the development of design activities.

Supplier A stated that neither MILCO nor other national defence firms support them financially when they invest in new equipments. Both of the suppliers' managers criticised MILCO commenting that it is unwilling to listen to the suppliers' points of view when a problem occurs. Thus, MILCO is unaware of the specific needs of an individual supplier with who it is working. Supplier B stated that MILCO provides training programs when required. However, as a firm with an aim to be a reliable supplier for a defence industry in the local and international market, supplier B prefers to be self-sufficient by investing in the development of its future trainers. In the light of the provided evidence, it is deduced that MILCO may respond to the suppliers' needs when required. On the other hand, due to the lack of communication and unwillingness to listen to the suppliers' perspectives, MILCO is incapable of determining the true needs of an individual supplier.

Both of the managers provided striking instances to support the information they provided. Based on the information received from the managers of the two suppliers, it is concluded that MILCO's approach towards the suppliers can be considered as a centralised one. However, there are some critical issues raised by the two suppliers, which might negatively affect the implementation of this approach. Firstly, it seems that MILCO is not keen on establishing a long term relationship with the

suppliers. This situation eventually causes the immediate suppliers to seek other potential customers. It is pertinent to note that during the interviews with the managers of both suppliers, it was inferred that they are already in search for other customers with whom a long term and mutual business commitment can be established. In addition, a lack of long term relationship with the immediate suppliers might provoke resistance from the suppliers to comply with MILCO's requirements such as working with a specified second or third level supplier or involving in design activities which require investments in the different areas of manufacturing. Secondly, MILCO needs to understand the significance of supplier selection process. This process is a matter of weighing up both the benefits and drawbacks of working with a particular supplier. MILCO should be aware of the supplier's existent relationships with other suppliers and customers in the wider network. Moreover, bringing a new supplier into the network should not create a feeling of unfairness among the existing suppliers. For this, it is critically important that MILCO is to be absolutely transparent in its dealings with the suppliers. For example, each supplier is entitled to be informed why its specific proposal is rejected, or what the benefits of choosing supplier X over supplier XX are. Therefore, on the basis of the data it is concluded that MILCO's supply network offers us a structure that is built largely based on a centralised control whereby the first tier suppliers are chosen by MILCO, and the second or third level suppliers are either directly chosen by MILCO or strongly recommended to the first tier supplier to choose from the provided supplier list. On the other hand, it is also easily concluded that while MILCO implements a central control over the supply chain, it does not fulfil the core requirements of managing a centralised supply chain such as forming a close relationship with the suppliers based on trust, being transparent in its dealings with the suppliers, and communicating with them effectively.

#### **4.2.2 Formalisation**

Analysis of the military electronics firm and supply chain in terms of formalisation is given in the following sub-section. The chain is explored to investigate through which formalised processes the focal firm ensures the existence of a high level understanding of the supply chain's expectations. As Choi and Hong (2002) state, it would not be possible for any firm, the focal firm in this case, to impose rules, procedures and norms to the supply chains at the system level; formalisation can only be implemented at a dyadic level (firm to firm). Similar to the analysis of centralisation, formalisation is examined firstly from the perspective of the focal firm, and the findings are presented in the following sub-section. Subsequently, for each dyad, the viewpoints of each supplier on their relationships with the focal firm in terms of this structural dimension are presented.

##### ***Focal Firm's Perspective***

The focal firm ensures the quality of the incoming and outgoing parts and products in compliance with quality management standards such as ISO 9001:1994 (Model for Quality Assurance in Design,

Development, Production, Installation and Servicing), AQAP-110 (NATO Quality Assurance Requirements for Design, Development and Production), and MIL-STD-1535 (Supplier Quality Assurance Program Requirements). Both of the interviewees at MILCO held the strong view that having these quality management standards enables them to produce consistent results in terms of product quality. In addition, MILCO works with approved suppliers, and makes the first tier suppliers engage with only specific second or third tier suppliers. This seems to be another factor maintaining quality. However, this sort of enforcement on the first tier suppliers is criticised of creating ‘too much rigidity in the focal firm - supplier relationships.

Once a supplier is chosen, contracts are the primary documents for both MILCO and the suppliers for the explanation of the rights and obligations of the two parts for a specific project, particularly for suppliers. The Purchasing manager emphasised that the expectations of MILCO from the suppliers are clearly stated in contracts. Documents with more detailed information such as purchasing order (PO) and drawings are also provided to the suppliers through emails, added the Purchasing manager at MILCO. Concerning the suppliers’ performance evaluation process, the Purchasing manager stated that the suppliers are informed periodically about their performance with regard to quality and delivery; if there is a decline in either performance measure, corrective actions are initiated to improve the situation. Lastly, the formalisation of the product design and development activities is examined in this case study. The Purchasing manager at MILCO recognised that naturally the design and development activities are the most ambiguous ones in the manufacturing environments; many changes might occur even after production starts. MILCO manages these activities in conjunction with the selected suppliers, not all the suppliers have design capability, in a way which is highly formalised. Any supplier involved in design activities needs to sign a confidentiality agreement form to prevent the distribution of information. Moreover, there is an established system to handle the engineering change orders at MILCO. The Purchasing manager at MILCO summarised their policy over the national suppliers by making the following comment: *‘MILCO has made a pledge to the national suppliers with whom it has the potential for future work, that any production which can be made by the national capabilities will not be produced by MILCO itself; hence, will definitely be outsourced’*. However, both of the managers of the first tier suppliers claimed that MILCO does not fulfil this promise, and required it to be checked by either an independent organisation or the Undersecretariat for Defence Industries of Turkey (SSM). In addition, the manager of supplier B stated that the MILCO’s General Manager has made a verbal promise to him about the possibility of supplier B’s involvement in the long term projects; so far, only short term contracts have been awarded to supplier B.

### ***Suppliers' Perspective***

The General Manager of supplier B pointed out that they have been working for MILCO for ten years now. According to him, in spite of the long-lasting relationship, trust between the two firms has not been completely established. The evidence of the lack of trust is that supplier B has not been awarded long term contracts even though most of MILCO's projects are long term ones, the General Manager suggested. Another significant instance indicating MILCO's low level of formalisation with supplier B was provided. It was stated by the General Manager of supplier B that MILCO's General Manager has verbally pledged to award long term contracts to supplier B for some time ago; however, nothing has been done so far. From his reflections of the problematic relationship between the two firms in terms of trust, it is understood that supplier B cannot foresee the future of the relationship with MILCO. This may not be an important issue for supplier B if it is not seeking a long term position in the military electronics sector in which MILCO is the primary focal firm in the national market. What supplier B is uncomfortable with seems to be the lack of both explicit and implicit understanding in MILCO's way of managing the supply base relations. Surely, this level of ambiguity particularly at the strategic level decisions is detrimental for both sides. From supplier B's perspective, they may feel the necessity of pursuing other customers all the time since they are not committed to MILCO with long term projects. Lacking a mutual and long term commitment in the supply base relations, MILCO is unlikely to achieve a fully integrated supply chain in which the specific targets are attained, in the sense that the supply chain cannot be set up to achieve the same objectives.

In addition to the evidence demonstrating the inadequate understanding between the focal firm and the first tier supplier at strategic level decisions, the General Manager of supplier B provided information about other areas in terms of the same structural dimension. It was suggested that MILCO is not transparent enough in the evaluation process of the suppliers' proposals for projects. This claim is based on the fact that supplier B has never been provided with the feedback on the reasons why its specific proposals were rejected. Moreover, it was commented that MILCO fails to regularly monitor the development of supplier B during the working period to respond to emerging needs. In relation to this, MILCO's personnel including the senior managers were criticised by both of the general managers of the first tier suppliers for not visiting their premises regularly. As Choi and Hong (2002) present in their findings, in addition to wordy documentations and performance reports, daily interactions and regular meetings: weekly, monthly, etc are appropriate ways of providing feedback to the suppliers, and they are effective ways of increasing the level of understanding among all participants.

The information gathered from the General Manager of supplier A in relation to formalisation is as follows. When supplier A was about to establish a quality management system in accordance with the requirements of ISO 9001 (1994 version), they called on MILCO to help them so that the two firms'

quality management systems could be compatible in certain areas particularly in documentation. This is a vivid example for demonstrating supplier A's intention of pursuing a long term relationship with MILCO where the both firms mutually commit for the development of the relationship between them. However, it was noted by him that this suggestion was rejected by MILCO giving the reason of confidentiality. Also, MILCO's system of informing the suppliers about the changes in the documents used by the suppliers was criticised. This is evidently due to the insufficient communication between the focal firm and the suppliers. Lastly, the General Manager of supplier A commented that MILCO is too rigid and not responsive to the supply side of the arguments when the price is concerned. In addition, there was no security in their relationship in terms of business. In order not to distort the evidence, however, it is important to note that once the findings from the first round of the interviews were shared with all the suppliers including supplier A, that specific information with regard to business security was regarded as a criticism for MILCO and at the second visit to supplier A; it was suggested that MILCO is actually understanding of the suppliers' need, and if they share the problems with MILCO, MILCO finds solutions to them. The reason for this change of information might be due to the increase in supplier A's workload which was confirmed by the Import and Export manager of supplier A. However, there is a need to note that this kind of information is delusive for a researcher and make analysis difficult. Evidence from supplier B is well-matched with the information which was collected at the first-round of the interviews at supplier A. The manager of supplier B stressed that contracts with MILCO most of the time are bias in favour of MILCO, and any objection by the supplier is not taken into the account.

### **4.2.3 Communication**

Communication dimension of the supply chain structure is explored from three aspects. Firstly, the means of communication employed between the focal firm and first tier suppliers are examined. Next, the types and level of information shared in the supply chain are attempted to be understood. As a last aspect, the relationship between the focal firm and the first tier suppliers in terms of existence of trust is examined. The following sub-section provides the findings of MILCO's supply chain in terms of the communication dimension.

#### ***Focal Firm's Perspective***

The Purchasing manager of MILCO drew attention to the fact that MILCO does not share the strategic decisions with the suppliers due to the significance of confidentiality in the defence sector. On the other hand, he commented that MILCO shares all the necessary information with the suppliers in order for them to realise the project as required by customers. Communication modes mainly consist of an email, phone and face-to-face meetings. Currently MILCO is working on a new project called 'e-purchasing' in which all suppliers will be connected to MILCO through a network, and they

will be able to follow the current status of their part on the system, the Purchasing manager stated. In relation to this new system, the Chief Engineer at the purchasing department stated that due to the security issues, this project is 'going quite slowly at the moment'. The Purchasing manager was asked whether this new system will be open to other Turkish defence firms in order for them to benefit from MILCO's approved suppliers list. He responded that since MILCO is in communication with other national defence firms through platforms such as panels and societies, they do not need to be in contact with them via information technology systems. The Purchasing manager continued by adding that if a potential supplier has worked for any other foundation's firm that is considered a good reference from MILCO's point of view. When further information is needed for that specific supplier, those referred companies are contacted. At the second round of the interview with the same manager, he stated that although MILCO does not share information with other defence firms on an electronic platform, they informally share information with each other via societies, unions, and partnership projects.

### ***Suppliers' Perspective***

The manager of supplier B argued that there is a communication problem between MILCO and the suppliers including themselves. The primary reason for this, suggested by him, was that MILCO's authorities do not regularly visit suppliers' premises; therefore, they are unaware of the specific abilities and/or needs of a supplier for an allocated project. In addition, MILCO is unsupportive of facilitating the inter-firm information system through which a supplier can access a variety of information such as material types, inventory level of the part, and shipment status. For example, supplier B cannot access MILCO's enterprise resource planning software (SAP) even for the required information. MILCO seems to be not ready to share the requisite information (technologies or other necessary information) with the first tier suppliers to allow them to work in an integrated manner, from both of the suppliers' perspectives. In support of the preceding statement, the manager of supplier A which is a strategic partner of MILCO claimed that the primary reason for MILCO to implement such partnership is to keep the suppliers under control, so that they can only develop up to a certain level but not become another MILCO in the sector. This is an absolutely critical assertion indicating a lack of trust between the focal firm and the first tier suppliers. Furthermore, according to the manager of supplier B, the supplier policy of MILCO is heavily affected by the individuals occupying the senior management positions within the company. Even though this situation was denied by MILCO's managers, the manager of supplier B claimed that the unstable supplier policy reflects the real situation; on top of which MILCO never conveys the targets of a project to supplier B, stated by the manager of supplier B. The existing communication means between the two firms are email, phone or face-to-face meetings although visits from MILCO rarely occur. Table – 4.1 presents

the summary of MILCO's supply chain in terms of all the structural dimensions considered for this research.

Table – 4.1 Viewpoints on the Structural Dimensions of MILCO’s Supply Chain

Supply Chain Structural Dimension	Focal Firm’s Perspective	Suppliers’ Perspective
<b>CENTRALISATION</b>	<ol style="list-style-type: none"> <li>1. chooses the first-tier suppliers and imposes an approved supplier list on the immediate suppliers to select from,</li> <li>2. reliance of the (national) suppliers on MILCO is large,</li> <li>3. involving the first tier suppliers into design activities,</li> <li>4. suppliers are supported in the following areas: financial, technical, and infrastructural.</li> </ol>	<ol style="list-style-type: none"> <li>1. insufficient supplier assessment process employed, particularly when choosing manufacturing suppliers.</li> <li>2. suppliers’ quality, delivery and cost performance followed by MILCO,</li> <li>3. not awarding suppliers with long term projects creates:               <ol style="list-style-type: none"> <li>a) underdeveloped supply base in terms of technological know-how,</li> <li>b) a feeling of unfairness among the suppliers.</li> </ol> </li> <li>4. no review of the suppliers on the following themes: financial situation, technology development and investment plans.</li> </ol>
<b>FORMALISATION</b>	<ol style="list-style-type: none"> <li>1. all the required quality management system standards exist and ensure the following:               <ol style="list-style-type: none"> <li>a) working with an approved suppliers,</li> <li>b) explicit supplier selection procedure,</li> <li>c) periodic feedback on suppliers’ performance with regard to quality and delivery,</li> <li>d) existence of wordy documents such as contracts, procedures, lists, drawings, forms.</li> </ol> </li> <li>2. formalised design activities due to,               <ol style="list-style-type: none"> <li>a) working with selected suppliers,</li> <li>b) issuance of a confidentiality agreement form,</li> <li>c) having an established intra-system to handle engineering change orders.</li> </ol> </li> <li>3. no sharing the strategic level decisions with the suppliers either explicitly or implicitly,</li> <li>4. no sharing the targets of projects with the suppliers; the suppliers are only informed about their performance results on the specific project,</li> <li>5. assuming that the suppliers always make profit as long as they sign a contract with MILCO,</li> <li>6. verbal promises to the suppliers are made in addition to the written documents.</li> </ol>	<ol style="list-style-type: none"> <li>1. suppliers cannot foresee their future with MILCO,</li> <li>2. MILCO is not transparent with its dealings with the suppliers,               <ol style="list-style-type: none"> <li>a) no feedback is provided to the suppliers with regard to their proposals,</li> <li>3. no regular visits the suppliers’ premises, especially during the realisation of the projects to increase the level of understanding,</li> </ol> </li> <li>4. contracts are bias in favour of M.ILCO.</li> </ol>
<b>COMMUNICATION</b>	<ol style="list-style-type: none"> <li>1. all the required information for the realisation of the projects is shared,</li> <li>2. email, phone, and face-to-face meetings are used,</li> <li>3. is transparent and trustworthy firm in the dealings with the suppliers.</li> </ol>	<ol style="list-style-type: none"> <li>1. not establishing a close relationship with the first tier suppliers might provoke,               <ol style="list-style-type: none"> <li>a) resistance from the suppliers to comply with the focal firm’s requirements,</li> <li>b) suppliers to seek other potential customers,</li> <li>c) a relationship which is not based on trust.</li> </ol> </li> <li>2. not being responsive to the supply side of the arguments. This causes:               <ol style="list-style-type: none"> <li>a) an ineffective communication with the suppliers,</li> <li>b) an inability of assessment of the opportunities and threats a specific supplier might bring to MILCO’s supply chain,</li> <li>c) a feeling of unfairness among the supply base.</li> </ol> </li> <li>3. no regular visits to the suppliers’ premises,</li> <li>4. no inter-firm information system between MILCO and the suppliers,               <ol style="list-style-type: none"> <li>a) suppliers have intermittent difficulty in accessing operational data.</li> </ol> </li> </ol>

### 4.3 Findings of the Agricultural Vehicle Firm and Supply Chain

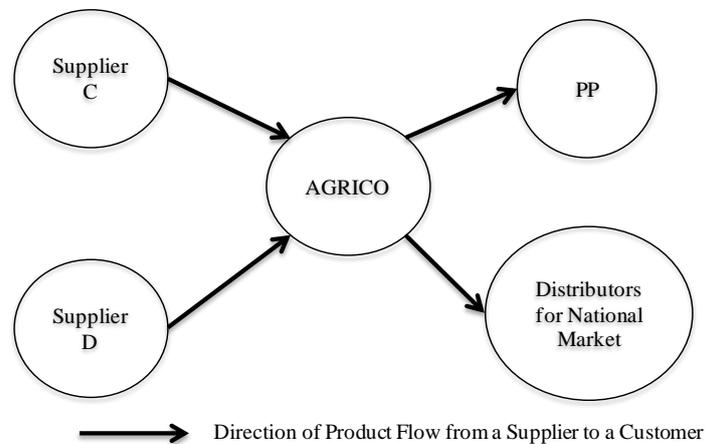


Figure – 4.3 An Overview of the Supply Chain

An overview of a tractor firm, AGRICO, and the suppliers, C and D is depicted in Figure – 4.3. The primary customers of this supply chain consist of the distributors for the national market and PP, who is also an important shareholder of the focal firm AGRICO. Similar to the first supply chain presented earlier in this chapter, the dimensions of a supply chain structure, namely centralisation, formalisation, and communication are examined from the perspectives of the both focal firm and two first-tier suppliers. A great amount of information with respect to the aforementioned dimensions was received from the various level personnel of AGRICO including managers, supervisors, specialist, and trainer. The interviews with the suppliers were arranged by the Supply Chain manager of the focal firm. During the interview with the Supply Chain manager, he kindly offered to provide the names of AGRICO’s two first-tier suppliers for further exploration.

#### 4.3.1 Centralisation

In the following sub-section, centralised management is explored firstly from the focal firm’s point of view. Next, the suppliers’ views on the focal firm’s application of power are examined, and the findings are presented.

##### *Focal Firm’s Perspective*

In gaining an understanding of AGRICO’s approach to centralised management, firstly, the supplier selection process was explored. This process is the area where AGRICO has made a noticeable improvement since 2008. AGRICO employs a new supplier selection process imposed by the corporate group which owns 90% of PP’s shares. The centralisation of the purchasing activities under

the corporate group contributed to the employment of same procedure for the selection of its worldwide manufacturing suppliers.

The Quality Assurance (QA) manager stated that AGRICO works with both foreign and local suppliers. The foreign suppliers are selected by PP, both shareholder and customer of AGRICO; the focal firm is not involved in this process. Even though this is the case for the selection of foreign suppliers, decision to work with any supplier regardless of its being foreign or national eventually rests solely with AGRICO, the QA manager pointed out. As long as a potential supplier appears to be the most competitive one among other candidates its being foreign or national is an insignificant factor, the Direct Purchasing Material specialist stated. In addition, as mentioned in the previous paragraph, the suppliers of PP are subject to the same supplier selection process used by all the corporate factories including AGRICO. Indeed, it is even preferable to work with an approved supplier of PP from AGRICO's standpoint since it allows the firm to reduce the overall auditing costs. Other than the aforementioned reason, intermittently, there are cases in which AGRICO has to work with a customer-specified supplier as a precondition for a project to start. For example, PP might require AGRICO to install only IVEKO motors, or another customer might ask the focal firm to work only with the Good-Year company for tyres. Once the supplier is determined, however, AGRICO is fully in charge of the management of negotiations, reaching an agreement, overseeing the activities occurring during production and generating solutions to after- sale problems which might arise due to that particular supplier.

With respect to the national suppliers, the Direct Purchasing department at AGRICO creates a potential supplier pool from which future suppliers are chosen based on the requirements of outsourced parts which are determined by the department of Research and Development. The selection of national suppliers is performed by collective work by the Direct Material Purchasing (DMP), and Indirect Material Purchasing and Supplier Development (IMPSD) departments. It starts with an initial assessment of a potential supplier by the DMP department based on the following criteria: the finance of a supplier, the administration of a supplier, the capability of a supplier, a proposed price for an outsource part. After the evaluation of these criteria, the DMP department requires the department of IMPSD to conduct audits at supplier premises. Two different types of audits applied to the suppliers: Potential Supplier Audit (PSA) if a supplier is new and Planned Supplier Process Audit (PSPA) if a supplier has previously worked with AGRICO.

During the interview with the specialist at the IMPSD department at AGRICO, it was indicated that the questions that are asked at AGRICO's audits are more advanced than the requirements of existing management standards such as ISO 9001 and ISO 16949. Hence, the planned suppliers' audits of AGRICO are not inhibited by the suppliers' having any type of quality management standards. It was very firmly suggested that AGRICO's supplier selection process is exhaustive with 45 different

questions covering nine distinct quality categories. The audits are performed at a firm level in which four or five parts and their processes are randomly selected for an investigation, i.e. PSA audit, or the primary focus of an audit might be a process of a specific part, i.e. PSPA. The latter has a broader scope than the former. Regardless of the audit types, PSA or PSPA, the overall score of the audit is considered as a quality level of a potential supplier, and is only one of the five inputs for the supplier selection process. In addition, for AGRICO a potential supplier's performance in each individual quality category is as important as its overall quality score. The reason for this is that the score of a potential supplier in the single quality area is an indicator to be utilised by AGRICO to direct the future improvement activities to the most essential areas in case that supplier begins working with AGRICO.

Once the quality score is available for that particular supplier, the final decision of accepting or rejecting the supplier rests solely with the Direct Material Purchasing (DMP) department. There are intermittent cases in which a supplier might be selected in spite of its low level audit results, the specialist at the Indirect Material Purchasing and Supplier Development (IMPSD) department mentioned. Due to a low price offered by a supplier, the DMP Department might choose the path for improving that particular supplier with support from the department of IMPSD. The IMPSD specialist pointed out, however, that this type of cases arises rarely. In terms of the selection of second or third level suppliers, the following information was given. Those audits, PSA and PSPA, are only conducted to select the firm's first tier suppliers. The QA manager commented that AGRICO is not involved in the selection process of other upstream suppliers, e.g. the selection of second tier suppliers is performed by the first tier suppliers. The only control mechanism of AGRICO over the selection process of the second or third level suppliers is maintained through the audits of the first tier suppliers in which AGRICO inspects and approves the supplier selection process of the first tier suppliers. Therefore, on the basis of the information gathered from the interviews, in regards to the first aspect of centralised management, namely supplier selection, it is evident that on the whole AGRICO selects the first tier suppliers and leaves the responsibility of choosing other upstream suppliers to the first tier suppliers. Certainly, there are exceptional situations in which AGRICO enforces the first tier supplier to work with a specific second-tier supplier. The QA manager provided an example to explain such conditions in detail. For two different types of tractors assembled by AGRICO, one with a cabin, the other without, AGRICO works with a cabin producing firm which is a first tier supplier. Regarding the tractor with a cabin, the cabin producing firm is directed by AGRICO to work with the same seat-producing second tier supplier which produces the seats for tractors without a cabin, so both models have the same seats. During the interviews with AGRICO's personnel, it was observed that the focal firm has policies for managing the first tier supplier. Its relationship with different level suppliers only occurs when AGRICO is required to be involved. The abundant evidence suggests that AGRICO has a well-established supplier selection process which has a written procedure and is

known by all the relevant personnel. The plans are made based on this procedure and, they are in implementation in accordance with the procedure. This process apparently works with a minimum deviation.

Once an appropriate supplier is chosen for a specific product, AGRICO can rely on this supplier for any types of process that are not available in-house. These processes might vary from design to production. Regardless of whether a process is related to different level decisions such as operational or strategic, AGRICO seeks supplier involvement in all types of processes. For example, during the prototype phase of a new product, the focal firm works closely with the suppliers; it is fully open to new ideas coming from them as long as the new innovation reduces the production costs and/or improves the functionality of a product. Another relevant example is the determination of the price of a product which is an important issue between the focal firm and the suppliers. Since AGRICO has a wide range of expertise in production and assembly based on their in-house sites experience, the focal firm is knowledgeable about the pricing process of a product. Hence, if a supplier quotes too high for a product, AGRICO rejects an initially offered price and negotiates for a better one.

At this point, it is important to note that contradictory statements concerning the above examples as to how and what extent AGRICO allows the suppliers to take part in a variety of its processes are made. One comment by the manager of IMPSD department was that most of the critical processes of AGRICO like welding, heat treatment, and brake system are performed in house; no supplier involvement exists in these critical processes. The second observation pertinent to the same issue was made during the interview with the Supply Chain manager. He suggested that after the completion of the introduction of a project in which primary aims are explained to a supplier, the decision to be involved in the project rests with the supplier to whom any financial data with regard to the project is not conveyed. The manager claimed that as a focal firm, they believe that if a supplier accepts to work with them, this is a strong indicator that they will make profits out of that project. Based on this evidence, it can be claimed that any supplier willing to participate in the contracts of AGRICO will likely find itself in a situation in which certain pricing is imposed on them by the focal firm. It is highly noteworthy to include a statement made by the General Manager of supplier A of the first supply chain which has previously worked for AGRICO in their early years in the sector. He pointed out that contracts made with AGRICO are always hugely biased in favour of AGRICO. Due to the past experience with this firm, supplier A principally never works for this firm.

Finally, AGRICO's approach in respect of the third significant aspect of centralisation, helping suppliers, was examined, and the following data was collected during the interviews. On the basis of the provided evidence, it can readily be claimed that AGRICO is an active player in this part of centralised management. Large parts of these activities are led by the department of Indirect Material Purchasing and Supplier Development (IMPSD). In line with the company's quality policy, AGRICO

aims to control and improve the supply base. On a yearly basis, the Supplier Development specialist determines a list of suppliers whose processes need improvement. This list is determined based on several inputs; some of which are the PPM ratio of a supplier, the results of the previous audits, monthly quality and delivery performance of a supplier accumulated during a year, especially a number of times it appears on the worst performing supplier list generated monthly. In addition, the list is shared with all the relevant departments at AGRICO in order to include their inputs and finalise the list of suppliers for which improvement activities will be planned and put into practise. The QA manager stressed that the necessary training is determined on the basis of the supplier's individual needs and is provided to them either by AGRICO's own personnel or by private consulting firms free of charge. These activities aim to introduce some new processes to the supplier and / or improve the supplier's existing processes so that the targets of the project in terms of quality, delivery time and price can be met by the supplier. The suppliers are trained in the areas of welding, heat treatment, hydraulic system and other processes. In addition, training in the appropriate implementation of quality tools such as process improvement, kaizen, and world class manufacturing is provided. A question of *whether AGRICO supports the processes of other upstream organisations besides the first tier supplier* was raised to the manager of IMPSD. He replied that AGRICO also helped the second or third tier suppliers when required. Further comments on the issue, however, made it clear that AGRICO does not acknowledge the fact that providing support to the second and third tier suppliers is its primary responsibility; rather, it is perceived as an intermittent contribution for a seamless flow in the supply chain. Even though AGRICO provides a large variety of training programs to the suppliers, no financial support is given to them. The Material Procurement supervisor commented that even though a supplier pledges to make a huge amount of investment for AGRICO's projects, AGRICO neither verbally nor in a written statement makes any pre-arrangement with that particular supplier in the exchange of that investment. The prime condition for AGRICO to award a supplier is to receive a part with a required quality and a low cost.

### ***Suppliers' Perspectives***

#### **Supplier Number 1: C**

During the interview with the General Manager of supplier C, two variables of the supply chain structure, namely centralisation and communication were explored. Instead of asking the same questions used for AGRICO, the General Manager was asked open-ended questions to elaborate upon C's experience with AGRICO in respect of managing the relationship between the two firms.

The General Manager stated that since 1977, AGRICO has been the primary customer of supplier C with 60% of C's total sales fulfilled by AGRICO's demand. The General Manager evaluated their relationship with AGRICO as 'very good'. This is owing to the flexible production line of supplier C, which can meet the requirements of different parts demanded by AGRICO in a timely manner. In

addition, supplier C considers price, quality, and delivery time sensitively and tries to achieve the set targets regarding these factors. It was stated that AGRICO has not audited supplier C for a long time now due to the extensive experience gained by working together for many years. Only when a problem occurs, the related personnel of the two parts meet to find a solution to the existing problem.

Being a much centralised organisation itself, supplier C, where all critical decisions are finalised by the General Manager, the supply chain of which supplier C and AGRICO are parts can be considered decentralised based on the definition of centralisation accepted for this research. That is to say, in general, AGRICO leaves supplier C to manage its activities independently. In addition, managing the other upstream suppliers, e.g. second tier, third tier, and so on is not a direct responsibility of AGRICO. This information is supported by the statements of AGRICO's managers who have been interviewed recently.

Two examples on different occasions were given by the General Manager in order to demonstrate supplier C's perspective on its main customer, AGRICO. As the examples will indicate, in the relationship between the two firms, AGRICO has the authoritative power over the supplier, C. Both examples illustrate that supplier C approaches more sensitively to the issues raised by AGRICO. On the other hand, being more powerful in the chain, AGRICO does not seem to manage the relationship with supplier C with much care. The first example is about a project which was completed by supplier C in detrimental to its profitability just to support AGRICO's assembly line. The circumstances for this specific case were detailed by the General Manager as follows: supplier C provided a quotation for the above mentioned project two years ago. Since then, they have not received any feedback from AGRICO about the status of the project. Only recently, AGRICO has informed supplier C on the details of the project. Without giving enough time to make preparation for production, supplier C had to manufacture the required parts to complete a total order of 100 tractors. This project was completed in a month. The General Manager of supplier C stressed that they have accepted the order only because AGRICO is their main customer, and they did not want to leave them without solutions. The second example which has taken place recently in Sanliurfa, a city in Turkey, presents both the level of closeness of the relationship between the two firms and the flexibility of supplier C's production line. When AGRICO was preparing to exhibit a tractor which had been brought from America, a part of the tractor was found defective. In order for AGRICO to continue with the exhibition, supplier C was asked to produce a correct part for a replacement. In three days, supplier C has provided the correct part to AGRICO.

The General Manager mentioned a situation from which supplier C attempts to capitalise on working for AGRICO, a well-known firm in both national and international market. When supplier C orders certain parts from any company, it usually receives a long delivery date; however, if supplier C places the order by giving the reference of AGRICO, the delivery date for the same order is automatically

reduced. The General Manager was asked a question of what happens when there are disputes among the firms of the chain. He responded that as supplier C, they do not inform AGRICO about problems, and they attempt to resolve them by themselves. It was also indicated by the General Manager that due to the bureaucratic way of working within AGRICO, making decisions might take a long time. Therefore, supplier C does not inform AGRICO for every decision that they take.

### **Supplier Number 2: D**

In terms of centralisation, the Assistant General Manager at supplier D provided the following information. AGRICO does not participate in the selection of other upstream level suppliers, e.g. second tier, third tier and so on. Furthermore, unlike Bosch, one of supplier D's main customers, AGRICO does not always specify a certain supplier for D to work with. Principally, if there is a supplier of AGRICO for that specific project, supplier D prefers to work with that specific supplier. Otherwise, it works with a supplier from its own supplier list. As will be explained in the following paragraph in detail, the primary reason for this approach of AGRICO might stem from the fact that the final product has a very low rate of plastic, and the majority of supplier D's raw material suppliers (%97) are international. Therefore, AGRICO does not feel the necessity of exerting close control over supplier D's raw material suppliers. In addition, as mentioned in the section of AGRICO's supplier selection process, AGRICO is not involved in the selection process of foreign suppliers. In terms of the low usage of plastic, the Assistant General Manager commented that maybe for the raw materials which are used heavily in a tractor, AGRICO applies control over the upstream suppliers. However, from the information given by the previous supplier of AGRICO, it is known that even for the highly used parts of tractors, raw material suppliers are not directly controlled by AGRICO. A subtle reason for this attitude of the focal firm was also pointed out by the Assistant General Manager. Due to the high cost of auditing process, in general focal firms attempt to delegate these kinds of responsibilities to the first tier suppliers. Therefore, while working for AGRICO, supplier D mostly works with its own suppliers, especially the ones with certificates in order to reduce its own auditing cost.

Having had a long term relationship with AGRICO (since 1974), the Assistant General Manager complained about the approach to supplier D by PP, both a share holder (owns 37.5% of the total share) and customer of AGRICO. During July 2011, supplier D has been awarded by Bosch Group, which has more than 4000 suppliers all over the world, the 'Superior Quality and Excellence Performance' award for its activities of 2009-2010. So far, PP has been unwilling to employ supplier D in more contracts despite its success. The Assistant General Manager added that between the years of 2003-2010, the number of visits paid to PP by him only, excluding others were more than 20. This information alone implies that there is huge desire from supplier D side to involve in a greater number of projects proposed by PP. It was claimed that as a company, they are better qualified than PP's local suppliers in terms of quality and cost variables; however, PP is unwilling to involve supplier D in

more projects without presenting well-grounded reasons. That is why current volume of trading between the two companies holds merely 1% of supplier D's total sales. Having said all these, the Assistant General Manager indicated another reason for a low rate of business relationship with off-road firms including AGRICO (7% of the total sales of supplier D are for AGRICO). It was explained that off-road vehicles which are built for the roads other than motorways require a small amount of plastic materials (around 1%). This is another reason for the low level of sales in this sector compared to the other sectors supplier D is involved in. The Assistant General Manager also stated that since its establishment, supplier D does not take part in any single sector exceeding its 30% sales and does not work for a single customer with more than its 25% sales. This is a principle of the firm since the establishment, and its application is supported by the risk management policy applied throughout the firm.

Supplier D is very much involved in the design activities of the parts shipped to AGRICO. In fact, design of some of the parts, which are categorised under the name KOSER, belongs to supplier D. Being able to design and develop its own parts is absolutely critical for supplier D, the Assistant General Manager stated. Supplier D has taken part in intermittent projects with national defence firms in order to improve the technological infrastructure and know-how in addition to providing support to the Turkish military sector. The Assistant General Manager made further comments on the current state of the Turkish military firms. The Turkish government and primary Turkish military firms like MILCO are criticised for not supporting the national supply base. It was stated by him that because these firms mostly perform off-set work, they do not have enough resource to support and develop the national supply base. Furthermore, he added that unless these main firms are able to define exactly what products they want to produce and how they can control them, they will not perform well in the future and be able to support the development of the national supply base. In order to illustrate the significance of the design activities, the Assistant General Manager provided the following information with regard to the approach taken to select a potential customer. Before selecting any customer, firstly, supplier D evaluates whether it can benefit from the customer's experience in order to improve the way they conduct their business. Secondly, the customer's know-how need is assessed. With every new project, supplier D attempts to increase the technological and know-how levels. Finally, the question of whether this potential customer can be actually a long term partner with whom the relationship lasts 15 to 20 years is attempted to be answered. Supplier D evaluates the current design of the part and the potential & willingness of the customer to be able to foresee whether other versions of the part can be made in the future.

The Assistant General Manager stated that as a company, they did not receive any financial help from AGRICO. In addition, supplier D is unwilling to participate in training activities which are provided by AGRICO free of charge. The reason for that stems from a belief that those free activities will

eventually be reflected to the price of the outsourced parts by AGRICO. That is why as a company, supplier D organises its own training activities for its employees.

### **4.3.2 Formalisation**

#### ***Focal Firm's Perspective***

Having an integrated management system which consists of ISO 9001: 2008, ISO 14001: 2004 and BS OHSAS 18001:2007 management standards whose name are the followings: quality management system standard, environmental management standard and occupational health and safety assessment standard, respectively, AGRICO encourages the suppliers to have any type of quality management standard. The Supply Chain manager at AGRICO critically mentioned that on the one hand, they themselves did not have any quality management standard until September 2010, but required the suppliers to have one on the other hand. It was informed that AGRICO has been certified by a third party firm only in September 2010 which is very recent. The main argument to support having a quality management standard was raised by the manager of Indirect Material Purchasing and Supplier Development (IMPSD) department stating that firms with any type of quality management standard are able to supply consistent quality in their products. Based on this primary reason, AGRICO hesitates to work with suppliers without any quality management certification.

The QA department at AGRICO aims to establish Total Quality principles within AGRICO and across the supply base. To achieve this, the department employs various tools such as kaizen, Failure Mode and Effect Analysis (FMEA), Statistical Process Control (SPC), and provides training in the required fields to improve the existing processes in-house. In addition, the department is in charge of the assessment of after-sales complaints in order to direct them to a right source. A question of *how AGRICO ensures that it receives parts and /or products which are in compliance with requirements at all times* was mooted to the QA manager. According to him, firstly, the description of the expectation for an outsourced part should be unambiguous. Next, establishing necessary systems at suppliers' premises will be likely to support the suppliers in producing only required quality parts. Currently, once a working relationship begins between AGRICO and a supplier, the focal firm manages this relationship to ensure that the supplier complies with all the requirements specified in a contract, specifications and drawings. In addition, the supplier is expected to take necessary preventive and / or corrective actions in response to the audit findings. Furthermore, the focal firm expects the supplier to attend the training activities concerning quality issues organised by the department of IMPSD. Each supplier is informed monthly about their performance measures in terms of delivery and quality. While AGRICO requires suppliers to make improvements on these measures, the focal firm also expects tangible reduction to be reflected on the current unit price of a product. At AGRICO, Quality Inspection is the second department which has direct communication with suppliers; incoming parts

are inspected by the personnel of this department against the required specifications to ensure that only parts with the required quality are supplied to the production line of AGRICO. One of the criticisms raised by the QA manager was that there are comparatively a great number of inspection personnel. It was suggested that this is an incompatible situation with AGRICO's aim of having a strong supply base which will ship only required quality parts to the focal firm enabling it to carry limited number of inspectors. Unfortunately, this is not the case at the moment, he concluded. The implication of the above information and that of the data collected from other interviewees at AGRICO are that the main control tool other than receiving inspection employed by AGRICO is the training activities. There is less likelihood that AGRICO applies other methods such as establishing systems at the suppliers' premises and providing its expectations to the suppliers clearly to ensure the quality of supplied parts. In terms of documentation, AGRICO has a system called QDMS (Quality Documentation Management System). QDMS carries all the required documents and procedures, and it is only accessible to AGRICO's own personnel. All procedures are prepared by AGRICO's own personnel.

There is no fixed rule or a restriction as to how much of the work can be given to a single supplier at AGRICO. The criterion choosing an appropriate supplier depends on a supplier's ability to meet the requirements of an outsourced part in terms of quality, delivery, and price. The Manager of Indirect Material Purchasing and Supplier Development (IMPSD) department stated that AGRICO is always ready to help the suppliers; they do not perceive them as third parties, but partners. AGRICO encourages the suppliers to develop into firms which are transformed from shop mentality and become more formalised.

When a problem arises, a solution to the problem is pursued by the people who are in charge of it in the first place. There are no written and determined rules when an upper management is informed about problems. These sorts of decisions at AGRICO are mostly subjective. If the problem is in larger extent, e.g. when there are strikes in the chain, AGRICO switches to the other company which does not work with union and attempts to supply products from this company. Other types of problems might occur in the chain; for example, very recently in the area of Ankara, where many suppliers are located, a huge explosion happened. Although the main reason for the explosion was still unclear (at the time of the interview), the company at which this horrific event happened was a supplier to AGRICO. Therefore, as a company, AGRICO should be prepared for these kinds of unexpected situations.

### ***Suppliers' Perspective***

In terms of formalisation, the Assistant General Manager at supplier D stated that in general, AGRICO allows supplier D to be independent and does not audit them. It was highlighted that this situation is due to the existing long term relationship between the two firms. He recognised the fact

that if this question was asked 10 or 15 years ago, the answer would be ‘*Yes, AGRICO controls the activities of us*’. However, in the current situation AGRICO applies no control over supplier D. On the other hand, Bosch, which is also a long term customer of supplier D conducts an audit per project in order to review supplier D’s financial, administrative and technological development in addition to the essential quality and cost reviews. Concerning supplier D’s own suppliers, control over them is maintained through regular visits and close communication. This was said to be necessary since most of supplier D’s suppliers are new. The company organises visits to the suppliers, twice a year, to sustain and improve the existing relationships with them. It was also mentioned that plans for the development of suppliers are created and implemented.

In terms of the written documents required by the quality management standards of the company, the management of the firm encourages establishing a company culture in which some norms and principles are unwritten but internalised by all the personnel from top to bottom. In order to create such an environment within the company, activities like family outings are held. Furthermore, at some of the meetings, talks take place to increase the motivation of the employees. A striking comment was made by the Assistant General Manager in respect of written documents including contracts. It was stated that the most important thing between any two firms in a business relationship is to realise the requirements of a project. Being a member of a supply chain, supplier D signs contracts with their customers and suppliers. However, once they start to keep looking at the contracts, that business relationship has come to end from the Assistant General Manager’s point of view. He acknowledged the fact that there might be areas which might be left unambiguous in written documents, or something which is not discussed previously might appear during the realisation stage of the project. A valid attitude towards these kinds of situations is an attempt to fulfil the requirements of the project under any circumstances. As a result, it is understood that as far as supplier D is concerned, for the business relationships with customers and suppliers, unwritten norms and verbal promises are as important as the written procedures.

Towards the end of the interview, the Assistant General Manager stated that AGRICO or any other firm belong to the same corporation is not concerned about the suppliers financial well-being including supplier D’s. On the other hand, Bosch with whom supplier D is in business more than fifteen years pays attention to whether the supplier is making profit at the end of a project. And, if it does not, Bosch might increase the price for an outsourced part. After this statement, the question of *whether Bosch shares the financial information of a project with the suppliers* was raised to the Assistant General Manager. He responded that Bosch shares most information with the suppliers in relation to quality, design and price targets of a project. However, they do not share financial targets since it will reduce the purchasing power of the company. It was added that they neither share their financial targets with the suppliers.

### 4.3.3 Communication

#### *Focal Firm's Perspective*

Communication with the suppliers is performed via email, phone and face-to-face meetings. While an email is the most frequent way of contact with suppliers, face-to-face meetings is the least common way to contact with them. Different reasons for not holding regular face-to-face meetings were provided by the following two personnel of AGRICO. The Supply Chain manager at AGRICO stated that when the financial state of the company is doing well, all the personnel who are directly in contact with the suppliers are encouraged to have face-to-face meetings with them either at their premises or at AGRICO's. Unfortunately, for the last couple of years, due to the financial difficulties, particularly visiting foreign suppliers has been restricted. Other reason was explained by the Direct Material Purchasing specialist. Although a desire to conduct regular meetings with suppliers was mentioned by him, impossibility of such meetings due to the daily production routine was firmly stated. It, however, was added that there are few cases when they hold regular meetings with particular suppliers. An example was provided. When a new supplier, producing string, began working for AGRICO, there were monthly meetings with them until on the whole the both parties were satisfied by the results of this new relationship. That is to say, the questions of how the total sales were, how the quality of the relationship between the two firms was, whether the expectations from the product were met, if there were any quality related problems with the product, whether any returned products occurred during this time were answered.

AGRICO pays special attention to employ the same personnel to contact potential suppliers during the selection phase, stated the Supply Chain manager. The primary reason for this is to be able to transfer same information regarding the requirements of the outsourced parts to different suppliers so that standardisation can be achieved for each part. A further argument in support of this policy is that more advantageous bargaining positions can be created for AGRICO if the propositions of one supplier are shared with a rival one in order to impose certain conditions on the second supplier. This situation is certainly unethical, and in the long run, it might damage the very existence of the supply base of AGRICO.

All the interviewees at AGRICO provided the same answers when the question of *what types of information conveyed to the suppliers* was raised. Their answers were that the financial targets of a project are not shared with the suppliers. On the other hand, quality or market related information is transferred to them. It is believed that if a supplier is informed about the potential benefits of a project such as increase in market share, they might devote their effort fully to realise the project.

More specific information with regard to supplier relations was provided during the interviews. The Supply Chain manager rejected the perception of a supply chain as a family union stressing that in family relationships, individuals are linked to each other with blood. On the other hand, in a supply chain, firms are linked to each other with financial means. That is why, it was stated that the relationship between AGRICO and the suppliers can be mostly called 'partners'. Due to the type of relationship AGRICO has with the suppliers, the Supply Chain manager acknowledged the fact that there is a high possibility of the suppliers seeking alternative customers which might offer them better business options. Nevertheless, it was stressed that AGRICO never damages the relationships with the suppliers on the basis of personnel conflicts; the only reason for AGRICO to relinquish working with any of them could be due to financial disputes. The manager of Indirect Material Purchasing and Supplier Development (IMPSD) department added further information on the above discussion. Disagreements between individuals within and throughout the supply chain do not affect the business relationships in a negative way. It was highlighted that finding a solution to a problem occurs in a decentralised manner in both within and across the chain. In other words, when a problem arises, firstly it is attempted to be resolved by people who initially are the separate sides of the argument. The upper management is informed about it, unless a solution can be generated by the individual parties. The same method is followed to resolve the disputes between the members of the chain. None of the interviewees mentioned a regular meeting between AGRICO and the suppliers as a control measure. All the available data on this issue indicates that although AGRICO and the suppliers are in constant contact, communication between the two parties does not include regular checks, but occurs when a problem arises. On the other hand, between AGRICO and the primary customer PP, quality related problems are discussed in bi-weekly meetings. To recapitulate, the suggestion of the evidence is that the same kind of control between AGRICO and PP through communication does not exist between AGRICO and the suppliers.

Finally, the communication between AGRICO's suppliers and customers is explored. In the supply chain of which AGRICO is the focal firm, customers' only contact point is AGRICO; none of the upstream suppliers including the first tier-suppliers has any responsibility towards customers. The main reason for this is that a warranty certification can only be issued between AGRICO and the customers. Therefore, if an after-sale problem arises, a customer directly informs AGRICO even though the cause of the problem might be linked to any of AGRICO's suppliers.

### ***Suppliers' Perspective***

The Assistant General Manager at supplier D started the conversation by stating that they have been a long time supplier of AGRICO, and their relationship is based on the values of trust and respect. Due to a short distance between the two firms, the psychical communication in terms of visiting each other at their premises has never been a problem. Therefore, the two firms hold mostly meetings. In

addition, supplier D employs other types of communication means such as phone, mail, portal to contact AGRICO. On this issue, the Assistant General Manager added a further detail. Even though AGRICO has a main portal whose abbreviation is ASE, supplier D limits the usage of this system for its own personnel. The primary reason for this restriction is due to the low security of the system. It was explained that with only one password, all information on the system can be accessed by any personnel regardless of the importance of data security. Furthermore, the Assistant General Manager casted a doubt that ASE is kept up-to-date in terms of the documents it carries because they never need to use the system.

In terms of the information flow, it occurs in a bi-directional way, that is to say, information is transferred from supplier D to the suppliers and customers and also, supplier D receives information from the suppliers and customers. Overall, similar to the first supplier of AGRICO interviewed in the scope of this research, supplier C, supplier D considers communication with AGRICO as 'very good'. Table - 4.2 presents the summary of the findings of AGRICO's supply chain in terms of the structural dimensions.

Table – 4.2 Viewpoints on the Structural Dimensions of AGRICO’s Supply Chain

Supply Chain Structural Dimension	Focal Firm’s Perspective	Suppliers’ Perspective	
		Supplier C	Supplier D
<b>CENTRALISATION</b>	<ol style="list-style-type: none"> <li>allows the first tier suppliers to be independent for the selection of their own suppliers,</li> <li>has an exhaustive supplier selection procedure,</li> <li>quality, delivery and price performance of the suppliers are followed,</li> <li>AGRICO’s environment is mainly conducive to the involvement of the suppliers in the operational processes,</li> <li>a wide range of training is provided to the first-tier suppliers,</li> <li>only when needed, involved in the management of the further upstream suppliers.</li> </ol>	<ol style="list-style-type: none"> <li>a long term supplier,</li> <li>largely dependent on AGRICO,</li> <li>no periodical audit performed by AGRICO,</li> <li>independent for both selecting and managing the upstream suppliers,</li> <li>being flexible is supplier C’s distinctive characteristic,</li> <li>AGRICO might intermittently ask supplier C not to bring certain (purchasing) personnel to meetings.</li> </ol>	<ol style="list-style-type: none"> <li>a long term supplier,</li> <li>largely independent from AGRICO,</li> <li>independent for selecting and managing its own suppliers,</li> <li>no periodical audit performed by AGRICO,</li> <li>mostly supplies its own designed products to AGRICO,</li> <li>no financial support from AGRICO,</li> <li>not willing to attend training activities organised by AGRICO.</li> </ol>
<b>FORMALISATION</b>	<ol style="list-style-type: none"> <li>aims to create a company culture,</li> <li>expects the suppliers to comply with contracts, specifications and drawings,</li> <li>requires the suppliers to take actions for the audit findings,</li> <li>expects the suppliers to attend training activities,</li> <li>has an online quality documentation management system (QMDS),</li> <li>quality and delivery performance of the suppliers are followed,</li> <li>yearly production volume is shared with the suppliers,</li> <li>strategic targets are shared with the suppliers in general terms.</li> </ol>	<ol style="list-style-type: none"> <li>no review on C’s financial status by AGRICO,</li> <li>no timely feedback on C’s project proposals,</li> <li>attempts to produce solutions by themselves due to AGRICO’s being a very bureaucratic organisation.</li> </ol>	<ol style="list-style-type: none"> <li>D perceives the creation of company culture as important as written documents,</li> <li>D gives very high importance to the verbal pledges made to the suppliers and customers</li> <li>no review on its financial status by AGRICO.</li> </ol>
<b>COMMUNICATION</b>	<ol style="list-style-type: none"> <li>e-mail, phone, and face-to-face meetings used,</li> <li>same purchasing personnel are employed to communicate with all participatory suppliers to get advantageous status over a supplier in terms of price,</li> <li>communicates with the suppliers when an issue arises,</li> <li>bi-weekly meetings held with the primary partner.</li> </ol>	<ol style="list-style-type: none"> <li>the relationship with AGRICO is a long term and close one,</li> <li>the relationship with AGRICO’s primary partner, PP, is difficult,</li> <li>no regular meetings held; when a problem occurs, a face-to-face meeting is arranged.</li> </ol>	<ol style="list-style-type: none"> <li>mostly, meetings are held,</li> <li>phone and e-mail are also employed,</li> <li>the relationship with AGRICO is based on trust and respect,</li> <li>the relationship with AGRICO’s primary partner, PP, is difficult,</li> <li>inter-portal provided by AGRICO is not secure, so restricted by D,</li> <li>overall, the communication with AGRICO is considered ‘very good’.</li> </ol>

#### 4.4 Summary

In this chapter, the findings of the two manufacturing supply chains in terms of their structural dimensions have been presented. For an initial verification of the above information, the findings from the interviews were shared with the individual interviewees from whom that specific piece of data had been received. Their comments were evaluated and integrated into the database.

As can be seen in table – 4.1 and table – 4.2, one clear finding is that while there is some overlapping information between the focal firms and their first-tier suppliers, in most respects the focal firm and the suppliers within each dyad hold different views about the application of the same structural dimensions in their relevant networks. In general, the reasons for these different opinions might be the results of two distinct scenarios. The first implication that in both of the supply chains, the focal firms are the power-holders, and manage the relevant supply chains as they wish without considering the suppliers' viewpoints on the issues arisen is of considerable likelihood. Hence, it can be argued that the focal firms are probably aware of the suppliers' disapprovals on some issues, but ignore them. The second implication might be that the level of understanding between the focal firms and suppliers is low, causing different perspectives on the same concepts.

From the standpoint of the first dyad whose focal firm is MILCO, it seems that MILCO manages the supply chain with a centralised approach because it fulfils all of the criteria described in the definition of centralisation in a supply chain context which is accepted for this research. Firstly, MILCO is involved in the selection of all tiers of the supply base. In addition, MILCO applies a certain extent of control over the suppliers by following their quality and delivery performance. Furthermore, it extends influence on the supply base by giving the suppliers participatory roles in some of the processes such as design and development of new parts. Finally, MILCO contributes to the development of the suppliers in the areas where specialisation is encouraged and needed by MILCO. When compared to the second case dyad whose focal firm is not involved in the selection of the second, third, and so on tier suppliers, on the other hand, MILCO's influence over the supply base seems weaker. The comparison of the raw data collected from the dyads seems to reveal the primary reason for this difference, which is the customer. While MILCO has a more powerful customer, The Undersecretariat for Defence Industries of Turkey (SSM), who is the principal decision maker including sourcing activities in this supply chain, AGRICO is largely independent on managing the supply base. It seems that power in MILCO's chain is shifted towards to the further downstream which is the customer thus reduces the influence of MILCO over the supply base. In addition, as was stated by MILCO's Purchasing manager, their firm's influence on the customer selected suppliers is less than the ones who are directly selected by MILCO.

The data from the case suppliers also suggests other potential reasons for a low level of influence of MILCO on them who are both selected directly by it. Firstly, the suppliers challenge the

appropriateness of supplier selection process employed by MILCO in terms of the personnel and methods used. The common view of both of the suppliers is that a long term supplier with all the required accoutrements might find itself in an unfair competition with another supplier who lacks the same level of infrastructure and industrial experience. In addition, the suppliers complained about MILCO's negative attitude to the viewpoints of the suppliers on the sourcing decisions. Secondly, after the selection stage, in contrast to AGRICO, MILCO does not play an initiator role for the development of the suppliers. Un-kept verbal promises given to the suppliers deteriorate the relationship between MILCO and the suppliers. One of the main concerns raised by the suppliers is the lack of business security when they are working with MILCO. The suppliers seem to give more importance to the business continuity in comparison to any other type of help. The lack of MILCO-to-firm coordination is visible from the data summarised in Table – 4.1. Not having an inter-firm information system causing inefficiency and ineffectiveness in the operational processes and has a negative effect on the relationship between the focal firm and the suppliers.

Turning now to the evidence on the second supply chain which operates in the agricultural industry, with a rigorous supplier selection process and continuity in supplier assessment and development processes, AGRICO seems to establish closer integration with the supply base. Similar to MILCO's case, AGRICO does not share the strategic level decisions with the supply base. On the other hand, by sharing yearly production volume with the suppliers, AGRICO makes the future for the suppliers more certain. This clarity in business relationship seems to contribute to the development of trust between AGRICO and the suppliers. Informing suppliers about this type of operational level data enables them to plan their production a year in advance. Moreover, having an inter-firm information system with the suppliers, on time and accurate transition of operational level data is facilitated. Due to the above mentioned reasons, it seems that the relationship between AGRICO and the supply base is stronger than that of MILCO and the supply base.

The data in both table – 4.1 and table – 4.2 reveals an interesting result. Even though the structure of the both chains seems to be different, both focal firms only follow their first-tier suppliers' quality, delivery and cost performance. This is an interesting result. One might expect to observe that the focal firm with an intense and organised management approach to the supply base can set out to achieve different objectives. However, this seems not to be the case for the dyads selected for this research.

In the following chapter, the analysis of the findings is going to be presented.

## CHAPTER V – RESEARCH ANALYSIS

### Introduction

This chapter includes sections which deal with the analysis of data. The aim of this analysis is to explore the ideas of supply chain quality (SCQ), and how it can be achieved. The findings from the case dyads are examined to validate the proposed model of this research. The first section, hence, starts with a brief introduction of the model. Based on the results of within and cross-case analysis, the further refinements to the model are suggested. The responses to the research questions, the discussion of the results of the analysis and how they relate to the extant body of relevant literature are presented in the following chapter. The final form of the model is also provided in the following chapter.

### 5.1 Applying the Model to the Cross-Case Analysis

The research is theoretically located in the intersection of two academic domains, namely Supply Chain Management (SCM) and Quality Management (QM) which appears to be emerging into Supply Chain Quality Management. Based on the literature review in the above mentioned two areas, the relationship between supply chain structure and supply chain integration merits further research both qualitative and quantitative in order for supply chains to become and remain competitive in the global market. It is the primary suggestion of this research that there is a strong relationship between supply chain structure and supply chain integration. Based on a review of both the organisation and supply chain literature, the three major dimensions of supply chain structure are suggested as centralisation, formalisation, and communication and likely to have a significant role influence on supply chain integration. Figure 5-1 shows the conceptual model of this research, which is then applied to the cross-cases.

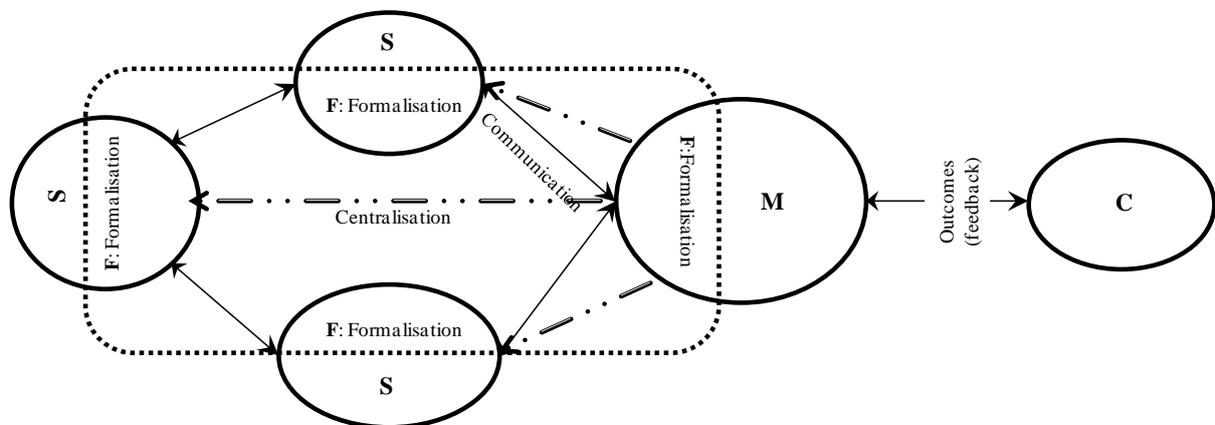
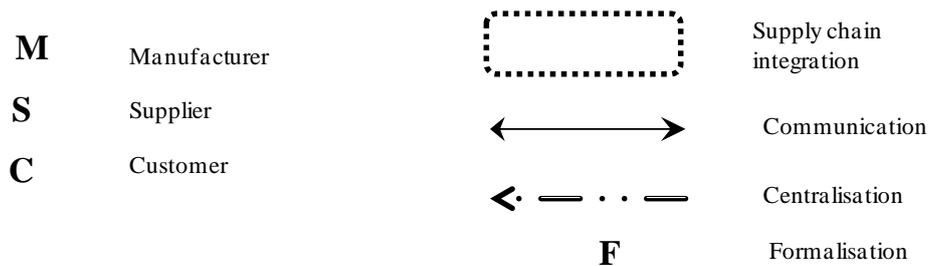


Figure – 5.1 Proposed Conceptual Model



The purpose of the first dimension is the concept of ‘control’. Via central management, a buyer, meaning to a company which buys semi-products from suppliers and performs assembly work on them, and is used interchangeably with ‘focal firm’ in the context of this research, can control the supply base in order to produce customer-required products and/or services. The emphasis of the second structural dimension, formalisation, is on the level of understanding between a buyer and the supply base. The last dimension, communication, largely deals with how well the technological infrastructure for information sharing is established and what types of data is shared between a buyer and the supply base.

## 5.2 What happens in Practice?

As briefly provided in the Findings Chapter, the application of all three structural dimensions in question exists in both supply chains. Therefore, it can be readily claimed that based on the proposed model, both chains operate under certain structure to manage their outputs. The relationship between the dimensions of the structure and integration in the chosen supply chains is illustrated in the following sections. Firstly, the implementation of centralisation in the two case dyads will be explained. In the scope of this study, supplier selection, control over suppliers’ processes and supplier participation, and supplier support are scrutinised to understand the impacts of centralisation on supply chain integration. Next, formalisation was analysed based on the both within and cross-case data to observe its effects on supply chain integration. Finally, communication with its recognised components namely means of communication, information sharing, and relationship aspect is considered as a possible structural dimension which is likely to have an effect on supply chain integration.

### 5.2.1 Centralisation

With centralisation, emphasis is on control which is exerted on the supply base by the focal firms through the processes of supplier selection, supplier participation in design activities, and supplier support. Each of these processes was explored to understand whether the implementation of them leads to improved integration between the focal firm and the first-tier suppliers.

This analysis was conducted independently for each process mentioned above. For example, in the case of the chosen supply chains, if either focal firm was involved in the supplier selection process of the first-tier suppliers, then second-tier suppliers, and so on in the relevant supply chain, that particular supply chain was called a centrally managed supply chain with regard to the first process which is supplier selection. Otherwise, it was called a decentralised supply chain again in respect of supplier selection process. Another example is that if either focal firm provided suppliers with support in order to ensure their sustainability in the long term, this particular chain was said to be centrally managed in respect of the third process which is helping suppliers to solve their problems. Therefore, it is important to note that a particular supply chain might be managed centrally with regard to, in this instance, the first process, while the same supply chain points to a rather decentralised environment with respect to the third process.

In the following paragraph, general information on the characteristics of the focal firms which are likely to impact the way these firms manage their supply base is given. In later subsections, more detail information with regard to the processes mentioned above, representing the centralisation structural dimension is provided.

The following table summarises both main and subtle differences between the two focal firms which are likely to have an effect on their supply base management policies.

Table - 5.1 Differences in Characteristic of the Focal Firms

MILCO	AGRICO
A private company with social responsibilities	A private company
Making profit is not a priority	Making profit is a priority
Works on a small lot size basis	Works on a large lot size basis
High level of sensitivity towards raw material suppliers	Moderate level of sensitivity towards raw material suppliers

Both an agricultural vehicle firm, denoted as AGRICO, and military electronics firm, denoted as MILCO, work with Turkish national and foreign suppliers. As they share similarities in the way they manage their supply bases, they have significant differences in their supply base management policies. It is likely that a subtle distinction in their organisation type accounts for these differences. Although both of the firms are private companies, MILCO is owned by the Turkish Armed Forces Foundation, and the demands of the Turkish Armed Forces accounts for 65% of its sales. Hence, the primary customer of MILCO is the Undersecretariat for Defence Industries of Turkey (SSM), which acts as the Turkish Arm Forces' procurement agency. Based on the collected evidence from the interviews at MILCO and its mission statement, it is clear that the priority of MILCO is to play a

crucial role in enhancing the Turkish Armed Forces' self-reliance on national resources. Furthermore, due to a national defence policy, MILCO is expected to contribute to the development of small and medium size defence firms by allocating certain percentage of every new project to the national suppliers. Therefore, it is clear that MILCO has social responsibilities in the military electronics sector while AGRICO is solely pursuing to be a profit-focused company in the global market. At the same time, employing cost efficient techniques in design, production, and services is considerably important for MILCO, though not a priority.

### **5.2.1.1 Supplier Selection**

There is evidence from the interviews to suggest that control exerted over a supply base via supplier selection process is different for the two focal firms. At the very beginning of the relationship with the suppliers which is the selection stage, AGRICO applies a tighter control over the suppliers than MILCO. This is primarily owing to the fact that AGRICO is largely independent on choosing its own suppliers, whereas MILCO has to comply with the requirements of its main customer, the Undersecretariat for Defence Industries of Turkey (SSM), which acts as the Turkish Arm Forces' procurement agency, in relation to working with suppliers. Only 170 out of more than 400 suppliers of MILCO are directly approved by MILCO itself. The rest are either customer-specified or single-source suppliers over which MILCO's influence is considerably limited. This loose control of MILCO over the suppliers, which are not directly chosen and audited, affects the level of integration MILCO builds in the supply chain, which is likely to have a negative effect on several outcomes of the chain such as product quality and consistency, responsiveness, sustainability, and resilience (Melnik et al., 2010). AGRICO, on the other hand, ensures that all of the suppliers including foreign ones go through the same auditing process during the selection process so that the individual firms' strengths and weaknesses are identified and known to the relevant departments of AGRICO. Indeed, the Supplier Development specialist at AGRICO stated that when they audit the suppliers, they do not pay much attention to whether or not that particular supplier has any quality management standards; they strictly follow through their own check list which is claimed to have higher objectives than any existing quality management standards.

In general, both focal firms employ same selection criteria in respect of a potential supplier, that is to say its financial status, administrative structure, technical capability, quality level, and proposed price for an outsourced part, for its assessment. However, as for the financial status in particular, there is a significant distinction in the two firms' approaches. The following body of evidence gathered during the visits to the both firms is likely to support the claim that overall, AGRICO is more cost-oriented as opposed to relation-oriented than MILCO in selecting the suppliers. The importance of the explanation given below is twofold. The first one is to manifest the two focal firms' strategic aim; the

second one is to observe whether their practices in supplier selection processes are in line with their strategic aim.

Before starting to work with any supplier, AGRICO firstly requests a quote for an outsourced part from a potential supplier. If the price is found to be competitive, the Direct Purchasing department then requires the Supplier Development specialist to conduct quality audits at that particular supplier's premises. In case a price is not considered competitive, auditing procedure does not take place. At MILCO, on the other hand, quality audits are conducted at the supplier premises prior to receiving a quotation from the potential supplier. This difference in their approaches at the very beginning of the supplier selection process is attributed to the distinction in their determination of the functional units' targets. While the Purchasing department at AGRICO identifies an amount of yearly savings from the procurement activities as their performance measure, the same functional department of MILCO does not specify any financial savings from the activities of materials management including the acquisition of raw materials, parts, and products as a performance assessment. There are two possible explanations for this. Firstly, as mentioned earlier, MILCO is a private company with social responsibilities; making profit is not a priority for MILCO as it is for AGRICO. Secondly, as shall be seen below in greater detail, the determination of strategic targets is an underdeveloped process at MILCO. It is difficult to suggest which one of the above explanations reflects the real situation, but another item of information regarding the price of an outsourced part might be supporting the above claim that MILCO aims to be more of a responsive supply chain than a cost-efficient one. Provided by the both Purchasing manager and Chief Engineer of MILCO, an important reason why MILCO cannot be sensitive to the unit price of an outsourced part is that the firm can only award its suppliers projects with small lot size rather than large lot size. Emphasis on small-lot production is one of the characteristics of a responsive supply chain (Melnik et al., 2010). At this point of the analysis with regard to price of a product, it is important to note the different view of MILCO's suppliers. According to both of its suppliers, even though the opposite is claimed by MILCO, price factor is a priority for MILCO when it selects the suppliers. The both suppliers' contention that MILCO creates an unfair environment in which they find themselves to compete with firms which enter the sector recently and lack adequate infrastructure in terms of technical equipment and know-how, management standards, and financial capability. However, a comparison between the both focal firms' approaches to their suppliers in terms of financial means is likely to support the initial assertion that AGRICO's supplier selection process begins with an approach which is more orientated towards to achieve a cost outcome than that of MILCO. When AGRICO examines the financial status of a supplier, it investigates whether that supplier is likely to request a prepayment or has requested it before, had it been worked with previously. If that is the case, such a demand is considered as a negative point for that supplier. On the other hand, MILCO uses prepayment as a way to support its suppliers. If a supplier requests a payment in advance, that is perfectly acceptable for MILCO.

In terms of overall supplier selection process including supplier assessment, AGRICO seems to have a formulated and implemented process in comparison to MILCO. This mainly stems from the fact that AGRICO has a separate unit to deal with supplier-related activities including assessment, selection and improvement. On the other hand, there is no discrete department or unit established for this purpose at MILCO. This issue was indeed raised during the interviews with the Purchasing manager at MILCO. He stated that MILCO is considering establishing an independent unit which will be responsible for the activities regarding the supplier relations solely. The current organisation structure of MILCO surely inhibits the effectiveness of its planning and implementation of supplier activities. At AGRICO, virtually all supplier-related activities are organised and led by the Supplier Development specialist who has fourteen years of manufacturing experience with an Engineering degree. Starting from the auditing process, potential strengths and weaknesses of a supplier are identified, and the relevant departments are informed accordingly. It is particularly significant that initial audit results are used as the main input in planning improvement activities upon a supplier, once it is chosen to be worked with. During the course of work relationship, the same questions in the audit list are used periodically so that improvements can be assessed. As the collected evidence indicates, at AGRICO, information obtained at the selection stage of a supplier and continuous update on the particular supplier are used as a base to make a decision on increasing or decreasing in the amount of workload for that supplier, and to identify the training needs for that supplier. However, in the case of MILCO, it seems that after the selection of the suppliers, MILCO discontinues its initiator role to control the suppliers through extensive supplier assessment and development systems. For example, in contrast to AGRICO's case, none of the interviewees at MILCO mentioned that supplier improvement activities are planned on the initial data received from the suppliers. It seems that there is no continuity in evaluation of the data coming from the suppliers. One of the suppliers of MILCO stated that MILCO emails a general training list to all its suppliers, and requests them to determine their own training needs. There was no mention of a specific development plan for an individual supplier prepared by MILCO. This is largely due to the lack of discrete department or a unit which can only focus on supplier related activities. Hence, it appears that MILCO lacks a rigorous methodology to assess the development of its suppliers. Therefore, it can be argued that due to the difference in the way they conduct their audits and follow-ups, AGRICO has a greater influence over its supply base than MILCO, a situation which will likely to increase the performance of AGRICO's chain in terms of responsiveness, product quality and consistency, delivery, sustainability.

Corroborating evidence from the both suppliers of MILCO in relation to supplier selection process strengthens the overall claim that MILCO's supplier selection process including supplier assessment and development systems is insufficient to achieve integration with the supply base. Both of its suppliers criticise MILCO for the appropriateness and quality of the evaluation system of MILCO for proposed offers as far as both personnel and a method are concerned; on top of which there is a lack

of close relationship with the first-tier suppliers once the working relationship is started, which is one of the most damaging factors inhibiting MILCO from exerting control over them. Contrary to expectations, the analysis of the findings did not find that MILCO's supply chain is managed centrally even though the first-tier suppliers are chosen by MILCO (when not selected by its customers and not a single source supplier), the second and/or third level suppliers are either directly chosen by MILCO or strongly recommended to the first-tier supplier to choose from the provided approved supplier list. This result rather contradicts with Choi & Hong's (2002) definition of centralised supply chain, in which a focal firm's (final assembler) active involvement in the selection of the numbers of the tiers is one of the three requirements of exercising control over a supply base. The findings from AGRICO's supply chain seem to be consistent with the above claim that the numbers of the tiers in a supply chain that a focal firm actively selects is not a critical factor for a forming a centralised supply chain. What critical is to establish a collaborative relationship with a particular supplier once it is chosen to be worked with. Even though AGRICO only involves in choosing the immediate suppliers (except some special second part suppliers) and expects them to manage their own suppliers, its initiator role in the relationship is continuous and strengthened by a rigorous supplier assessment and development plan it employs. Another finding is also considerably surprising that even though MILCO's approach to potential suppliers in terms of financial issues is more understanding than that of AGRICO, this alone is insufficient to develop a collaborative working relationship in which a certain level of control over the upstream of the chain can be applied to ensure that the requirements of the downstream of the chain are always met. Hence, the proposed model needs to be modified based on this emerging knowledge; that is to say, the focal firm's participation in the selection of the further upstream suppliers is not associated with a greater level of control over the supply base. In fact, as the allocated sources for supplier management disperse, the focal firm's support for an individual supplier decreases. This will likely to have a negative effect on an inter-firm relationship, hence overall integration. Table – 5.2 provides the results of analysis in respect of supplier selection process.

Table – 5.2 Comparison of Supplier Selection

		AGRICO and MILCO	
		Similarities	Differences
<b>CENTRALISATION</b>	<b>Supplier Selection</b>	<ol style="list-style-type: none"> <li>1. same criteria for supplier selection are employed by the both focal firms.</li> </ol>	<ol style="list-style-type: none"> <li>1. AGRICO is largely independent on choosing the suppliers, but MILCO is not,</li> <li>2. significance of each criterion differs for each focal firm,</li> <li>3. supplier selection is implemented in accordance with AGRICO's strategy; the same is not true for MILCO's,</li> <li>4. supplier selection is supported by extensive assessment and development programs at AGRICO; it is not same at MILCO,</li> <li>5. a discrete department to deal with supplier related issues exists at AGRICO; it was not available at MILCO (at the time of the interview).</li> </ol>

### 5.2.1.2 Control over Suppliers' Processes and Supplier Participation

Once the working relationship starts with a supplier, all the evidence points to that AGRICO exerts a certain extent of control on the first-tier suppliers' processes rather than leaving them on their own. This control varies depending on the process being strategic, tactical or operational. In terms of strategic processes, AGRICO's influence is indirect. For processes such as an investment planning, determining a vision/mission, or searching new markets (customers), AGRICO guides or encourages the first-tier suppliers in a certain way but never enforces certain rules over them. Likewise, AGRICO gives advice to the suppliers for the management of their tactical processes such as human resource, organisation structure or a creation of department without a forceful power. However, when it comes to the operational processes, the approach of AGRICO to the first-tier suppliers is more assertive in comparison with the above mentioned process types. One of the ways that AGRICO wields a substantial influence on the first-tier suppliers' operational processes is the periodical follow-ups. Each supplier is informed monthly about their performance regarding quality and delivery. In addition, based on the same measures, AGRICO determines each month the worst ten poorly performing suppliers. These suppliers are informed with an official letter and required to explain the reasons for their low performance and to devise an action plan to improve the current situation. When required by a supplier, quality related problems are attempted to be solved by the involvement of AGRICO's own personnel from relevant departments. Regarding delivery performance of the suppliers, there is a scheme of fines at AGRICO which has been strictly applied for the last two years.

Any cost incurred by a late delivery is charged to that particular supplier. In order to avoid a late delivery, AGRICO strongly advises the suppliers to ship their parts on time. For that, if necessary, an increase in overtime hours is recommended. On the other hand, AGRICO works closely with the suppliers to receive only a required amount of supply to reduce its inventory costs.

MILCO's influence on the suppliers shows some similarity with AGRICO. In fact, the General Manager of MILCO's supplier challenges MILCO in terms of sufficiency of its guidance in strategic issues. The quotation from him is provided below:

*'We require MILCO to support us in our strategic level decisions. For example, we want to buy the materials to be used for MILCO by ourselves, but we do not have the purchasing capability to do that. The training is only considered for the improvement in the technical operations; however, we want training activities to include the management as well.'*

***General Manager of MILCO's supplier, supplier B***

In terms of overtime hours, mission/vision statement, human resource policy, MILCO is indirectly influential on the suppliers. That is to say, it encourages the suppliers or gives them advice on the path they should take, but is not forceful over them. More specific information in relation to human resource management policy was given by the Purchasing manager at MILCO. He stated that based on an agreement in the national defence sector, MILCO does not employ any personnel of a supplier without their consent. As noted earlier, another important difference between the two focal firms with respect to controlling their supply base is that while MILCO forces the first-tier suppliers to work with specific second, third level or raw material suppliers, AGRICO is in close interaction and integration with only the immediate suppliers and leaves the management of the further upstream suppliers to the first-tier suppliers. This can be another contributing factor for AGRICO's objective of managing a cost efficient supply chain in which the cost of auditing, follow-ups, and in general that of managing more suppliers are practically diminished. On the other hand, MILCO ensures that all of the first-tier suppliers are working with other upstream level suppliers which are approved by MILCO. In addition, as a general policy, the suppliers of MILCO are subject to the constraints of who they can work for. In other words, when they are awarded contracts by MILCO, they are confined to working with customers who are not either MILCO's national or international competitors. Moreover, the Purchasing manager at MILCO emphasised that if a candidate supplier has potential to be possible future contender for MILCO, they do not work with that supplier. This is interesting information and aligned with the claim of one of MILCO's suppliers that MILCO uses the strategic partnering scheme to keep suppliers under control so that they cannot develop and become another MILCO in the sector. The reason for this was not discussed further and just stated as a general policy of the company. On the other hand, AGRICO does not limit the suppliers in who they work with. On the contrary, they

encourage their suppliers to work with their competitors so that new knowledge can be transferred to them.

All the interviewees from the departments of Design and Quality at AGRICO suggest that they are in frequent contact with the suppliers and work collaboratively. As a result of the exploration of the above statement via both general and more specific questions, it may not be the case that AGRICO has the suppliers involved in most of its processes, especially the strategic ones. With the exception of the product design and development process, none of the other strategic and tactical processes such as AGRICO's investment planning, budget planning, a new market search, human resource management includes the participation of the suppliers. It would appear that AGRICO acts more like a power holder in the chain rather than an equal partner to the suppliers. Due to the conflicting data about the pricing process of a new product, it is difficult to draw a conclusion whether or not AGRICO involves the suppliers in this process by requiring a detailed pricing schedule from them to understand and discuss their pricing process so that an acceptable price for both parties can be reached. On the other hand, it is only reasonable for the Direct Purchasing department at AGRICO to seek a supplier with a best offer since one of the critical yearly targets of the department is to reduce the outsourcing budget. Overall, though, it is confirmed that AGRICO is willing to listen to the suppliers' sides of the arguments when it comes to a price of a product providing that a required change in price arises due to external factors such as fluctuations in the exchange rate, fuel or energy prices.

In the case of MILCO, the data collected from the interviews indicates that the involvement of the suppliers in MILCO's processes from operational to strategic is very limited. There are cases, however, in which engineers from MILCO work with suppliers' personnel at supplier premises. Nevertheless, this is limited only in operational level processes.

The striking observation to emerge from the data comparison between AGRICO and MILCO was that both of the focal firms only follow their suppliers' quality, delivery, and cost performance measures. Neither AGRICO nor MILCO controls their suppliers' other performance measures such as responsiveness, innovation, resilience, sustainability, or security. In addition, based on each completed project, the evaluation of that particular project whether it was profitable for the supplier is not performed by any of the focal firms. Furthermore, none of those who were interviewed mentioned that neither of the focal firms controls outcomes from their second, third, or so on tier suppliers. The only information in respect of this, while MILCO is very sensitive to its raw material suppliers, AGRICO's level of sensitivity to them is at moderate level. Hence, as the overall data suggests, none of the focal firms is well-integrated with their suppliers in strategic terms. It seems that working cooperatively with the operational processes exists between AGRICO and the first-tier suppliers due to the rigorous control applied by AGRICO. The above conclusion cannot be made for MILCO's relationship with the first-tier suppliers even for operational processes. In order not to distort the facts,

the following information gathered at the second round of information from one of MILCO’s first-tier suppliers, supplier A is noted. This supplier comments that their engineers work with MILCO’s design engineers at supplier A’s premises, sometimes even on weekends. However, this data, rather contradictory to the evidence gathered at the first round of the interview, might stem from the fact that supplier A has recently been awarded contracts by MILCO.

Table – 5.3 Comparison of Supplier Participation

		AGRICO and MILCO	
		Similarities	Differences
<b>CENTRALISATION</b>	<b>Control over Suppliers’ Processes and Supplier Participation</b>	<ol style="list-style-type: none"> <li>1. influence on the suppliers’ strategic and tactical processes are suggestive by the both focal firms, not forceful,</li> <li>2. only quality, delivery, and cost measures are followed periodically,</li> <li>3. no strategic measures are employed to assess suppliers’ performance,</li> <li>4. no early supplier involvement in design activities.</li> </ol>	<ol style="list-style-type: none"> <li>1. the first-tier suppliers are constrained by MILCO in terms of who they work with / for; no such limitation applied by AGRICO.</li> </ol>

### 5.2.1.3 Supplier Support

In terms of supplier support, the most significance difference between the two focal firms is that while AGRICO is the initiator and follower of the training needs of its suppliers, MILCO distributes a list of available training to all the suppliers so that they can choose an appropriate one to attend. Furthermore, AGRICO’s education and training activities cover a substantial variety of areas from technical to management. On the other hand, training activities at MILCO is mostly focused on technical areas. Regarding financial support, however, MILCO is more understanding towards its suppliers than AGRICO. When a supplier encounters a financial problem, MILCO is willing to offer several options such as advance-payment and availability of bank credits. AGRICO is very strict when it comes to the financial issues. One of its suppliers commented that AGRICO is not concerned about whether its suppliers’ are making profit or not. Both of the focal firms do not review their suppliers’ financial status during or at the end of the project to understand whether that particular supplier is making profit.

In terms of assigning long term contracts to suppliers, the suppliers of AGRICO have a high level of satisfaction than those of MILCO. This information was confirmed by the two of MILCO’s first-tier suppliers who want to have continued business from MILCO, but never been given long term contracts even though both suppliers have been in a long term business relationship with MILCO. Nevertheless, AGRICO works with the suppliers on a long term contract base, and there are cases when a supplier is awarded for three-year long projects. This information is significant, especially for

the suppliers to ensure the continuity of the relationship with their focal firms. Table – 5.4 summaries the above analysis.

Table – 5.4 Comparison of Supplier Support

		AGRICO and MILCO	
		Similarities	Differences
<b>CENTRALISATION</b>	<b>Supplier Support</b>	1. none of the focal firms financially supports their suppliers.	1. AGRICO takes the initiative role in organising training activities for the suppliers, the same is not true for MILCO, 2. training at AGRICO covers a wide range of subjects; MILCO mostly provides technical training, 3. MILCO is more understanding towards the suppliers with financial difficulties, the same is not true for AGRICO, 4. AGRICO awards the suppliers long term contracts, whereas MILCO gives short term business to the suppliers.

The analysis of the overall data points to the significance of the supplier assessment and development processes to ensure the attainment of specific supply chain outcomes. Comparing the supply chain of AGRICO with that of MILCO showed that the supplier development activities of the former are based on a rigorous and continuous supplier assessment process, in the sense that initial assessment results of a supplier form the basis of the subsequent follow-ups and determination of specific training needs for that particular supplier. Moreover, training activities provided to the suppliers by AGRICO cover a wide range of subjects from technical to managerial. On the other hand, the latter does not play a proactive role to manage the suppliers’ development activities; the suppliers are expected to identify their own needs in terms of training which mostly covers technical subjects, and the visits to suppliers are considerably limited. The possible interpretation of this might be due to the limited control MILCO has over most of its suppliers, i.e. only 43 % of all MILCO’s suppliers are directly approved by them, the rest are either customer-selected or single-source suppliers. However, both of the case suppliers were selected by MILCO itself, and a lack of systematic supplier assessment and development activities at these suppliers rule out the validity of above explanation. Therefore, based on the data collected from the interviews, although AGRICO seems to be in search for a new supplier which can offer a lower price particularly for the products whose cost is comparatively high, and to be unwilling to invest in suppliers in financial terms, AGRICO’s rigorous and proactive supplier assessment and development processes have potential to enable its supply chain to be responsive to

the changes coming from customers. However, lack of systematic supplier assessment and development processes inhibit MILCO's ability to be responsive to the customers' requirements. Although the information from MILCO and the suppliers conflicts with whether MILCO prioritises price over other criteria when outsourcing, there are strong evidence to suggest that MILCO is not as sensitive to price as AGRICO. For example, MILCO is more understanding towards its suppliers when they face financial difficulties, or potential suppliers are firstly audited at their premises before submitting a price quotation for an outsourced part. Hence, this data supports that MILCO aims to be a responsive supply chain as opposed to a cost-oriented supply chain in which the emphasis is on production and inventory cost reduction. On the other hand, being a responsive supply chain requires an extensive supplier assessment and development systems which MILCO clearly lacks.

The results of this study show that supplier support including systematic assessment and development processes, and continuous contracts is the most critical of all other control methods a focal firm employs over its supply base. Although both focal firms employ same supplier selection criteria, the firm which provides its suppliers with continuous business and determining individual training needs based on a rigorous supplier assessment process makes a greater influence on the development of its suppliers which will enhance the overall supply chain performance.

## **5.2.2 Formalisation**

The second dimension of the proposed framework is that supply chain integration depends on generating clear, exact, and understandable expectations among the chain members. Either explicitly or implicitly, each member of a supply chain should have a clear understanding of its role in the overall chain. Lack of clarity with regard to the expectations of each member causes a number of poor performance measures for the entire chain with regard to delivery, quality, customers, and cost. The formalisation dimension of the two chosen supply chains has been explored from the following perspectives.

### **5.2.2.1 Clarity of Understanding within each of the Two Focal Firms**

Both of the focal firms operate in accordance with the quality management standards relevant to their production type. Procedures are written for jobs and roles, and monitored on an online documentation system. Specified procedures are accessible only to the relevant personnel of each focal company. In addition to the periodic audits over these management systems by a third party, AGRICO is audited twice a year by a different group of people determined by the companies of the corporate group in order to check the compatibility of AGRICO to their level of world class manufacturing.

Although both firms have the required distinct quality management standards, AGRICO differs from MILCO in a number of significant ways. It seems that AGRICO's efforts to create a company culture

in which the principles of Total Quality Management (TQM) applied are greater than those of MILCO. The main contribution to these efforts at AGRICO is performed by the Quality Assurance department whose principal role at AGRICO is to establish enablers of TQM such as training, teamwork, cross-functional teams, and empowerment particularly within AGRICO. When it comes supporting the development of the same principles across the supply base, the Quality Assurance department works in conjunction with a specialist from the department of Indirect Material Purchasing and Supplier Development (IMPSD). The following quotation from the specialist who was in charge of the development of suppliers at AGRICO is a strong indication of how much the personnel of AGRICO are confident about their company quality culture.

*'Suppliers' being certified by the existing quality management standards such as ISO 9001 and ISO 16949 is not a critical condition for us. The primary feature we expect from our suppliers is to meet the requirements of AGRICO because we have much higher standards than those of ISO 16949, which is widely employed in the automobile industry.'*

***Specialist at the Department of IMPSD at AGRICO***

Furthermore, every employee from an entry level to senior management level interviewed at AGRICO had as his / her goal the achievement of the requirements of World Class Manufacturing. It was apparent that via top management leadership, strategy to meet the objectives of World Class Manufacturing is in application at AGRICO. On the other hand, there was no evidence to suggest that MILCO makes a sufficient effort to advance the understanding of quality beyond the requirements stated in their quality management standards. The major reason for this lies in MILCO's strategic level decision making process. It was quite surprising to learn that the determination of the strategic targets is not a common practice in the firm. Undoubtedly, lack of firmly defined strategic objectives provokes an ambiguous, unclear environment in which distinct functional departments determine their own operational targets which are not broken down from the same strategic objectives. Therefore, it can be rightly argued that the objectives of these different departments are likely to conflict with each other inhibiting intra-integration.

When the Purchasing manager stated that being a profitable organisation is not a top priority for MILCO, the following comment by the interviewer was made to him in reaction to this statement. *'MILCO may not prioritise to make profits; however, its supply base certainly does'*. It was inferred based on his response to the above comment that due to an enormous amount of work in the military electronics sector, MILCO believes that all of its suppliers can make profit. On the other hand, both of MILCO's suppliers criticised MILCO mostly because it does not award them long term projects, and they cannot plan their future when working with MILCO.

For the operational level targets, all the interviewees at MILCO were able to mention some measures though none of them provided or suggested to provide a written card or form which can show a list of tangible measures in contrast to the personnel of AGRICO. This is not a surprising observation since operational level targets are the outcomes to the careful evaluation and reduction of strategic targets. Therefore, it can readily be claimed that having an established process to make strategic level decisions and conveying them to the all levels of a firm is critical to create an unambiguous environment in which all functional areas within a firm aim to achieve same objectives. This kind of clarity certainly is missing in MILCO.

### **5.2.2.2 Clarity of Understanding in Relation to Supplier Related Activities**

#### ***Operational Processes***

A question of ‘how AGRICO ensures that it receives parts and/or products in compliance with its requirements at all times’ was raised with the Quality Assurance (QA) manager. According to him, firstly, description of the expectations for an outsourced part should be unambiguous. Next, establishing necessary systems at suppliers’ premises is likely to support the suppliers in producing only required quality parts. At AGRICO, a variety of activities to describe the expectations clearly are in use. Parts coming from suppliers are inspected in compliance with their specifications, drawings and other contractual requirements. If a defective product is found, the relevant supplier is immediately informed and required to take necessary corrective and preventive actions. Via periodical audits, special visits, and other communication means, frequent contacts with the suppliers are maintained. Furthermore, based on collected input on a particular supplier during a year such as its audit results, and monthly quality and delivery performance measures, training activities are organised so that that particular supplier can be brought to the level of fulfilling AGRICO’s expectations.

Therefore, based on the evidence collected during the interviews, it can be argued that AGRICO presents a high level of clarity in conveying its operational level expectations to its suppliers. One significant criticism, however, was raised by the Quality Assurance manager at AGRICO. He pointed to the fact that currently at AGRICO, there is a substantial number of inspection personnel in comparison to a small number of quality assurance personnel. He suggested that this brings about a question of incompatibility with AGRICO’s aim of having a strong supply base which can ship only required quality parts to the focal firm enabling it to employ a limited number of inspectors. The information received from the manager of the Quality Inspection department verified the above statement saying that currently, AGRICO is aiming to increase the number of its inspection personnel. The implication of the above suggestion leads to two conclusions. The first is that AGRICO lacks trust in suppliers, so it needs to increase the control over the outsourced parts. The second is that there

is ambiguity between AGRICO and its suppliers with regard to conveying operational expectations since AGRICO needs to increase its inspection power.

In the case of MILCO, on the basis of the data obtained from the interviews, the focal firm explicitly conveys its expectations from the operational level activities which directly affect product quality to the suppliers via the means of established quality management system standards such as documents, lists, forms, and performance feedback. It was observed, however, widely employed methods for information sharing such as information technology (IT) systems and an adequate number of formal or informal meetings are not effectively used at MILCO. On top of these, a lack of trust prevents MILCO from being transparent in terms of its dealing with the suppliers. One of the suppliers mentioned that intermittently, acquiring operational level data to realise the projects might be difficult and takes unnecessarily longer when working for MILCO's projects.

### *Strategic Processes*

Stevens (1989) proposes that when the issues related to the suppliers are excluded from the strategic debate of the organisation and confined within the operational boundaries, there are missed opportunities in that specific supply chain. He argues that in order for a completed integration in any supply chain, the management of supply base is to be viewed from three perspectives: strategic, tactical, and operational. As a result, to achieve an integrated supply chain, the focal firm should direct its supply base to achieve its strategic targets.

In the case of MILCO, a low level of clarity of the strategic level processes between the focal firm and the first tier suppliers exists. The information obtained from one of MILCO's first tier suppliers proves this assertion: due to the lack of formalisation in taking decisions at strategic level, the supplier cannot foresee how its relationship with MILCO will unfold in the near future. From the supplier's perspective, since it is not committed to MILCO with long term projects, pursuing other customers all the time is necessary. Lacking a mutual and long term commitment in its supply base relations, MILCO seems unlikely to achieve a fully integrated supply chain in which the strategic targets are attained.

Interesting information with regard to MILCO's strategic targets was received from the manager of the Purchasing department. He noted that determining strategic targets is new to MILCO and managed by a separate group called the department of Strategic Management. When this information was shared with the above supplier, they were not surprised. They stated that MILCO should make more efforts to determine its strategic targets and transfer them clearly to its suppliers so that they can act all together in the same direction. It was interesting to learn that in such a big company, strategic targets are not well-established and not known to all levels of management.

Striking information to establish the reasons why the Turkish military firms in general are not formalised was provided by one of AGRICO’s suppliers. This particular supplier of AGRICO had previously worked for MILCO and was therefore a very valuable respondent. The Assistant General Manager noted that the reasons for working for the national military firms are twofold. The first one is to contribute to the needs of Turkish Armed Forces; the second one is to benefit from knowledge transfer. It was suggested that MILCO and other Turkish military firms do not have a sufficient level of knowledge to define the requirements of a new product including all the processes such as design and development, production, testing and maintenance. He added that the main reason for this stems from the fact that MILCO and other military organisations are mostly working on off-set projects in which information sharing is limited and profit margin is low. He stated that if an organisation with national responsibilities cannot make money, this reduces its ability to support the development of the supply base. It is therefore likely that for any firm such connections exist between not being able to define a unique product and being unclear in both its intra- and inter-processes with other supply chain members.

In the case of AGRICO, there is no evidence to suggest that the focal firm includes its suppliers in their strategic decision making process. On the other hand, AGRICO’s already determined goals and targets by the involvement of top management and parent company are placed upon the relevant departments and are converted to the operational terms to be achieved. This clarity of strategic targets enables AGRICO to structure the supply chain and manage it accordingly to achieve a specified goal or a set of goals. The following table presents a comparison of the chosen cases in terms of the formalisation structural factor.

Table - 5.5 Comparison of Formalisation

	AGRICO and MILCO	
	Similarities	Differences
<b>FORMALISATION</b>	<ol style="list-style-type: none"> <li>1. quality management standards exist in the both focal firms,</li> <li>2. online documentation systems are available at the both focal firms,</li> <li>3. access to quality documents is restricted to only relevant personnel within the focal firms,</li> <li>4. clarity of strategic direction of the case supply chains is similar for all the pertinent suppliers.</li> </ol>	<ol style="list-style-type: none"> <li>1. there is effort to advance QM activities at AGRICO, the same is not true for MILCO,</li> <li>2. strategic objectives are determined and reduced to functional and personnel targets at AGRICO; the same is not true for MILCO,</li> <li>3. yearly production target is shared with the suppliers at AGRICO, the same is not true for MILCO.</li> </ol>

In conclusion, there is evidence to suggest that lack of clarity in the strategic level decision making process has a negative effect on MILCO’s supply base management activities. Due to its insufficient

strategic planning, MILCO is unable to make the future unambiguous for the suppliers, in the sense that MILCO does not allocate long term projects to the suppliers, even to the strategic partners. It seems that integration at both levels, intra-integration within firm and inter-integration with the suppliers, is comparatively low at MILCO due to a lack of strategic decision making process. The observed unsystematic and inadequate supplier assessment and development activities in MILCO could be attributed to MILCO's approach to award the suppliers with short term projects. Therefore, it can be argued that a low level of clarity of any one firm's strategic decision process provokes a discontinuous influence on the supply base. This situation is likely to hinder MILCO in its efforts to become a responsive, secure, or a sustainable supply chain.

The last part of the analysis of formalisation shows that there is a notable lack of identification of other performance measures in both supply chains. Both focal firms evaluate their suppliers' performance on the basis of cost, quality, and delivery. The requirements of other performance measures such as being responsive, secure, sustainable, resilient, and innovative are not clearly defined although the suppliers are intermittently expected to meet one or a mix of these objectives. For example, one of the suppliers of AGRICO stated that their primary competence from AGRICO's perspective is their flexible production line. In fact, this supplier provided a vivid example for this. In order to support AGRICO's production line, in a very short notice, they manufactured the required parts for 100 tractors at the expense of their profitability. It was apparent that none of the suppliers was receiving feedback on their performance on the above mentioned measures apart from quality, delivery, and price. This finding was unexpected and suggests three possibilities: The first one might be that there is an implicit understanding between the focal firms and their suppliers about what the expectations are from each other. Even though, in case of AGRICO for example, the responsiveness level of a supplier is not an explicitly identified performance measure, AGRICO expects this measure to be met from the suppliers. The second option may be that the focal firms are not aware of the potential of both internal and external resources to identify different goals to increase their competitiveness in the market. Lastly, it is possible that provided that reaching further performance targets requires a closer internal and external integration with suppliers and customers which is associated with a great amount of investment in terms of time, money, and knowledge, neither of the focal firms is willing to make such commitments.

In terms of Quality Management (QM) standards, it seems their contribution to create a clear understanding of the roles and responsibilities of each supply chain member is limited; hence these standards are only a step towards formalisation, not formalisation itself.

### **5.2.3 Communication**

With this dimension, two main aspects were explored in the chosen supply chains. The first one was to find out about the means used for communication in the selected supply chains. The second one was to understand which level of information shared between the focal firms and their supply base. In addition, as a similar approach to that of Robinson & Malhotra (2005), in which communication activities are combined with partnership activities, in this research the communication structural dimension was explored by taking into account the type of relationship existing between the focal firms and their supply base. As many researchers argue (Chopra & Meindl, 2010; Emmett & Crocker, 2006; Hofstede, 2007; Narasimhan & Nair, 2005), it is unlikely to share information and goals within an environment in which trust does not exist. Therefore, as part of communication, the focal firms and their suppliers were questioned the way they perceived their relationship in terms of trust.

#### **5.2.3.1 Means of Communication**

AGRICO and both of the first- tier suppliers considered for this research are taking advantage of the close distance between them. In addition to phone and email contacts, meetings are held. It was observed that AGRICO is in frequent contact with the suppliers although this does not occur via regular meetings. Both of the suppliers of AGRICO, although the significant difference between them in terms of their dependence on AGRICO exists - while one with a high level of dependency, the other one is no dependency at all-, confirmed the above argument by defining their communication with AGRICO is close. When they need to hold face-to-face meetings, they can arrange them fairly easily. In terms of inter-information system, AGRICO employs a portal through which the suppliers can access all the related information with regard to the projects they work on such as drawings, the status of their parts and their proposals regarding other projects, and can share information about themselves such as certificates, tools, and machines they have or acquired recently. Information gathered from the supplier whose dependency level is almost none to AGRICO challenges the quality of this inter-firm information system. The Assistant General Manager stated that all the information without departmental distinction can be accessed by all their personnel due to the usage of only one password. Hence, they limit the usage of the system. It was added that without using the portal, they can still complete their work; therefore, the quality of the information system in terms of keeping the up-to-date information was questioned by the manager. This data must be interpreted with caution because there was no similar complaint from the other case supplier whose usage of the system occurs frequently.

Communication between MILCO and the suppliers is considered problematic. A number of reasons for this were provided by the two of the suppliers. Firstly, both MILCO's suppliers criticised MILCO for not being open to suggestions coming from the suppliers. In addition, even though phone and emails are used, visits to suppliers' premises by MILCO's personnel especially by the senior

personnel are very limited. Lastly, there is no information system between MILCO and the first-tier suppliers to enable on time and accurate information flow. Although during the first round of the interviews with the Purchasing manager at MILCO, it was stated that MILCO is currently undertaking a project to build such a system with the suppliers to enable information sharing; the Chief Engineer of the Purchasing department at MILCO indicated during the later interviews that this project, called 'e-purchasing', is not progressing at the required pace due to security reasons. Evaluation of all the data from MILCO and its suppliers suggests that security and confidentiality reasons are not real causes behind the delay in the project. The Purchasing manager at MILCO stated that design data is considered confidential and shared solely with relevant suppliers. Obligations and restrictions imposed on the use of proprietary information are secured by contracts and forms signed between MILCO and the pertinent suppliers. In addition, all the suppliers of MILCO, who take part in the design activities, are aware of MILCO's sensitivity on the issue, and so far no problems have arisen in this matter, added the Purchasing manager. A quotation from the Purchasing manager explains why none of the national suppliers of MILCO are likely to breach the agreements they have made with MILCO.

*“Especially from the national suppliers’ points of view, MILCO is a very powerful defence firm whose long term contract is the main factor for the survival of many small and medium size firms in the national military sector”.*

#### ***Purchasing Manager at MILCO***

The above statement clearly shows that if MILCO terminates the contracts with a supplier for any reason, sustainability of that supplier in the sector might be in danger, e.g. 40% of supplier A's sales is contributed by MILCO and the same supplier's 30% of sales are acquired from the contracts assigned by other Turkish Armed Forces' company; in the same vein, supplier B's 50% of sales comes from MILCO contracts; the rest of its sales is derived from other Turkish Armed Forces' company. It seems possible that this substantive amount of dependency to the national defence firms is due to the low level of competitiveness of the national suppliers in the global market. There is, however, other possible explanation. It was confirmed by both MILCO and the suppliers contacted in this research that the suppliers are subject to the constraints when working with MILCO's competitors in both national and international market given the reason for confidentiality in knowledge transfer.

The evidence from the suppliers points to the same conclusion that MILCO is unwilling and unsupportive to implement an inter-firm information system without providing valid reasons. The interviews at one of the suppliers exposed the fact that engineers at this specific supplier might experience intermittent difficulties with receiving even the required data to realise the project due to a lack of information system between MILCO and the suppliers. Instead of using recent information technologies, relying on a limited number of purchasing personnel to transfer the required data to

suppliers either by uploading, e-mailing, or even mailing them is likely to result in shortcomings in the communication between MILCO and the suppliers. Lack of a specific department in charge of resolving supplier related issues is added to MILCO's overall complex organisational structure provokes an inefficient and ineffective communication with the suppliers. This situation seems likely to hinder MILCO from achieving several performance measures such as responsiveness, quality, on-time delivery, resilience, and cost.

Clearly, information sharing which lacks some of its significant qualities such as timeliness, availability, external connectivity, completeness, and frequently updated information (Zhou and Benton, 2007) results in quality, delivery and service related problems. On the other hand, it seems that the existing communication problems between MILCO and the suppliers are mostly attributed to inadequate attention shown to the suppliers, i.e. not visiting their premises, not listening to their side of the arguments, rather than a lack of inter-firm information system. Not having an inter-firm information system, however, is a strong indication that MILCO does not trust the suppliers. Overall, the current communication means employed by MILCO prevents it from timely, accurate, and completed information sharing with the suppliers inhibiting supply chain integration which likely to cause future performance problems in the areas of delivery, service, and particularly quality. The evidence from the personnel of MILCO supports to the above claim that one of the common causes of quality related problems in the outsourced parts lies in the inconsistencies of MILCO's documents. It was explained that in most respects, the design of the outsourced parts is incomplete; hence, drawings of these parts are subject to constant changes. Instead of having an access to the related drawings and documents, the suppliers have to wait for MILCO to upload, email or mail these documents to them. Any delay or a mistake in this task caused by MILCO clearly provokes the suppliers to produce parts which do not meet with the specifications. In the case of AGRICO, however, the data suggests that by the application of inter-firm information sharing system with its suppliers and with other communication means both AGRICO and the suppliers are able to receive timely and accurate information with regard to the relevant parts and likely to take immediate action when a problem occurs.

### **5.2.3.2 Information Sharing**

In terms of strategic information sharing, the approach of the both of the focal firms is similar. Both focal firms verbally convey their strategic targets to the suppliers. In most respects, the suppliers are informed about the current status and future aims of the focal firms during the meetings which are held to discuss operational issues. As a new approach, however, last March MILCO brought all the suppliers together at its premises to inform them about its strategic targets. Without providing a great amount of detail, achieved and expected values in sales, export rate, and market share are shared with the suppliers. Based on the evidence collected from the both cases, it can be argued that the primary

aim to transfer these kinds of information to the suppliers is to increase their motivation at their work and their loyalty to the buyers. The personnel from both of the focal firms collectively stated that informing suppliers in the general status of the company and market, and possible risks and disruptions helps them to make necessary preparation for the future.

Although the both focal firms mainly show similar characteristics in conveying strategic targets to the suppliers, there are some important distinctions in the way that they perform these tasks. In the case of AGRICO, financial values are not shared with the suppliers. Instead, at the beginning of each year AGRICO informs all the suppliers about the yearly production volume with a letter so that each supplier can calculate its approximate sales to AGRICO. The below quotation from the Direct Material Purchasing Specialist explains the reason for this:

*'We share the yearly production volume with our suppliers. Sharing our expected sales or profit values with the suppliers is not reasonable since dynamics within a particular year might vary. That is to say, we do not tell our supplier that we will make this amount of sales in this year, and we will give you this number of parts so that your sales will be this amount. The reason for this is that during that particular year, we might actually find another supplier which can provide that part cheaper. In such cases, the sales of that particular supplier will decrease. That is why we only share the unchanged yearly production volume with them, and we send them a letter at the beginning of each year including this information.'*

***Direct Material Purchasing Specialist at AGRICO***

In the case of MILCO, strategic targets are not reduced to tangible production numbers. The reason for this mainly stems from the fact that the determination of strategic targets is a new process for MILCO. It was observed during the interviews that individual departments are aware of neither MILCO's strategic targets nor their specific roles in realising these targets. Hence, its inability not to provide the suppliers with more concrete production values which was reduced down from the strategic targets results in the problematic relationship with the suppliers. One of the two suppliers stated that they cannot foresee their future with MILCO. A quotation from the General Manager of that particular supplier is given below:

*'Two years ago, the General Manager of MILCO pledged to award us long term projects. Nothing has happened so far. We want to plan for our future with MILCO, but they do not award us long term projects.'*

***General Manager of MILCO's supplier, supplier B***

As the above data suggests, MILCO's top management might give a false promise to individual suppliers about a possible increase in their workload during face-to-face meetings. Instead of providing tangible production workload for all its suppliers so that they can have a clear idea about

the future, making unfulfilled pledges degrades the relationship MILCO builds with the suppliers. Another supplier of MILCO, indeed its strategic supplier, also criticised MILCO for not sharing its long term production plans with them.

The comparative data from the both cases indicates that having an information system is not a prerequisite to convey strategic targets. Conversely, formal or informal face-to-face meetings are more appropriate and effective way of communication for this purpose. Reducing strategic targets to tangible numbers, however, seems a very critical factor for suppliers. The data from the interviews further suggests that the suppliers which have or access tangible operational information such as forecasted production volume, delivery schedule, inventory level seem to be more satisfied with their focal firms and feel a part of the supply chain than the ones which are verbally informed about strategic targets of their focal firms but lack concrete operational information. Therefore, it can be argued that the main reason why the integration of AGRICO's suppliers into the chain is comparatively higher lies in their access to the operational information. Due to the better established strategic process, AGRICO can make the future for both its own employees and its supplier more deterministic than MILCO. This enhances the supply chain of AGRICO to become responsive to the requests coming from customers. On the final examination, it seems that part of communication, information sharing, has value as long as it generates clarity in the relationship between the focal firms and suppliers, and stimulates the understanding of each other's business.

### **5.2.3.3 Relationship**

In the scope of this research, trust was considered as the most important element in a buyer and supplier relationship when there are mutual targets to be achieved. Building trust between firms is negatively affected by unfulfilled promises. This is vivid in the case of MILCO in which the top management makes promises to the suppliers about the future workload, but never fulfils them. On the other hand, the suppliers of AGRICO have a much clearer understanding of the conditions on which the current and future work relationships are based. On the issue, the following statement was made:

*'Intermittently, we have suppliers coming to us and demanding for a certain amount of workload in response to the investment they will make for our projects. We never give them any promises in advance neither written nor verbally. We encourage them to make investment, but at the same time we tell them that we have to see the advantages of this new investment brings to AGRICO, particularly in terms of quality and price, otherwise this new investment is not meaningful for us'.*

***Direct Material Purchasing Supervisor at AGRICO***

The above statement, even though it indicates a relationship in which there is a clear understanding of the conditions under which a supplier is able to be awarded business, is unlikely to point to a one

based on trust from the perspective of a supplier. A thorough examination of the evidence gathered from all the participants in this research reveals that both of the focal firms lack trust in their suppliers. Unlike MILCO's case, reaching this conclusion for AGRICO's supply chain was considerably difficult due to the hybrid information gathered during the interviews.

In the case of MILCO, a substantial number of instances are available to prove the above statement. MILCO imposes restrictions on the suppliers' working with its competitors, especially with the national ones via contracts. In addition, the Purchasing manager at MILCO stated that as a general policy, MILCO does not work with suppliers who have potential to be its competitors in the future. It was explained that while MILCO contributes to the development of the suppliers, it solely wants the suppliers to specialise in the capabilities which do not exist at MILCO. This statement was verified by one of MILCO's strategic suppliers whose General Manager provided the following information:

*'The main reason why MILCO forms a strategic alliance with some of its suppliers is to keep them under tight control so that they can only develop to a certain level, but not become another MILCO in the sector.'*

***General Manager of a strategic supplier of MILCO, supplier A***

During the interviews conducted at the premises of both MILCO and the suppliers, it was observed that the lack of trust in this supply chain is bi-directional. One of the suppliers was hesitant to attend training on cost analysis techniques organised by another establishment of Turkish Armed Forces Foundation, SASAD. The General Manager stated that they wanted to trust MILCO's good intentions on these kinds of activities, but at the moment they lack trust towards MILCO. Both of the suppliers are wary of MILCO, feel disappointed, and question the capability of its personnel and the appropriateness of the methods employed in various processes such as supplier selection process, the evaluation of proposals, consultations, efforts in suppliers' development activities, and pricing of outsourced parts. In response, it was apparent that MILCO does not trust the suppliers to establish an information channel via which an adequate amount of operational data can be transferred accurately and on time in order for the suppliers to realise the projects under the required conditions in terms of quality, delivery, and cost.

As was mentioned earlier, the evidence regarding a lack of trust is not particularly revealing in AGRICO's case. In fact, some of the activities performed by AGRICO in its relationship with the suppliers are slightly different from those of MILCO. For instance, the suppliers are not constrained by AGRICO in working for other customers. In fact, AGRICO encourages the suppliers to work with its competitors believing that the suppliers can gain a unique capability and transfer this new knowledge to AGRICO. In addition, there is an inter-firm information system between AGRICO and the suppliers to enable the smooth flow of operational information. The following evidence, however,

is in conflict with the rest of the evidence. Firstly, it was stated by the two different managers of AGRICO that AGRICO is in the process of increasing the number of inspectors. This points to a situation in which AGRICO needs to control the parts coming from suppliers; meaning does not have complete trust on the suppliers' ability to perform such tasks. The second and most important observation of all is that the most severe complaints of the relationships mostly came from the suppliers who are largely depended on their focal firms. Only one supplier, supplier D, whose relationship is likely to be considered as a relational-base, as opposed to power-based, articulated the relationship with AGRICO as a trust-based relationship. Even trust was mentioned when discussing supplier D's relationship with AGRICO, some of the evidence collected during the interviews was not supportive this assessment such as not attending the training activities organised by AGRICO with a doubt that they might reflect the free training activities in the price of an outsourced parts. In addition, the General Manager Assistant commented that unlike other customers, AGRICO is not concerned about their financial well-being. This statement is also conflict with a relationship which is based on trust. All the other suppliers, in some way or another were also understood to be not completely satisfied with their relationship with the relevant focal firms, and felt unfairly treated even though there was intermittent hesitance voicing their concerns. Taken together, the data suggests that building trust requires tangible investment in both parts, and it is not related to whether the relationship is a power-based in which there is weaker and powerful partner or relational-based in which both parts are interdependent on each other. Table - 5.4 below presents the findings of the analysis for the communication dimension of supply chain structure.

Table - 5.6 Comparison of Communication

	AGRICO and MILCO	
	Similarities	Differences
<b>COMMUNICATION</b>	<ol style="list-style-type: none"> <li>1. email, phone, and meetings are the mainly employed means of communication,</li> <li>2. strategic targets are conveyed verbally by the both focal firms,</li> <li>3. trust is not perceptible in the both case supply chains.</li> </ol>	<ol style="list-style-type: none"> <li>1. in general, communication between AGRICO and the suppliers is satisfactory, whereas that of between MILCO and the suppliers is problematic,</li> <li>2. a discrete department regarding the supplier activities exists at AGRICO, but not available at MILCO,</li> <li>3. an inter-firm information system is available for AGRICO's supply chain, but not for that of MILCO,</li> <li>4. sharing operational data is effectively and efficiently performed in AGRICO's supply chain, the same is not true for MILCO's supply chain,</li> </ol>

### 5.3 Summary

The first section of the analysis chapter briefly presents the underlying purpose of the structural dimensions. In the second section, detailed information in respect of how and to what extent the structural dimensions are employed by each supply chain is given. Similarities and differences in the application of the dimensions in question and their effects on supply chain integration are analysed based on the information collected during case study interviews.

The centralisation structural dimension of the supply chain emphasises that the focal firms can establish and maintain a close control over their supply base through the processes of supplier selection, controlling suppliers' processes & supplier participation, and supplier support. Amongst all the control methods, the analysis of the case data revealed that supplier support including continuous contracts is of particular significance for enhancing the motivation of a supplier and eventually leading to higher supplier performance. Moreover, the study's results indicated that as part of supplier support, systematic supplier development activities based on a rigorous supplier assessment process have a considerable influence on supplier performance. Contrary to expectations, the results of the analysis did not find that receiving financial support is of particular significance for suppliers. Instead, the suppliers of both focal firms give more importance to being awarded long-term projects and supported by continuous and rigorous supplier development activities. Furthermore, the analysis of the data showed that employing certain supplier selection criteria is not as critical as the efforts made afterwards to improve supplier performance. It can, thus, be suggested that focal firms need to devise rigorous supplier assessment systems on which continuous and individual-supplier oriented development activities can be organised and implemented. This, clearly, is likely to increase the capability of suppliers which can work with the focal firms to achieve the objectives of an entire supply chain. The comparison of the data from the two cases also revealed an unanticipated result. What is surprising is that there was no observed difference in terms of the authority the focal firms have over the supply base due to their different approach to the selection of further upstream suppliers; while MILCO provides a core supplier list to the first-tier suppliers to choose from, AGRICO allows them to choose and manage their own suppliers. In fact, this practice of MILCO was criticised by one of the first-tier suppliers considered in this research.

With respect to formalisation, the analysis of clarity in understanding of what expectations are in terms of the operational and strategic level decisions within company and among the supply chain members is completed. Based on the data collected from the interviews, the effect of different levels of formalisation on integration and relevant supply chain performance measures is discussed in the pertinent section of this chapter. The results indicated that insufficient strategic planning within the focal firm is likely to influence the supply base management, in particular the processes of supplier

assessment and supplier support. The study also found that the suppliers are not keen on the involvement of their buyers' strategic level decisions as long as their short and middle term future is made unambiguous by tangible operational values. It was surprising to note that apart from quality, delivery, and cost, no other performance measures are identified, and made known to the suppliers. Even though some suppliers are expected to be flexible, for example, no assessment was performed on the suppliers regarding the relevant performance measures. This result might be explained by the fact that there is an implicit understanding between the focal firms and their suppliers as well as explicit expectations. On the other hand, this is unlikely because if this was the case the results should not have been detrimental for the profitability of that particular supplier. There might be other explanations as well. Due to the subjective employment of this criterion when select suppliers, a low level of understanding between the focal firms and the suppliers in terms of what they expect from each other might exist, and these circumstances might create confusion and ambiguity in the relationships.

Lastly, the communication structural dimension with its application in the chosen supply chains regarding the means of communication, information content, and relationship is examined based on the case study data. The most interesting finding was that effective communication in terms of conveying strategic level information does not require firms to have advanced information technologies. On the contrary, holding face-to-face meetings is preferable and a common practice in the chosen cases to share this kind of information. In the case of operational level data, however, having integrated information technologies seems to make a substantive difference between an integrated and non-integrated supply chain. On the basis of the security and confidentiality arguments, MILCO's unwillingness to share sensitive information with the suppliers and to establish an inter-firm information system limit MILCO's ability to integrate with the suppliers in order to achieve a specific or a set of goals that it is set out to attain. On balance, as far as MILCO's supply chain is concerned, the overall picture seems to be that the lack of a relationship based on trust and inter-firm information system even with the strategic suppliers prevents MILCO from developing a close relationship with the suppliers. This, surely, is not a condition in which integration with the upstream of the supply chain can be achieved so that the requirements of customers can be met. When addressing trust for AGRICO's case, although the relationships with the suppliers are not based on trust, a tangible commitment of inter-firm information systems enhance the information flow between AGRICO and the first-tier suppliers; hence, communication between AGRICO and the suppliers can be comparatively considered satisfactory.

The following chapter will discuss the findings of the analysis. The meaning of the findings in theory is attempted to be answered by recognising the compatible and incompatible elements between

relevant literature and real-world data. The proposed framework with the final modifications will be presented in the Discussion Chapter.

## CHAPTER VI - DISCUSSION

### Introduction

This chapter begins with presenting the final form of the conceptual model. It continues discussing the results of the analysis and how they relate to the extant body of the relevant literature. In the third section, an effort is made to answer the research questions around how the structure of a supply chain affects integration, which variables of a supply chain structure is likely to contribute to performance, and what the most influential variable is to achieve the required level of integration and performance ultimately enabling a supply chain to be competitive in the global market. Before the conclusion of the chapter, the possible reasons why the proposed model of this research may not work for all supply chain models are presented. The chapter concludes with a brief summary.

### 6.1 FINAL FORM OF THE CONCEPTUAL MODEL

Based on the results of the analysis, which was performed in chapter five the proposed conceptual model was refined, and its final form is illustrated below in Figure – 6.1.

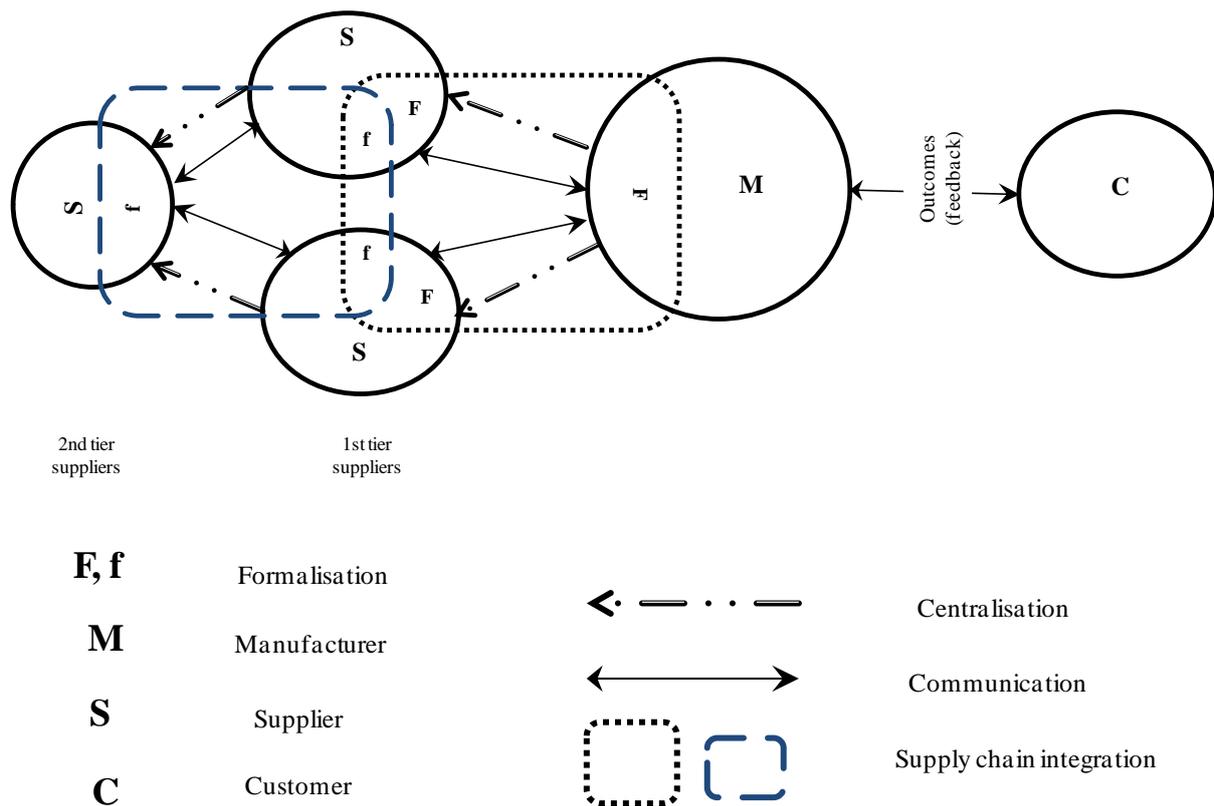


Figure – 6.1 Final Form of the Conceptual Model

Mentzer et al. (2001) emphasise the significance of strategic orientation throughout a supply chain in order that management to be called a Supply Chain Management. There are a significant number of studies in the literature of Operations Management which strongly advocate the concept of integration within the supply chain (Flynn et al., 2010; Frohlich&Westbrook, 2001; Kim, 2009; Vickery et al., 2003; Cousins&Menguc, 2006; Narasimhan&Kim, 2002). The change in SCM's scope from transactional methods to collaborative approaches is well-accepted and has gained significant recognition in both academia and industry.

Today, the idea is to consider and manage the entire supply chain including internal, external functions in a collaborative manner (Zhang et al., 2011); in other words, the supply chains should be strategically managed as a single system in contrast to individually optimising separate systems or sub-systems (Vickery et al., 2003).

The present study's findings as illustrated on the proposed model, are also supportive the concept of integration in the supply chain. On the other hand, the current findings question the possibility of the management of supply chain as a single organisation where power is centred on one point. The findings of this study suggest that optimum integration in a supply chain occurs within dyads by depending on the variables of supply chain structure, namely centralisation, formalisation and communication.

In case of centralisation which is represented by the processes of supplier selection, supplier participation and supplier support in the chosen case studies, the present evidence shows that when the resources in relation to the above mentioned processes allocated within dyads, the focal firm's relationships with the closest suppliers become stronger, and this has a positive effect on the focal firm's influence on the further level suppliers. This might contradict with the current supply chain management thinking in particular in the practice of the aerospace, food, and automotive industry where the powerful focal firm manages the whole supply chain through rules, regulations, audits, and communication means.

When it comes to the cases of this research, due to the following reasons, the findings are contradictory to the general practice. In the case of MILCO's supply chain, it is evident that MILCO's main customer, SSM, a governmental body, is the power holder. As it was observed during the interview at another Turkish defence firm, TAI, SSM might exploit the power over the focal firms. Hence, it serves MILCO's purpose of forming a responsive supply chain to focus on its own-selected suppliers. By establishing stronger relationships with them, MILCO might still have an influence over the further level suppliers to work in a collaborative manner to response the customer's requirements.

When it comes to AGRICO's supply chain, the power is shared equally between AGRICO and its primary customer and the share-holder PP. Due to AGRICO's aim to form and manage a cost-efficient supply chain, the delegation of management responsibilities for the further level suppliers is only plausible from AGRICO's point of view. This situation does not prevent AGRICO from exerting its influence on the supply base because it has rigorous supplier selection and continuous supplier assessment processes. Hence, also AGRICO, by focusing only the first-tier suppliers, it can achieve integration within the supply chain to meet the customer requirements.

In terms of formalisation and communication, the current literature suggests that the aims and objectives of the supply chain need to be conveyed throughout all member firms. Sustainable competitiveness of a supply chain lies in the satisfaction of all the members via a commitment to common goals (Gunasekaran et al., 2004; Jayaram et al., 2011; Lee, 2004). On the other hand, as it was seen in the chosen cases, the reality does not match with the literature. None of the focal firms are in a full cooperation with their suppliers at strategic level. Indeed, there was evidence to suggest that strategic targets are kept confidential within the focal firms and only some part of them are conveyed to the suppliers, sometimes even in a manipulative way. On the other hand, AGRICO achieves required level integration with the suppliers by making their short and middle term future unambiguous. Via communication means, AGRICO shares operational level data and yearly production volume with the suppliers.

As a result, as shown in the model, to attain optimum level integration within a supply chain, the effective management, clear understanding and necessary communication means within dyads need to be initiated to serve the supply chain's purpose.

As the limitation of the proposed model, it can be argued that its usage is not preferred by a powerful focal firm with sufficient resources to manage the further level suppliers. Also, the model might not find any application for the supply chains whose power holder's country of origin regulates strictly and requires the power holder to ensure that all of the suppliers comply with national or international standards (Prakash and Potoski, 2006, see in Crouch and Maclean)

### **6.1.1 The Changes Reflected in the Final Form of the Model**

There are several changes which are shown in the final form of the model. The first vivid difference to the earlier version of the model, used in the cross-case analysis is related to centralisation. The model applied in the cross-case analysis suggests that in order for a focal firm to ensure control over the supply base, it needs to be involved in the selection and management of the further level suppliers in addition to the first-tier ones. On the other hand, the findings which were based on the qualitative data analysis of the perspectives of the both focal firms and their first-tier suppliers did not support the

above assertion. The results of the present study found that the focal firms' management of the first-tier suppliers is sufficient for having an adequate level of control over the whole supply base as long as the management of first-tier suppliers is based on rigorous and continuous supplier assessment, selection and development processes. In terms of the influence secured on the supply bases via other two processes, namely suppliers' involvement in design activities and supplier support, the findings suggest that supplier support which provides suppliers with business continuity and training activities determined based on the individual needs of the suppliers seems to prevail on the suppliers to feel closer to their focal firms.

Formalisation represents the generation of clear understanding in a supply chain environment in the all version of the conceptual model. The present results are significant in at least major two respects. Before providing a description of those areas, it is important to note that the findings of this study further support the idea of Choi and Hong (2002), which suggests that formalisation occurs at a dyadic level, not at a network level (p. 470); the conceptual model was refined to illustrate this change. The above assertion is of relevance to the first major finding of this study regarding formalisation. The current findings seem to indicate that in a particular dyadic relationship, in order for any rules, procedures or other behavioural guidelines to be considered formalised, there needs to be some kind of an instigator who mostly determines and describes these rules, procedures and behavioural guidelines. Hence, it can be concluded that a level of formalisation depends on the level of influence one party exerts on the other in that dyadic relationship. More importantly, due to the way formalisation exists in a supply chain environment, it seems that integration can occur at different levels in the network (Cousins & Menguc, 2006); therefore, it appears to be unlikely to discuss supply chain integration as *the acting of all members in a supply chain as a single organisation*. On the other hand, the present results still indicate the second major finding. It was found that in-formalised processes create confusion, ambiguity and a sense of unfairness in a supply chain environment. It is likely therefore that due to the clarity it brings to the environment, formalisation facilitates supply chain integration.

The present findings indicate that similar to the centralisation and formalisation dimensions, the most effective communication occurs between dyads, each firm has better knowledge about their closest supplier and customer in the network. In terms of information system, the findings suggest that the usage of it does not seem to play a key role for strategic level coordination. Case findings further suggest that power-based relationship is not conducive to the development of trust although the lack of trust appears not be essential for both parties to put a sufficient amount of commitment into the relationship, so that supply chain integration can arise.

In-depth discussion of the findings in relation to the current literature is carried out in the following section.

## 6.2 DISCUSSING THE ANALYSIS RESULTS IN THE LITERATURE

This research set out to answer a number of questions. The below discussion specifically provides a response to the main research question of *how the structure of a supply chain affects supply chain integration* by considering the each dimension of the supply chain structure independently.

### 6.2.1 Formalisation

The discussions in respect of the formalisation dimension of the supply chain structure are strengthened by the sound examples of satisfactory outcomes when strategic decisions are reflected in the operational processes or those of unsatisfactory results when the opposite is true. In addition, the findings of this study also expose the significance of implementation and repetition of rules and procedure in order to create a clear understanding; in other words, for them to be considered formalised.

During the supplier selection process, AGRICO follows a very clear path from the perspectives of both AGRICO and the suppliers. Firstly, compared to MILCO, it seems that the supplier selection process in AGRICO is practiced in compliance with the firm's strategy of low-cost policy when forming a supply chain. This finding is consistent with the work by Xia et al. (2008), which found that supplier evaluation and selection, which is one of a company's most important processes, must be systematically considered from the decision makers. In their work, they state that supplier evaluation and selection could be influenced by a supply chain strategy. This information also accords with the previous suggestion made by Stevens (1989) that supply issues need to be included in strategic debates in order to form an integrated supply chain with a high level of competitive power.

As the data, provided in the Findings chapter, indicates due to the limited involvement of AGRICO in the supplier selection process, savings on overall auditing costs are made, which serve well the cost-efficient strategy of AGRICO. In addition, AGRICO priorities price when it selects the suppliers, and savings on the outsourced parts are utilised as a yearly target measure for the Purchasing department. Furthermore, the strategic decision by the corporate group of AGRICO to apply a standard selection procedure to all the suppliers contributes to the firm's strategic aim of generating a cost-efficient supply chain. The above observation finds support in the work of Melnyk et al. (2010) suggesting that cost-driven supply chains characteristically demand standardisation of processes, often the general slogan in such systems is *'Without standardisation, there is no opportunity for improvement'*. Due to this standard selection process, from the very beginning, which is the supplier selection stage, AGRICO is likely to have a very clear picture of each potential supplier's strengths and weaknesses even though some of the suppliers are not directly selected by AGRICO (i.e. foreign suppliers are not

audited by AGRICO, but AGRICO can be sure that each of them has also gone through the same scrutiny by AGRICO's primary shareholder, PP).

Nevertheless, there appears to be some evidence linking a lack of implementation of written rules and procedure with unsatisfactory outcomes in AGRICO's supply chain, namely that this long-term supplier of AGRICO, included in this research, incurs intermittent profitability losses in order to fulfil AGRICO's demands. This situation is likely the result of the rules and regulations which are little-used or far from the objective evaluation. The following example proves this point.

The General Manager of this specific supplier emphasised that because AGRICO is their long-term customer and their dependency on them is large, they attempt to be very responsive to the demands of AGRICO even though this approach incurs intermittent profitability losses to them. In addition, this supplier of AGRICO believed that apart from major performance measures (i.e. delivery, quality, and price), the real reason for their selection stems from their flexible production line. This belief of the supplier is slightly unclear because of the following two reasons.

Firstly, in line with the argument made by Melnyk et al. (2010), AGRICO's focus on meeting delivery, quality, and cost objectives is rational on the basis of its strategic aim. On the other hand, while an emphasis on cost reduction, the expectation of the supplier to respond to changes in demand (volume, mix, location) at a reasonable cost is not sensible and creates confusion and frustration (ibid, p.36). It is not surprising that AGRICO was already placing a burden on that supplier and possibly deteriorating the long-term sustainability of the supply chain. There are two alternative ways to address this problem. The first option is related to AGRICO prioritising certain objectives but not others. If the strategy of the company is designed to create a cost-efficient supply chain, AGRICO needs to be content with the suppliers' sufficient performance on price, delivery, and quality. It is true and understandable, on the other hand, that in today's world, pursuing only a low cost strategy is unlikely to enable a supply chain to remain competitive over the long term (Melnyk et al., 2010, p.38). In relation to this observation, the management of AGRICO might have recognised the changes in the needs of the customers and strived to achieve different outcomes for the supply chain (Melnyk et al., 2010, p.38). The expectation of the suppliers to achieve a different target than above mentioned ones, however, requires the introduction of certain characteristics and practices to both within the company and throughout the supply chain. Hence, the second solution might be that AGRICO needs to revise its strategic decisions with regard to suppliers and clearly describe the expectations of the supply base based on these renewed decisions, so that they can together establish the necessary infrastructure to meet such demands like being responsive to changes in demand without damaging the profitability of both sides or sustainability of the supply chain in the long-term.

Secondly, this particular supplier's attempt to be flexible might be attributed to one of the requirements of AGRICO's current supplier selection procedure. In fact, the standard supplier selection procedure employed by AGRICO includes measures to evaluate the supplier's ability in the areas of finance, management (i.e. questions are asked whether the supplier can respond to demand changes), capability. But, these measures are only considered subjectively as opposed to the objective assessment of quality, delivery, and cost measures, stated by the Direct Purchasing personnel of AGRICO. The evidence gathered from both AGRICO and the suppliers supports the above information, in the sense that AGRICO only sends official delivery and quality performance reports to the suppliers once a month. In the absence of evidence to the contrary, it can be assumed that in the light of a lack of continuous and objective feedback on some of the focal firm's expectations of the supplier, these expectations are unlikely to be remembered and understood over time by the two parties involved; in other words, they are not considered formalised. Because of this kind of process which is not formalised, at this point in the relationship, the supplier attempts to be responsive to the demands of AGRICO at the expense of its profitability. If the circumstances continue, the long-term sustainability of the supplier, eventually that of the supply chain is likely to be under risk.

When it comes to MILCO, it has to work mostly with either customer-specified or single source suppliers on who its influence is limited in comparison to the ones selected directly by it. Hence, at the beginning, MILCO is likely to have a vague picture of a supplier who is imposed by its primary customer, the Undersecretariat for Defence Industries of Turkey (SSM). In addition, not allocating sufficient resources for supplier-related activities within the company (i.e. there was no separate unit or department which deals specifically with the supplier related activities at MILCO at the time of the interview; however, the further information was received at the writing stage of this study that such department was established within MILCO) and ineffective communication inhibit MILCO from focusing on getting to know an individual supplier in great detail. The above conditions of MILCO contradict with its aim of creating a responsive supply chain in which extensive supplier assessment and development, and information systems need to be in place (Melnik et al., 2010, p.37).

Apart from the above assertion suggesting that operational processes become clearer and more effective when they are in line with the strategic decisions which they are derived from, this discussion specifically indicates a possible relationship between the part of the centralisation dimension of supply chain structure, which is supplier selection, and the formalisation dimension of supply chain structure. Unlike the observation made by Choi & Hong (2002), which indicates a strong effect of the policies of the final assembler on the centralisation and complexity dimensions of supply chain structure, the present finding seems to be consistent with other research (Walsh & Dewar, 1987), which found that rules, regulations, even commands or desires are not considered formalised until they are understood, remembered and in implementation over long periods of time by all the

parties involved, also divorced from their originators. Hence, it seems likely that Choi & Hong (2002) consider the cost cutting policy of the final assembler as a formalised procedure and had an effect on the structure of the supply chain because the final assembler in their study actually had a sufficient amount of power or influence on the supply base to implement that policy. This observation finds support in the work of Wong and Boon-itt (2008), which states that institutional norms referring to *the expectations of behaviour that are acceptable within an institutional environment*, are (usually) used by powerful institutes to affect the practices of other institutions or individuals. As in AGRICO's case, even though at the supplier selection procedure the measures in relation to finance, management (the examination of flexibility capability of a supplier is performed), capability exist, due to their subjective usage, the existence of them does not have an effect on the formation of the specific supply chain. Another example from MILCO's case is supportive to the above claim. The General Manager of MILCO gave a verbal promise of long-term projects to supplier B. As this promise was not kept (at the time of the interview) and its originator was still known, it only creates confusion and an ambiguous expectation from the perspective of supplier B and certainly reduces *the quality of the interaction expectation*, term used by Walsh & Dewar (1987, p.219) to define formalisation. This surely has a negative impact on the relationship between the focal firm and this particular supplier.

On balance, when all the processes under the centralisation dimension are considered the above suggestion, which is the possible sequential relationship between the structural dimensions of centralisation and formalisation, seems to be valid. Therefore, it can be argued that in general, any processes to be considered formalised, there should be an influence, power or authority to make those processes understandable, remembered and in practice over time.

In addition, formalised procedures need to create a sense of fairness in a supply chain (Choi & Hong, 2002). Whether written or unwritten, explicit, implicit (if the relationship is long-term), rules and other behavioural regulations need to bring precision and fairness (ibid, p. 470). In support of this observation of Choi and Hong, the findings of this research suggest once more that MILCO's supplier management process may not be considered formalised since they do not generate a feeling of fairness among the suppliers. The evidence is that both suppliers of MILCO criticised MILCO's approach to create an unfair competition in which long term suppliers have to compete with the suppliers that enter the sector recently and lack sufficient infrastructure in terms of standards, skills, and technical capability. This, undoubtedly, affects the relationship between MILCO and the long term suppliers negatively. MILCO admits that strategic partnership scheme does not guarantee contracts to a supplier which belongs to this scheme, and strategic partners need to compete with other suppliers to secure a business contract. It is surprising information that strategic suppliers need to prove their capability every time a new contract is available. This might be an indication that the assessment and follow-ups for these strategic partners are not performed continuously and effectively so that when new work is

available in the area that these suppliers specialise, they can be awarded the contracts immediately without a need for competing with other suppliers which are not strategic partners of MILCO.

The final point in respect of formalisation is related to quality management standards. As the results suggest being certified by various quality management standards is insufficient to provide with clarity of roles, responsibilities and expectations of each member to other participants in a supply chain. This information is support to the earlier research conducted by Yeung (2008), who found that because standards like ISO mainly focuses on operational processes, it does not induce strategic supply management which is considered in his work as a significant initiative for higher business performance in today's supply chains. Hence, as seen in AGRICO's case, where the practices of Total Quality Management and World Class Manufacturing take place, quality management standards need to be used as a foundation and managers should go beyond that in order to remain competitive in the market.

### **6.2.2 Centralisation**

Based on the definition of centralisation in a supply chain context, which is proposed by Choi & Hong (2002) and accepted for this research, the centralisation dimension of the supply chain structure represents notions of power, authority, influence and/or control that a focal firm (final assembler or buyer, used interchangeably) exerts on the supply base. Due to a variety of constraints of the 'real world', the final assembler cannot make all decisions for all suppliers in the network (supply chain, used interchangeably). Choi & Hong (2002) reflect these realities in their definition of centralisation in a supply chain context and state that the final assembler can be selectively involved in the decision making, and this process would likely to occur in a dyadic relationship and extend out in the network in a serial process. As a result, based on the definition of Choi & Hong (2002) centralisation in the supply chain occurs in a linear context with respect to the final assembler, and the power or authority this final assembler exerts on the supply base is confined to the following processes: the selection of the suppliers, involving suppliers in the design activities, and helping suppliers to solve their problems.

In terms of supplier selection process, the cases' findings illustrate that the both focal firms manage their supply base differently. In other words, while MILCO, a military electronics firm, gets involved in the selection of all the tiers of suppliers, AGRICO, an agricultural firm, solely selects the first tier suppliers and requires them to select their own suppliers. Hence, drawing on the information from Choi & Hong (2002) it can be concluded that with regard to supplier selection process, MILCO's supply chain is managed centrally, and that of AGRICO is called decentralised supply chain. The results of this study in relation to supplier selection process are the most interesting, in the sense that this study has been unable to demonstrate that as a centrally managed supply chain, MILCO seems to

have a greater extent of influence over the supply base than AGRICO whose supply base is managed in a decentralised way.

Several reasons for the above observation are provided from the perspectives of both of the focal firms. In spite of a cost-efficient strategy, AGRICO is able to assess the first-tier suppliers thoroughly owing to its rigorous and standard supplier selection procedure applied to all the first-tier suppliers including the foreign ones (i.e. AGRICO's primary partner, PP, applies the same supplier selection procedure which was developed by the corporate group to international suppliers). In this supplier selection procedure, the questions with regard to the second-tier suppliers are asked to the first-tier ones to understand how the first-tier suppliers contribute to the development of their supply bases. This is only done, though, for suppliers who have necessary infrastructure to help their supply bases. Another important feature of AGRICO's supplier evaluation and selection procedure is its continuity. Once the working relationship begins with the supplier, the same questions used in the selection stage are employed to assess the development of individual supplier. Hence, it can be concluded that via a rigorous supplier evaluation and selection process, AGRICO can have a considerable control on not only the first-tier suppliers but also further upstream level suppliers.

A low level of influence of MILCO on the supply base (the evidence were: the suppliers are not willing to work with the further upstream suppliers imposed by MILCO, are not content with the current relationship with MILCO, and seeking other potential customers) is apparent. This situation is likely to the result of ineffective strategic decision making process at MILCO. As examined in the previous chapter in detail, the analysis of all the evidence suggests that MILCO aims to be a responsive supply chain as opposed to a cost-efficient one. Even though a claim, the prioritisation of price over other performance measures when selecting suppliers, was made by the suppliers, most part of the further evidence made it unlikely to suggest that MILCO manages its supply base on the basis of costs. Firstly, the statement by the Purchasing manager at MILCO with regard to MILCO's not being a profit-oriented company accounted for why savings on the outsourcing activities are not employed as a yearly target measure. Secondly, as pointed out by one of the suppliers, '*MILCO's parts are never early; they are always in demand of more parts*'. In support of the previous sentence, there was no information to suggest that MILCO applies any specific production approach like JIT to control the inventory level of the company or the supply chain. That is to say, inventory cost is not a critical measure to be followed by MILCO; it solely requires parts to be delivered on time, so that the end product can be shipped on time. Besides the other evidence analysed in detail in the previous chapter, the following comment made by one of the suppliers who was considered for this research indicates that MILCO aims to be a responsive supply chain rather than a low-cost one. '*MILCO spends money, but it is not clear how it spends*'.

Another significant disadvantage of MILCO in controlling the supply base lies in the fact that most of the suppliers, named as subcontractors, are determined by its main customer, the Undersecretariat for Defence Industries of Turkey (SSM), which acts as a Turkish Arm Forces' Procurement Agency. MILCO does not have much say on these firms, and it was expressed that the subcontractors are not audited as strictly as the ones chosen directly by MILCO. Hence, it can be concluded that even though MILCO is involved in the selection of further level suppliers, this does not determine the certain extent of control over them. However, in the case of AGRICO, even though it is not involved in the selection of further level suppliers, because of a rigorous, continuous, and standard supplier selection procedure, the amount of control AGRICO exercises over the supply base is considerably higher than that of MILCO exerts on the supply base. This observation is consistent with the results of a recent study conducted by Kim et al. (2011), investigating the properties of supply chain structure by employing a formal, quantitative approach, social network analysis (SNA). For their study, Kim et al. (2011) use the qualitative data derived from the three automotive supply networks published by Choi and Hong (2002). In contrast to the findings of Choi and Hong (2002), Kim et al. suggest that the focal firm's direct involvement or ties in the different level suppliers does not ensure a centrally controlled supply chain. The reason why Kim et al. (2011) find an opposite result to that of Choi and Hong (2002) is suggested that Choi and Hong (2002) only consider the position of the focal firms in their relevant network to decide on the centralisation dimension of the whole network. On the other hand, SNA analysis is used to evaluate the relative node (i.e. person or firm) level centrality scores of all networks members to arrive at the overall network centralisation. For the present study, while a qualitative approach is used, the analysis of centralisation was performed by taking into account the perspectives of both suppliers and focal firms.

These results also differ from Choi & Kim's (2008) suggestion that in order for a final assembler to ensure the quality of final products, control via centralised management is necessary. A real world example provided by Choi & Kim (2008) (p.6, example number one) showing that an aerospace company works with an integrated supplier who brought another supplier to the network supplying a deficient product, resulting a negative effect on the part quality produced by the aerospace company (final product quality). At the end, the aerospace company started managing second-tier supplier itself. In other words, this supply chain became more centralised in order to ensure the quality of the final product. However, the findings of this research do not support the above claim. With regard to supplier selection process, the findings of this study show that as long as the evaluation of the first-tier suppliers by the final assembler is based on a rigorous procedure, the final assembler is already able to examine the ability of the first-tier suppliers to manage their own supply base. Hence, there would not be any necessity for the involvement of the final assembler in the management of the second-tier suppliers. In addition, if that particular focal firm is aimed to manage a cost-efficient supply chain, the management of more suppliers will negatively affect the overall strategic objective.

The data from AGRICO supports that creating a competitive environment among suppliers contributes to their development which has a direct and positive effect on the focal firm's performance such as sales of that particular product, delivery, design, and quality. The specialist at Supplier Development department at AGRICO stated that by determining monthly the worst ten poorly performing suppliers on quality and delivery and disseminating this list to all its suppliers stimulate competition and encourage the suppliers to make greater efforts to improve their weak areas. This result is consistent with the result of Krause et al. (2000) who acknowledge that when supplier assessment is performed to provide feedback to a particular supplier, in the sense that that the supplier is informed about its performance level compared to others, this might surrogate the activity for creating competitive pressure and has an indirect positive impact on the supplier performance improvement mediated by direct involvement.

### **6.2.3 Communication**

#### ***Information Sharing and Means of Communication***

Information sharing is a means to capture the supply chain dynamics and thus reduce uncertainty in external and internal environments (Zhou & Benton, 2007, p. 1363). Croom (2001) states that in the transaction cost theory the degree of uncertainty relating to a transaction is directly related to the degree of information available to the customer. In addition, in the same study, Croom (2001) suggests that inequality in information sharing between a seller and buyer may give one party an 'advantage' over the other, or alternatively cause considerable confusion due to incomplete knowledge. One of the main arguments Croom states in the study is that due to ineffective information sharing (opportunistic or self-seeking with guile), firms are pursuing vertical integration rather than pursuing obligatory or collaborative inter-firm relationship. This is supported by the finding of the present study that insufficient information sharing provokes either party to be alienated from the partnership type of relationship and led either party particularly the suppliers to seek for other possible customers.

Effective integration of the entire supply chain depends heavily on the availability of accurate and on time information that can be shared by all members of the supply chain (Min & Zhou, 2002). The significance of information technologies for on time and accurate information exchange in addition to its various other benefits has been a subject of a large amount of research (Chopra & Meindl, 2010; Kuei et al., 2002; Lee et al., 2012; Sabbaghi & Vaidyanathan, 2007; Sanders, 2008; Zhou & Benton, 2007). Having an information-system to coordinate production/information flow is one of many requirements of designing and managing a responsive supply chain (Melnik et al., 2010). This view is supported by the result of the two cases' comparison illustrating the focal firm without an inter-firm information system with the suppliers is likely to have shortcomings in several operational

performance measures, such as quality, on time delivery, responsiveness to the changes in demand. Even though both supply chains show similarities rather than differences when they convey strategic targets which are the results of high level decision making process, the overall observation show that the lack of inter-information system with the suppliers to allow the smooth flow of the operational data provokes a negative feeling from the standpoint of the suppliers. This view is supported by the earlier study conducted by Sanders (2008) who suggest that utilisation of IT may be more conducive for the activities of operational coordination meaning automation of processes and bringing efficiency to tasks. In addition, the same study indicates that the use of IT may not be sufficient for the strategic information sharing which requires face-to-face interaction.

An interesting observation made by Croom (2001) that in general, the more extensively firms used inter-organisational networks, the more-hierarchical were their relationships with the trading partners, even when using highly open and ubiquitous public data network infrastructures. This is really interesting, and suggests that the existence of an information sharing system between firms may indicate a centralised type of management in that particular relationship. This suggestion may find support in the results of this study. The analysis of the data gathered from the selected supply chains shows that MILCO does not have control or influence over the first-tier suppliers as much as AGRICO has over the first-tier suppliers. This situation might be attributed to the fact that there is no inter-information system between MILCO and the suppliers, but there exists such system between AGRICO and the first-tier suppliers. Hence, the finding of the cases combined with support from the relevant literature suggests the employment of information sharing system for the purpose of operational data exchange might have an effect on designing and managing a centralised supply chain. Based on the above discussion, it might be worth noting that the perceptible influence MILCO seems to wield over the supply base may be largely determined by the suppliers' dependence on it in terms of business continuity due to its being quasi-monopolistic in the national military sector. Hence, it seems that if the suppliers of MILCO are able to find other potential customers, the existing influence of MILCO on the suppliers will greatly diminish.

### ***Relationship Aspect: Trust***

Liker & Choi (2004) argue that it is more difficult to build a close relationship with the suppliers than firms imagine. It requires various sorts of efforts from the parts involved in that relationship. A significant number of researchers have stated that organisations need to rely on intangible factors such as trust, commitment, and shared vision to overcome the obstacle of reluctant sharing information with their supply chain partners (Fynes et al., 2005; Galbreath, 2002; Handfield, 1994; Kumar, 1996; Liker & Choi, 2004; Sako et al., 1994; Hofstede, 2007)

Kumar (1996, p. 97) distinguishes between the different senses of the mixed feelings such as dependability, honesty, and trust in a dyadic relationship. He argues that promoting trust is different

than that of dependability and honesty, and not always the existence of the latter two concepts leads to the former in the relationship. In his work, trust is defined as *the ability of the parties to make a leap of faith: they believe that each is interested in other's welfare and that neither will act without first considering the action's impact on the other*. He also suggests in the same work that when both sides (buyer and supplier) trust each other, they can share confidential information, to invest in understanding each other's business, and to customise their information sharing systems or dedicate people or resources to serve each other better. The present findings seem to be consistent with the work by Kumar (1996) and Fynes et al. (2005), which found that trust is likely to develop in a dyadic relationship with a high level of interdependence of the parties to each other. In the cases of this study, for suppliers A, B, and C, the relevant focal firms' power over them were large so those dyadic relationships are considered as a power-based one. For the relationship between supplier D and AGRICO in which there is no dependence at all, i.e. only 7% of supplier D's sales is contributed by AGRICO. However, this information needs to be interpreted with causation as the design of the bulk of those sent to AGRICO belongs to supplier D. Even though this is not confirmed, this information might indicate a reverse dependence between AGRICO and supplier D. On balance, however, the overall picture seems to be in accordance with those of Kumar (1996), Fynes et al. (2005) and Lambert et al. (1996) that a high interdependency is an intrinsic part of a trust based relationship.

The findings of this study with a considerable number of illuminating instances support the above statement, particularly the part where it mentions the existence of trust in a relationship gives rises to investment in understanding each other's business. It was observed during the interviews that neither of the focal firms has made an investment in the suppliers. In the case of AGRICO, the supplier's specific investment for the focal firm's business is encouraged if only it brings tangible benefits to AGRICO in terms of quality and cost. This finding contradicts with that of Handfield and Bechtel (2002) who suggest that buyers' trust to the suppliers will be enhanced by the suppliers' site-specific investment in the form of production capacity and equipment to the buyers' business. The present findings might be further support for the suggestion of this research that power-based relationships in a supply chain environment does not foster a trust-based relationships. The lack of trust in MILCO's supply chain is much more observable than that of AGRICO. The commonality between the two different cases is that in the both supply chains, the focal firms, who do not put much effort to build a trust-based relationship with the suppliers, weigh a certain extent of power over their suppliers. The suppliers of both of the focal firms, particularly supplier A, B, and C have made an investment in their relationship with the relevant focal firm. This observation is interesting, in the sense that all the suppliers mentioned above are the ones who are largely dependent on their focal firms. On the other hand, supplier D is an independent supplier whose only 7% of sales are contributed by AGRICO's products. Hence, the results indicate that buyers, in this case, are not willing to or not need to establish a trust-based relationship with the suppliers whose dependency on them is extremely high.

The findings of this research support the claim made by Kumar (1996), Lambert et al. (1996) and Fynes et al. (2005) who suggest that in order for trust to be developed, the level of inter-dependence between the buyer and supplier should be high. If there is a power-based relationship or almost no dependence at all or very low dependence, it is unlikely trust to be flourished in that relationship. This observation can be supported by a substantial number of examples provided in the both Findings and Analysis chapters of this study proving that in MILCO's relationship with the first-tier suppliers, fear is larger than trust (Kumar, 1996; Lambert et al., 1996). Hence, this prevents MILCO from designing and managing a responsive supply chain. When it comes to AGRICO, although the relationship with the suppliers is more satisfactory, it also lacks trust, hence it is only in accordance with AGRICO's current strategy which is to design and manage a cost-efficient supply chain.

The study of Lambert et al. (1996) suggests that trust can be established through legal contracts at the beginning of the relationship, but after it may not be that much based on the legal contracts, but on the tangible commitments and performance emerged over time. This is supported by the data collected from the both dyads. One of the suppliers reviled MILCO for its being very restrictive on the contracts, and they together cannot discuss anything beyond the contracts. Handfield and Bechtel (2002, p. 376) suggest that if the buyers and suppliers cling to the "safety" offered by the such contracts, this reliance may actually discourage either party to move beyond contracts toward a reliance on interpersonal trust. Indeed, Lambert et al. (1996) emphasise that in a trust-based relationship, contracts are written in very general terms, short and include less specific terms or no written agreement at all. Based on the information collected from MILCO, the contracts are written in very detailed forms.

### **6.3 Answering the Research Questions**

Based on the presentation of the gaps identified in the literature and the motivation of the research in the introduction chapter, it is aimed to find a response to the following research questions with the proposed model:

Secondary research questions are as follows:

- 1. Does 'supply chain structure' provide a useful concept to both practitioners and academics?*

This study considers three variables of supply chain structure to explore its effect on Supply Chain Integration. Although these are not the only factors affecting supply chain structure, the present research proves that the following variables of supply chain structure have an influence on Supply Chain Integration, namely centralisation, formalisation and communication.

The qualitative analysis of the case data suggests that the level of integration in the supply chain is determined how well the above mentioned variables of supply chain structure are applied and

managed within the dyads. Hence, the further research in the area of supply chain structure and its relationship to Supply Chain Integration is welcome to contribute to the current understanding of effective management of supply chains.

## *2. How does each variable of supply chain structure affect supply chain integration?*

The determination of a set of performance measures in relation to each structural dimension was performed late in the research (after the interviews were conducted); hence, the interviewer lacked the sufficient knowledge to explore this area during the case studies. On the other hand, it was also observed during the interviews that there may not be a standard approach to this request from all the participant firms, in the sense that while some of the interviewees may appear to share this type of information, some others may not seem to share those measures giving the reasons for them being either confidential or unknown. Hence, for the purpose of this study it may have been a possibility that incomplete information with regard to performance measures would not have allowed a comparison of the two case supply chains with different structure.

A response to this research question, therefore, was produced by considering the effects of each structural dimension on Supply Chain Integration. Because this study is exploratory in its nature, it can be argued that focusing on a high level abstract concept like supply chain integration is more appropriate, as opposed to specific performance measures to increase the understanding of the relationship between the two abstract concepts, supply chain structure and supply chain integration. In addition, the review of the literature on the positive relationship between supply chain integration and performance measures were carried out and manifested in chapter two. Hence, it is the assumption of this research that when supply chain integration is achieved, it will result in an improved performance for the whole supply chain.

The discussion of the effect of each structural dimension on supply chain integration begins by the centralisation dimension and continues with formalisation and communication.

### ***Centralisation***

Firstly, this study found that supplier selection is a process which can be used by a focal firm to control the supply base. On the other hand, unlike the findings of Choi & Hong (2002), this study found that control on a supply base can be established by a focal firm's participation of only the first-tier suppliers. As long as a rigorous and continuous supplier assessment and development of the first-tier suppliers is ensured, a focal firm can have as much influence over the supply base without facing the management of the further upstream suppliers. This is significant not only for supply chains which are designed to be cost-efficient, but also important for the ones which are designed to achieve different sets of outcomes such as responsive, security, sustainability, resilience. It might not be that much of concern, if the supply chain is set up to achieve an innovative one since this type of supply

chains need to encourage the involvement of a wide range of different perspectives and solutions (Melnyk et al., 2010, p. 37). In addition, as Wang (2001) provides in his work, innovativeness has a negative effect on the centralisation structural dimension. Hence, this result has been reflected in the final form of the model. Furthermore, the results in relation to the centralisation corroborate the findings of Kim (2007) who suggests that excessive centralisation of an organisation negatively affects supply chain integration with external suppliers and customers. Although in that study centralisation is mainly about the concentration of the logistic decisions in a single organisation, the results may still be relevant to this study due to the definition of SCM provided by Council of Logistics Management (1998) which states that the effective supply chain management depends on the inter-connectedness of logistics and purchasing decisions. Therefore, the negative effect of excessive centralisation can be generalised about purchasing decisions which were the primary subject of the present study.

### ***Formalisation***

As the findings suggest, as long as there is clarity in terms of business continuity, the suppliers are content with the relationship with their focal firms. It seems that the means used for creating such an understanding such as formal, informal meetings, usage of IT or verbal promises are not a critical issue from the perspective of the suppliers. In addition, the clarity in the relationship can be based on either explicit or implicit understanding as long as a supplier knows that they have a new program coming from that particular customer. The result of this study based on the data comparison between the two focal firms is very revealing in this respect. While MILCO neither explicitly nor implicitly creates a clear future for the first-tier suppliers so that they can visualise their future with MILCO, AGRICO is more successful making the future unambiguous for the first-tier suppliers by sharing yearly production volume with them. This finding is supported by the earlier work of Choi & Hong (2002) who found that both implicit and explicit understanding contributes positively to the inter-firm relationship between a final assembler and the first-tier suppliers. It is also suggested by the work of Choi & Hong (2002) and Wong (1999) that long term contracts motivate suppliers, create a sense of fairness on the part of supplier believing that unless there was a major problem in the relationship, the business relationship would continue. The evidence from the cases bears out the view that MILCO is not successful in creating a formalised supply chain, particularly at strategic level; the first-tier suppliers of MILCO were unable to foresee how their short, middle, and long term business relationships with MILCO will unfold. Not being able to visualising even the short term future, the relationship between MILCO and the suppliers is likely to be affected negatively, and prevents this particular supply chain from developing into an integrated one.

Similar to the strategic level, MILCO is not a formalised company at operational level. Choi and Hong (2002) state that larger supply base around a buying firm should be more formalised meaning it

should be depending on rules, procedures, norms than a smaller supply base. However, this is not seen in the case of MILCO. Even though it has a large number of suppliers, it is not formalised enough. This might stem from the fact that MILCO does not have a sufficient level of control over the suppliers during and after selection; that is to say, because MILCO is not independent on the selection of the suppliers, it cannot establish a certain extent of control over them. This is again support to the suggestion of this research that without authority, the existence of formalised rules and procedures seems unlikely.

### ***Communication***

The findings of the present research indicate that the employment of IT is essential for clarity in particularly sharing operational data. It was observed that not establishing such systems with suppliers deteriorates the existing relationship. Hence, the results are in accordance with the findings of Sanders (2008) and Lee et al. (2012) who found that the usage of information system (IT) by suppliers for operational purposes involving automation of processes and making processes more efficient enables supplier-buyer operational coordination. Although Sanders's (2008) study examines the implementation of IT from the point of view of only one member of the dyad, supplier, the author provides empirical evidence to illustrate that at the end, operational level coordination between buyer and supplier via the IT usage brings operational benefits to the suppliers. On the other hand, the results of the present study are not in agreement with another finding of Sanders's study that the usage of IT is also significant for the supplier-buyer strategic coordination. In fact, in the both case dyads, sharing strategic information occurs at either formal or informal face-to-face meetings. It seems that as long as the promises given during those formal or informal meetings even during conversations are followed and fulfilled, they are highly valued from the viewpoints of the suppliers and give rise to closer relationships between the buyers and the suppliers.

On balance, on the other hand, this study produced results which corroborate the findings of a great deal of the previous work in the field of supply chain management. As suggested by Cousins and Menguc (2006), Narasimhan and Nair (2005) and Handfield and Bechtel (2002), the present findings confirm that communication can be achieved through both formal and informal links among the supply chain.

The comparison of the information collected from all the interviews points to a conclusion that trust does not seem to be essential for information sharing among a supply chain. As the case evidence illustrates, AGRICO and the suppliers can share necessary information to realise the objectives of the projects although as analysed in chapter five, the relationship between AGRICO and the suppliers cannot be recognised as a trust-based one. The same comment can be made for MILCO and the suppliers. The Purchasing manager of MILCO was confident that the suppliers cannot misuse the

propriety information conveyed to them due to MILCO's strong position in the national market (both of the case suppliers are largely dependent on MILCO in terms of business volume). Hence, from the perspective of MILCO, there seems to be no trust problem towards the suppliers. Yet, MILCO was ineffective sharing even required operational data with the suppliers. This condition MILCO and the suppliers were in is likely to stem from the lack of IT usage between MILCO and the suppliers.

3. *What are the most important variables of a supply chain structure) in order to achieve supply chain integration?*

This research provides a valid argument that all the proposed dimensions of supply chain structure have an effect on supply chain integration (see response to research question two). Based on the results of this study, on the other hand, it can be argued that there is a possible sequence among these variables. Observations on a cause and effect relationship between centralisation and formalisation are published by Choi & Hong (2002). Based on a case study which includes three automotive supply chains, they suggest that the focal firms' formalised cost cutting policies have a significant impact on the structure of the network (e.g. the degree of centralisation as well as complexity of the network). Their observation seems to be viable if only a focal firm (final assembler in their study) has authority over the supply base. In fact, in the two of their supply networks, the final assemblers who require their suppliers to comply with the cost policy are the influential partner in the network so the only option for the suppliers to remain in the game is to obey the request of their powerful partner. The similar examples exist in the case dyads of this study. The powerful focal firm imposes certain policies and restrictions on their suppliers, and in most respects these policies and restrictions are unilaterally determined by the powerful partner. Hence, it can be argued that in power-based relationships, the formalisation of rules and procedures arises from the powerful partner's request. Therefore, if there is any sequence to be suggested between centralisation and formalisation, the former induces the latter.

The comparison of the data collected from the two dyads in respect of IT usage also illustrates that the focal firm who has IT links with the suppliers can have a large amount of influence on them especially on operational processes, as opposed to the one who does not have IT link with the suppliers. The findings of this study indicate that a lack of IT results in the problems of the flow of operational data. In any supply chain, even though information flow is bidirectional, the main source of the upstream of the chain is the information coming from the downstream of the chain. Hence, if this action does not occur smoothly, this negatively affects the relationship especially from the viewpoints of the upstream of the chain, suppliers. The study's findings show that when the suppliers encounter such situations, they take on the responsibility to deal with the problems. Thus, the authority moves away from the focal firm, leading to rather a decentralised supply chain. Based on the findings of the cases it can be argued that as part of the communication structural dimension, the

utilisation of information systems has an effect on the centralisation dimension. This finding corroborates the results of Lee et al. (2012) who empirically prove the positive effect of IT integration on the structure of domination, referring to *agents having power to execute on and reproduce structures* (Sydow & Windeler, 1998). The term relationship quality denotes the structure of domination in Lee et al.'s study, and it is represented by the components of reciprocity and stability. This possible sequence of IT and authority also finds support from the study of Croom (2001). It is observed that inter-firm networks use IT more often for the purpose of authority rather than that of electronic communication which can reduce costs of coordination (Malone et al., 1987, see in Croom (2001), p. 507). In his quantitative study, Wang (2001), on the other hand, provides evidence that the usage of IT has a direct effect on neither centralisation nor formalisation. Although Wang (2001) states in his work by citing a large amount of literature (p. 433, 434) that the effect of IT use on the both centralisation and formalisation structural dimensions is controversial, inconclusive, inconsistent, by taking Information Processing (IP) view it is argued that an organisation's information intensity which could be considered as a similar construct to the present study's information sharing part of communication due to the survey items it is assessed on is the primary factor affecting both its IT importance and structures including formalisation and centralisation. This study produced results which corroborate the findings of a recent work by Lee et al. (2012) who suggest that the usage of IT will increase the performance of the firm if only it is used to better understand customers. Hence, it can be argued that the use of IT facilitates the understanding of operational processes both within and across the supply chain, so as a means of the generation of understanding the usage of IT comes before formalisation. Figure – 6.2 depicts the above discussion.

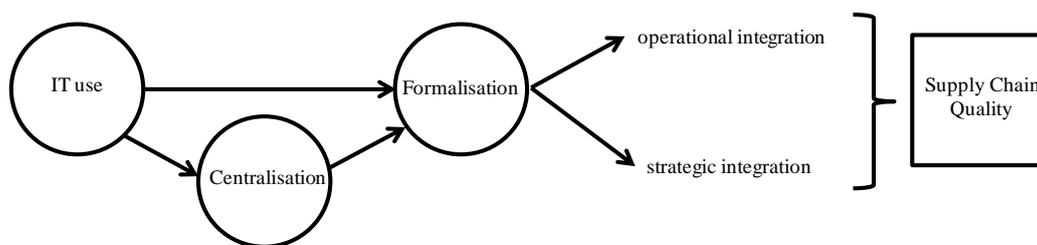


Figure – 6.2 Sequences of the Structural Dimensions

#### 6.4 Theoretical Implications

##### ***Claim Number 1: centralisation induces formalisation***

Based on the findings of the present study, it can be argued that centralisation induces formalisation. In the work by Choi and Hong (2002), the opposite is suggested, in that formalised policies have a significant impact on the centralisation and complexity dimensions of the network's structure. The current findings are supported by Wong and Boon-itt (2008), who state that institutional norms

referring to *the expectations of behaviour that are acceptable within an institutional environment*, are (usually) used by powerful institutes to affect the practices of other institutions or individuals. The present study provides additional evidence with respect to the possible sequential relationship between centralisation and formalisation, and suggests that centralisation causes formalisation. Whilst this study produced the opposite results to that of Choi and Hong's observation regarding the possible role of formalisation in promoting centralisation, it did substantiate the information given in the same study that formalisation exists at the dyadic level, not at the supply chain level. This finding may enhance the understanding of centrally managed supply chains. If the clarity in the expectation of an interaction within a supply chain, that is to say, formalisation occurs between the two firms, but not simultaneously throughout the supply chains, this might be an indication that such an environment is generated by the involvement of those two parties; hence, further support the suggestion by Choi and Hong that centralisation also starts in a dyadic relationship and extends out in the supply chain in a linear context in respect of the final assembler.

***Claim Number 2: manage only one tier at a time to have effective control over the whole supply chain***

The findings of the present study regarding centralisation may further the understanding of the ways via which influence is effectively used in a supply chain environment. The comparison of the data collected from the two different dyads, both operating in the manufacturing industry, suggests that the focal firm's direct involvement in the selection of the further level suppliers, i.e. second, third and so on, is not worth making the effort and providing resources to increase the level of control the focal firm has over the supply base. Instead, allocating a sufficient amount of resource to the relationship with the first-tier suppliers in terms of the processes of assessment, selection, monitoring with continuous feedback and support will be a better alternative for the focal firm to control the whole supply base. By the means of the above mentioned processes under the centralisation dimension, the focal firm will be able to influence the behaviour of the first-tier suppliers and bring the expected behaviour into alignment with their own interests (Handley & Benton, 2012). As the evidence provided by Choi and Hong (2002) demonstrates, the information from the final assembler regarding what lies beyond the first-tier suppliers, i.e. who the second or third tier suppliers are, is often inaccurate. In addition, there was also evidence provided in the same study suggesting that when the further level suppliers are selected by the final assembler, this situation negatively affects the relationship between those suppliers and their closest customers. A similar observation is made in the present study, in the sense that a focal firm's providing a core supplier list to the first-tier suppliers negatively affects the inter-firm relationships. The first-tier suppliers explained the reason for their unwillingness to this practice. As the content of work outsourced becomes narrower and more specialised further away the chain, and their processes is closer to the ones that need to be completed by the further level suppliers, they are likely to have relatively more knowledge about the both

processes and firms which are to perform the outsourced task with the required quality and cost. In addition, similar to the observation made in Choi and Hong's study, those further level suppliers which are imposed by the focal firms on the first-tier suppliers become more loyal to the focal firms. This creates a feeling of unfairness and ambiguity within the suppliers, and it is recognised as the opposite trait to that of formalisation which is likely to negatively affect the supply chain integration. In some ways, this might be considered as another proof that the way centralisation is implemented affects formalisation (Handley & Benton, 2012). Taken together, the current data suggests that with the exception of the innovative supply chains, in which simultaneous idea sharing would be needed and beneficial (Melnyk et al., 2010), for other types of a supply chain, such as low-cost, responsive, secure, sustainable and resilient, the efficient and effective management of the whole network is largely determined by the quality of the relationship within any dyads in the network.

***Claim Number 3: ensuring continuous contracts is the most important incentive in a supplier-buyer relationship from the perspective of a supplier***

Turning to the formalisation dimension, the present findings suggest that the generation of clear understanding between the focal firm and the suppliers is of critical importance for a required level of supply chain integration. It was observed that the supplier whose short and middle-term future is made clear by the focal firm is relatively more satisfactory with the relationship than the one who cannot foresee the future with the focal firm. The implication of this finding is the possibility that in general supplier support, specifically business security which is studied under the centralisation structural dimension in the context of this research is a significant factor to enable supply chain integration. Without business security, suppliers do not feel close to their partners and are not committed to the relationships. Another implication of the same finding might be that clarity in the strategic level decision making process between the focal firm and the supplier seems to be more critical for the continuity and quality of the relationship than clarity in the operational level process since awarding contracts to the suppliers can be considered as an outcome of a strategic decision making process.

***Claim Number 4: In general, communication induces both centralisation and formalisation***

***Claim Number 5: While the usage of IT is critical for increasing operational clarity between firms, it is not essential for that of strategic clarity between firms***

***Claim Number 6: trust is not essential to achieve supply chain integration***

When it comes to the means employed for the generation of a clear understanding between the focal firm and the suppliers, they seem to vary in a wide scale and not carry critical importance. On the

other hand, similar to those of formalisation and centralisation, this study argues that the most effective communication occurs within dyads. Although the usage of IT was not observed to be essential for clarity in the strategic level decisions, its use was particularly important for the seamless flow of the operational level information. Having an information system between firms also contributes to the influence one party has on the other. This finding has inter-link with the concept of trust which is difficult to establish in any relationships, particularly power-based business relationships. The present study produced results which do not agree with the findings of a great deal of the previous work in this field. The comparison of the information collected from all the interviews points to a conclusion that trust is not essential in order to performing activities which link firms together, particularly information sharing between firms or among supply chain members. Even if the relationship within a dyad is not a trust-based one, which is highly unlikely in a power-based relationship, the supplier feels secure and makes all the required effort to realise the project in accordance with the requirements as long as they are attached to the focal firms with business continuity. Hence, a conclusion can be drawn that the relationship based on trust is an insignificant factor in the way of achieving supply chain integration.

It is though worth mentioning that all the theoretical claims are reached by examining the cases which are subject to limitations that are stated in the Conclusion Chapter of this thesis.

### **6.5 The Reasons Why the Proposed Model may not work for all Supply Chain Models**

A low level of influence of MILCO, the military electronics firm, on all the suppliers was apparent. Hence, the models depending on the influential focal firms' management of the supply base including different tiers of supplier might work in industries such as automotive, textile or food, but seems unlikely to put into practice in MILCO's supply chain. There are several reasons why the proposed model suggests a dyadic management approach for MILCO's supply chain.

This is mainly due to the very powerful customer in MILCO's supply chain, who is the Undersecretariat for Defence Industries of Turkey (SSM) acting as a Turkish Arm Forces' Procurement Agency. Most of the suppliers of this particular supply chain are determined by SSM. The selection of these suppliers, which are called subcontractors and mostly international firms, depends on not only commercial and technical criteria but also political relations between Turkey and the target firm's home country.

As a result, MILCO's control over the subcontractors is considerably limited. When a problem occurs regarding the subcontractors, as seen in Turkish Aerospace Industry's (TAI) supply chain, which is another defence firm and focal firm of SSM, SSM is the main party for the decision making for the pertinent issue. This situation is self-explanatory why MILCO has a underdeveloped strategic decision

making process when its importance in the Turkish Defence Industry and its status in the League of Nations are considered. Even though MILCO's aim is to establish and manage a responsive supply chain, its lack of power in making strategic decisions prevent it from building close relationships with the supply base to attain this objective.

When it comes to AGRICO, power between AGRICO and its main partner and also the customer is shared evenly. Hence, as the present results show AGRICO's influence on the supply base is comparatively larger than that of MILCO. On the other hand, the proposed model which articulates the management of the dyadic relationship within a supply chain as opposed to one firm managing the whole supply chain seems to work AGRICO's supply chain as well. The reason stems from the fact that AGRICO aims to structure and manage a cost-efficient supply chain; hence by delegating the management of the further level suppliers to its closest firms is only logical from AGRICO's perspective.

Crouch and Maclean's study (2011) suggests that when the relationship between the buyer and supplier is based on a high level of asset-specificity, there is the application of power or control of one party over the other one. The above mentioned study provides evidence from two different sectors, namely automobile and textile to support the assertion that there is a positive relationship between having asset-specificity in a buyer-supplier relationship and power exertion in that particular relationship. The findings of the present study are also in support of the above claim, in the sense that Turkish Armed Forces with the relevant bodies like SSM (the Undersecretariat for Defence Industries of Turkey) and Turkish Armed Forces Foundation are the reason why the Turkish Defence firms including MILCO and TAI exist. Indeed, 45% of TAI are owned by SSM, and 85% MILCO is owned by the Turkish Armed Forces Foundation.

When the two focal firms are compared, AGRICO seems to have a higher level of asset-specificity in the supplier relationships regarding investment in training and auditing. Neither firm has capital investment in their suppliers and they do not require their suppliers to do so. Particularly, from the viewpoint of AGRICO, they only encourage the supplier to make any investment if only that particular investment brings benefit to AGRICO either in terms of the functionality of the production or price. In addition, as defined in the above mentioned research of Crouch and Maclean, 'commitment' between the parties determines the level of power one party exerts on the other. This result is very vivid in the present study, in the sense that MILCO has a very low level commitment to the suppliers and this condition affects the application of the power it has on the suppliers. On the other hand, by providing a long term contracts to the suppliers, AGRICO establishes a high level of commitment between their first tier suppliers and this condition affects the level of power it has on the suppliers.

In addition to the reasons provided above, Crouch and Maclean's study analysed the question of the origin of a country on its implementation of rules and procedures in the supply chain was investigated. The study's results show that there is a high level of relationship between the origin of the country in which rules and regulations are implemented strictly and followed by everyone. Their study shows that if the buyer comes from a highly regulated country, its effort to implement and control their suppliers whether they follow the rules and regulations or other requirements of the country of origin more closely. On the other hand, the origin of both focal firms, Turkey, are not considered very strict on the implementation of rules and procedures, these firms still need more powerful firms to introduce their own standards and rules to enforce the whole supply chain.

Therefore, as the empirical analysis of the present study shows, the proposed model in this study is mostly supported by the empirical evidence. It is only beneficial for MILCO and AGRICO to focus on their first tier suppliers by allocating all the necessary resources to manage their relationships in more efficient and effective way and delegate the management of the further level suppliers to their closest or significant tier-firms.

## **6.6 Summary**

In conclusion, the findings seem to suggest that a buyer's or as used in this research a focal firm's involvement in the management of the first-tier suppliers is sufficient for an effective supply chain control to achieve a required level of integration. It appears that the focal firm's influence over the whole supply base can be ensured via the management of the first-tier suppliers as long as a rigorous supplier assessment, selection and development plan is in implementation by the focal firm.

In terms of furthering the understanding of the expectations of each member in taking part in the network, the results are more interesting. Firstly, the analysis of the findings suggests that formalisation exists at the dyadic level in a supply chain, as opposed to at the system level in which the model applied to the data set illustrates, in the sense that a same level of understanding exists throughout a supply chain. The present finding is similar to that of Choi and Hong (2002); therefore, the applied model was modified to fit the real world data. Due to this form of understanding in a supply chain environment, this research argues that there cannot be a form of integration in a supply chain, in which all the members can act as a single organisation. Secondly, this time, unlike the findings of Choi and Hong, but supportive of the work by Wong and Boon-itt (2008), this research found results that without an influence, nothing happens in a supply chain; hence, in order any process to be understood and implemented over time; that is to say, the rules, regulations, processes even desires to be considered formalised, there must be an sufficient amount of power to instigate the formalisation process. The further implication of this finding might be that the structure of organisation or that of supply chain does not emerge as suggested by Choi et al. (2001), Choi and

Hong (2002), Choi and Kim (2008). Rather there needs to be some kind of an instigator to organise and manage a system regardless of its size, type or complexity. The understanding arising between the focal firms and the suppliers is represented at two levels in this study: operational and strategic clarity of expectations; hence while the former leads to a required level of operational integration, the latter causes a required level of strategic integration. The combination of the two is called supply chain quality in which desired outcomes is attained.

In terms of the relationship aspect of communication, trust seems not to be an indispensable factor for achieving the desired outcomes in any supply chain. In addition, the present result strongly suggests that in order for trust to be developed among members of a supply chain, they should be linked to each other with a high level of interdependency. In the case of power-based relationships, as long as there is business security for the firms who work with/for a powerful partner, it seems that they can make sufficient commitment to the relationship so that the desired outcomes can be attained.

As the final model illustrates, in a very complex network, it is almost impossible or even unnecessary to have complete integration. An adequate level of integration is satisfactory to achieve desired outcomes. So, it seems that it is only a myth, not a reality to talk about a supply chain which needs to act like a single organisation to achieve its targets. The findings of this research confirm that a full integration in a supply chain is not necessary, even an unfavoured option.

The following chapter will conclude this research by presenting the theoretical and practical implications of the current study along with providing information on the limitations of the research and the direction for the future work.

## CHAPTER VII – CONCLUSION

### Introduction

The Conclusion chapter consists of four sections. Section one presents this study's contribution to the existing theory. In the following section, the practical implications of the research undertaken are explained. The third section talks about the limitations to the study and suggestions for future research. Finally, the chapter concludes with a brief summary.

### 7.1 Practical Implications

In conclusion, it seems that working with a qualified supplier which enhances an entire supply chain to deliver the required outcome mainly depends on the efforts made by the focal firm. Hence, a focal firm needs to approach supplier-related activities systematically. A variety of means such as awarding continuous contracts (supplier incentives), technical, managerial, financial support, and competitive pressure can be used by a focal firm to motivate the supply base to improve their performance which will positively reflect on the improvement of the end performance. The analysis of the overall data received from the suppliers shows that the most important motivation for the suppliers who were included in this research is to have continuous business security. Even though none of the focal firms provides their suppliers with financial support, the suppliers who criticised their focal firms are the ones who do not foresee their short and long term future with their focal firm. The results of this study show that the larger a supplier's dependency to a focal firm in terms of workload, the more willing it is to make efforts to meet the focal firm's objectives. Hence, it seems that trust is not of critical importance to realise the requirements of a project as long as there are a sufficient level of commitment by the parties involved. Although the significance of trust cannot be overlooked, in power-based relationships, it is unlikely to be controlled easily and not necessary to exist to attain the objectives.

It is important that a focal firm should allocate supply-related resources wisely in order to reach a required target. This study suggests de-centralised management approach, in other words, management within dyads as a better alternative for the effective management of the whole supply chain. To recapitulate the reasons for this approach: because of the increase in the number of the suppliers that needed to be managed, the focal firm will not be able to build a close business relationship with the first-tier supplier to start the integration at the very beginning. Hence, the integration will be weak with the first-tier supplier. Also, imposing a core supplier list on the first-tier suppliers will likely to affect the relationship negatively between them and the further level suppliers. All the evidence from the present case studies also proves this point that even though the selection of the further level suppliers was made by the focal firms, the first-tier suppliers assumed overall responsibility for the management of business operations. Hence, it is only logical and more practical

for them to select and manage their suppliers. Therefore, managers of today's supply chains need to focus on the management of their most critical partner in terms of the end objectives they aim to attain. Also, instead of focusing on the relational factors, such as establishing trust in the relationship, the managers need to put more efforts to enable the suppliers to secure incoming business.

## **7.2 Limitations to the Study and Future Work**

This section has limitations that need to be addressed, and provides directions for future research. There are several limitations to the study. Although it is clearly stated in the previous sections that supply chains experience problems regardless of their industry type, the focus of this research is on manufacturing sector. Due to this reason, the generalisability of the results to other industries is limited. Nevertheless, it seems likely that some of all of the findings will be relevant in other environments. It will be invaluable to replicate the study in a wide variety of sectors including service and industries to observe the similarities and differences observed in contrasting environments.

The selected cases are all companies in Turkey. Although both of the case supply chains have supplied some of their raw-materials and semi-products from international suppliers, and have international customers, all of the contacted firms in the scope of this research are local firms. This could limit the generalisability of the findings. It might be likely that the focal firms (final assembler, used interchangeably) and the first-tier suppliers which play essential roles in most supply chains and have critical roles for the scope of this research show different characteristics and management style based on the countries they are located. For example, Turkish firms might be different from those in other countries such the US, the UK, Germany, and Japan to name a few. Hence, future researchers should replicate and extend the framework to the supply chains drawn from other countries. In the same vein, cross-cultural studies that examine the similarities and differences between countries based on the proposed framework will be desirable.

Another limitation to this study is the difficulty in accessing specific performance information. This was particularly difficult for the focal firm of one of the supply chains. Due to the lack of coherent strategic level activities, the interviewer was not encouraged to contact the relevant personnel from the department of Strategic Management. Also, it was observed that the most of the respondents were not in complete awareness of the operational level targets. Therefore, for this particular firm, there was no data collected on specific performance measures such as profitability, market share, quality, customer satisfaction. It is also worth noting, however, that even though some tangible performance values were gathered during the interviews, in general, firms including the suppliers were hesitant to share this kind of data with outsiders. When asked about specific performance measures such as quality and profitability, one of the suppliers' response was *'Yes, we monitor those performance values, but they are confidential so we cannot make them accessible'*, or the answers were more

general like, *'I think we have been doing much better in terms of profitability compared to the last year since we have been awarded more projects from the focal company'*. In addition, especially for strategic level measures such as profitability and market share, the need to contact top management is most of the time necessary since only personnel at those level have this type of data. The interviews for this research only included senior level managers some of who did not have this particular information. Therefore, due to these kinds of difficulties combined with the support from the relevant literature, the emphasis was on the approaches to the supply chain design and management to achieve any outcome as opposed to specific performance measures. Future research may want to consider specific performance measures depending on the type of supply chains included in the research.

Supply chain integration is based on three main parts in the current literature (Flynn and Flynn, 2010). They are intra-firm integration, manufacturer – supplier integration, and manufacturer – customer integration. Although this research addresses the significance of manufacturer – customer integration, the following restrictions have inhibited the exploration of this aspect of integration as much as manufacturer – supplier integration and intra-firm integration. Firstly, an increase in the number of interviews to include customers would extend the completion of the case studies. Due to the time constraints, the emphasis was given to the one side of the supply chain which is the upstream side. Secondly, the primary customer of one of the manufacturers chosen for this study was the government agency. An arrangement for the appointments with the public institutions usually takes longer, so a limitation for time was the main factor for confining the research to focusing on intra-firm and manufacturer – supplier integration. Future research which investigates all the aspects of supply chain integration simultaneously based on the proposed framework will make a valuable contribution to both literature and practice, in the sense that it may explore the relationships among these three aspects of supply chain integration.

The fact that this study explores the relationships among supply chain structure, supply chain integration and supply chain quality only from the viewpoint of a dyadic relationship, the focal firms and first-tier suppliers, the significance of the inclusion of a wider supply chain environment is obvious. Because supply chains are large and complex, it would be almost impossible to include all supply chain participants in the study. While exploring the dimensions of the supply chain structure, the both focal firms and first-tier suppliers were questioned on their views about the further upstream suppliers in relation to these dimensions, it would be invaluable to increase the number of the participants in terms of the level of tiers in order to conduct in-depth analysis. This would be an invaluable contribution to the both theory and practice to have deeper understanding for the highly abstract concepts such as supply chain structure, supply chain integration, and supply chain quality. In addition, this study only included the two first-tier suppliers for each focal firm. An increase in the

number of the same tier supplier will strengthen the reliability of the information collected from the focal firms and the first-tier suppliers, hence the findings of the study.

The last part of limitation to be noted is the case study instrument employed in this research. Details of the development of the case instrument and style of the interviews were provided in the Methodology chapter of this thesis. All the sources for the questions were also provided. Even though the method for ensuring construct and content validity were provided in the above mentioned chapter, the researcher also acknowledges the limitations on the accumulated knowledge on the concepts being interest to this research. Due to them being characteristically abstract, various possible exploration aspects of the dimensions exist. In the scope of this study, however, centralisation, for example, was confined to three processes: supplier selection, supplier involvement in design activities, and supplier support. Therefore, all the questions under the centralisation dimension were directly related to the above mentioned three processes. The same logic was used in the generation of the questions for the formalisation and communication dimensions. Hence, future research is welcome to look for other features of these concepts and raise different questions. In addition, future research taking other possible structural dimensions such as complexity, specialisation, inter – dependence and their effects on supply chain integration into consideration will add a valuable contribution to both practice and theory.

Apart from obvious factors such as economic circumstances, technological innovations, natural events, there are less perceptible elements which might have an effect on the performance of supply chains.

Supply chains are complex and each firm is likely to have connections with other suppliers and/or customers in the network. *Structural embeddedness*, the term used by Choi and Kim (2008) describes this situation and emphasises the significance of a firm's extended network on its performance. Hence, it can be argued that less vivid elements affecting the firm's performance, ultimately that of supply chain it connect to stem from the firm's links in the extended network (i.e. how a supplier's relationship with its suppliers or other buying firms affects its performance (ibid)).

The review of the literature for this study discusses the relationship between supply chain integration and performance and supports the idea of those who suggest that higher business performance is attained via integration in a supply chain (Cousins & Menguc, 2006; Flynn et al., 2010; Frohlich & Westbrook, 2001; Kim, 2009; Narasimhan & Kim, 2002; Romano & Vinelli, 2001; Stevens, 1989; Tan, 2001; Tan et al., 1998; Vickery et al., 2003; Wang et al., 2007). And, this research acknowledges the fact that integration occurs at three levels: within a firm (internal), with suppliers and customers (external) (Flynn et al., 2010; Frohlich & Westbrook, 2001). However, due to a number of limitations, for this research, as far as the focal firms of the case dyads are concerned, internal and customer

integration were not explored as detailed as supplier integration. Thus, it is likely, especially for MILCO's supply chain that the characteristics of the customer affect the performance of that particular supply chain. In fact, an enormous amount of influence of MILCO's main customer, the Undersecretariat for Defence Industries of Turkey (SSM), which acts as a Turkish Arm Forces' Procurement Agency on MILCO's supplier selection and management policy was observed and noted in this study. Therefore, the desired outcomes would be enhanced if the factors coming from the downstream of the chain were carefully determined and included in the study.

Further improvement could be made by changes in organisation structures within company. It was observed during the case-studies that hierarchical structure of the single firm, the links among the departments and a number of employees working in specific departments are all influential factors for the performance of the single firm. In addition, the positions of the departments functioning as a bridge to the external firms (suppliers and customers) are of particular significance. For instance, not having a discrete department which is solely responsible for supplier-related activities was a demotivating condition for both MILCO and the suppliers. For AGRICO, supplier development activities were performed under the department of Indirect Material Purchasing and Supplier Development, and employed only one engineer dealing with all the activities. These were some of the conditions critically brought to the interviewer's attention during the case visits. Hence, it is obvious that the allocation of a sufficient amount of resources within the firm to meet the demands of the external links in a supply chain is of critical for the firm's performance, ultimately that of the supply chain. From the perspectives of the suppliers, there was little negative feedback on the centralised form of the focal firms; it is noted that decision making process takes longer at these firms, MILCO and AGRICO. On the other hand, it seems that suppliers do not pay much attention to the structure of the customers as long as they have a clear understanding of their business future with that particular focal firm. Another criticism raised by the suppliers is related to the capability of their customer's evaluation systems. They reviled about the personnel and methods employed to assess them and their proposals. Hence, it could be invaluable for the buyer to originate a new system which can periodically check the effectiveness of the people and the methods utilised for those purpose mentioned above.

### **7.3 Conclusion**

This study set out to explore the ideas of supply chain quality (SCQ) which is defined as *the extent to which a focal firm integrates with the external links, particularly with the supply base, so that desired outcomes for the supply chain can be determined and achieved via the appropriate design and management of the supply base*. Based on this definition, it can be argued that when a supply chain attains the targets, that particular chain might be called as a competitive one, in other words, a quality supply chain. This is the general framework of the present research, from where the more specific

focus becomes to 'how those targets regardless of their type can be achieved'. Then, in response to this question, based primarily on the literature review, the concept of integration sits at the central point in the present study.

There are a significant number of previous studies to emphasising the importance of supply chain integration. However, due to the highly complex nature of the supply chain, there is no consensus on the responses to how to achieve it. It has not been made clear what the most important concepts and variables to focus on are, whether supply chain integration is ever possible or even plausible in the manufacturing environment, which are the important issues to be explored.

The findings of the present study conclude that managing the whole network requires a strategy that is based on a dyad relationship, underpinned by the rigorous supplier evaluation, selection, and support processes. This is named as centralisation in this study. In addition, the strategic and operational targets need to be mutually complementary, but they need to be articulated as such in order to ensure a clear, readily understood inter-firm policies, rules, regulations and behavioural guidelines. This is named as formalisation in this study. Particularly, short and middle term future of the suppliers need to be made clear with business continuity; the suppliers need to feel secure, in the sense that they know that they will remain as part of the operations unless something serious happens. As an enabler for both centralisation and formalisation, information sharing is an essential part of this triangle and can be considered as the support mechanism of the system, which is the supply chain. Again, based on the literature review, above mentioned concepts can be represented by the terms, centralisation, formalisation and communication are the dimensions of the supply chain structure.

While none of the dimensions of the supply chain structure identified in this research are new or novel, they have never been studied in this context before. More importantly, based on the existing knowledge, there have not been studies to investigate the relationship between these dimensions of the supply chain structure and supply chain integration and relate this knowledge to the supply chain quality. Therefore, the key contribution of this research is that it has taken a step toward increasing the understanding of a very complex phenomenon in a manner that is only possible when using qualitative methods. The primary focus needs to be on the management of the dyads in a particular supply chain in order to manage the whole network effectively. Future work to replicate the present study in particular the dyadic relationships within the supply chain to enhance the findings of this study would be invaluable.

Overall, conceptualisation this research proposes has both theoretical and practical importance and lays a foundation for future studies concerning the strategic potential of any dyad in general, that of buyer and the first-tier supplier in particular to design and manage the whole network to achieve supply chain integration, and ultimately supply chain quality. The new knowledge produced by this

study is that the effective management of the whole network stems from the management of the dyads in that particular network in the sense that the relationship within a dyad is sufficiently formalised and facilitated by the means of communication.

#### **7.4 Aims and Research Questions**

The purpose of this research is to provide an exploratory first step to build theory in order to address some gaps in the supply chain management literature. Furthermore, this study offers a framework and guidelines for practitioners of supply chains operating in the manufacturing industry in Turkey especially senior and top managers to design their supply chains in order to achieve supply chain integration. This research explores how the supply chain structure based on three main dimensions, namely centralisation, formalisation, and communication affects the supply chain integration and ultimately performance of the overall chain, in other words, supply chain quality.

A qualitative research is carried out using data collected from 41 interviews including the pilot study to response the following research questions:

**1. Does ‘supply chain structure’ provide a useful concept to both practitioners and academics?**

The present findings support the assertion made by Choi and Hong (2002) that in order to manage a supply chain, we as academics and practitioners focus our attention on increasing the understanding of supply chain structure. As shown in the Literature Review Chapter, the competitiveness of a supply chain comes with the achievement of integration within a supply chain. The present study shows that the critical point is to know how you as a manager of a supply chain configure the supply chain to achieve optimum level integration to attain the objectives.

**2. How does each variable of a supply chain structure affect supply chain integration?**

Centrally managed supply chains are managed by a single firm who has the power. It was observed during the study and supported by the literature review that suppliers are likely to comply with the requirements of the power holder even that firm is not their direct customer. This situation negatively affects the relationship between that supplier and its direct customer who is not the power holder. The findings of this study prove that the centralised management of the whole supply chain has a negative effect on the integration within a supply chain.

This study provides evidence to support that the level of integration between suppliers and their focal firms increase when the future of the suppliers is made unambiguous. The findings suggest that suppliers feel content with their relationships with the focal firms particularly when their short and middle term future is made clearer by awarding them with contracts.

In terms of communication, the present study's finding shows that the employment of IT is critical especially for sharing operational level data. The findings are supportive to the previous suggestion (Cousins and Menguc, 2006; Narasimhan and Nair, 2005; Handfield and Bechtel, 2002) that communication occurs among firms through formal and informal links. For strategic level of information sharing, the suppliers would not prefer formal communication to the informal ones. As long as the promises given during those formal or informal meetings or even conversations are fulfilled, they are highly valued from the viewpoints of the suppliers and give rise to the closer relationships between the focal firms and suppliers.

### **3. What are the most important variables of a supply chain structure in order to achieve supply chain integration?**

The findings of this study suggest that there is a possible sequence among these structural variables considered in this research on the way to achieve integration.

The comparison of the data collected from the two dyads in respect of IT usage illustrates that the focal firm who has IT links with the suppliers can have a large amount of influence on them. Hence, it is suggested that communication which is represented by the IT usage comes before centralisation.

In the definition of formalisation, which is employed in this research, it says that formalisation is about creating clear understanding among firms. The findings of the study suggest that rules and regulations are required by the powerful partner. Hence, in order any process, rules or regulations to be implemented, there needs to be a party with power. Therefore, it is claimed that centralisation comes before formalisation.

## **Appendix I – Interview Questions**

Pilot Study

### **General Questions**

Which management systems are used in your organisation, e.g. quality management, supply chain management, etc.?

### **Sub-sections' Interview Questions**

#### **Centralisation**

*'the degree of centralisation which reflects the scope of responsibilities and the power of SCM department within the organisation' (Kim, S.W., 2007, p. 325),*

*'the concentration of decision-making, that is, centralisation has defined as the extent to which the power to make SCM decisions is concentrated in an organisation' (previous SCM literature, Mollenkopf et al., 2000; Iyer et al., 2004; Manolis et al., 2004 see in Kim, S.W., 2007, p. 325),*

*'as consolidating SCM activities in a separate SCM functional area or department. They treat the grouping of SCM activities as scope, a separate dimension of the organisation structure' (Droge et al., 1992 see in Kim, S.W., 2007, p. 325),*

*'centralisation tells us where in the organisation decisions are made. Who has the authority, power and position to make decisions?' (Kim, S.W., 2007, p. 325).*

1. How are requirements of labour force determined in your organisation? Is there any involvement of suppliers and/or customers into this process?
2. How are the appointments of the workers done in your organisation? Is there any involvement of suppliers and/or customers into this process?
3. How is promotion of direct workers carried out? – not explored
4. Which department or cross-function deals with labour disputes may occur in your organisation or across the SC? – not explored
5. How is the organisation structure? Is it more towards centralisation or decentralisation?
6. What is the procedure for the appointment of supervisory (management) staff from outside the organisation? When this is the case, does your organisation inform upstream and/or downstream organisations in the SC?
7. What is the procedure for a promotion of supervisory (management) staff? – at an organisation level
8. What is the procedure for determining the salaries of supervisory (management) staff? – at an organisation level
9. What is the procedure for the spending of unbudgeted or unallocated money on capital items in your organisation? Does the same procedure apply throughout the SC? – not explored
10. What is the procedure for the spending of unbudgeted or unallocated money on revenue items? Does the same procedure apply throughout the SC? – not explored
11. Selection of type or brand for new equipment\*
12. What is the procedure for overtime to be worked? Do any of your staff involve into a decision of this type in other member organisations in the SC?
13. Are delivery dates and/or priority of orders accessible to any member organisations in the SC?
14. What is the procedure for the promotion of new product or service? Which department is responsible? Is there a cross functional team in the SC for this type of work?
15. What are the new marketing policies across the SC?
16. Extent and class of market (operational field) to be aimed for\*, **Again, what is the policy of determining an extent and class of market?**
17. Costing; i.e., to what costing system, processes, etc. the inspection system, if any, will be applied\*, systems in terms accounting, inspection, etc., are these decided upon the consensus of all member organisations in the SC?
18. Inspection; i.e., to what items, processes, etc. the inspection system, if any, will be applied\*, is there any involvement of supply chain partners in the inspection period?
19. Operations that will have work studies made of them\*
20. How does the planning stage occur in the SC?
21. What is the procedure for reviewing the outputs against given plans? Is there any involvement of member organisations of the SC into this process? (Outputs to be scheduled against given plans)
22. What is the procedure for dismissal of operative? Is there any say of other member organisations in this procedure?

23. What is the procedure for dismissal of supervisor? Is there any say of other member organisations in this procedure?
24. Is there a preferred method for personnel selection in your organisation? Is it applied throughout the SC?
25. Are there common selected methods for training activities? Are the inter-organisational training activities available across the SC? Which department plans these types of activities in your organisation?
26. Is a buying procedure similar (or same) throughout the SC?
27. Suppliers of materials to be used\*
28. Is there a common approach for determining the work methods to be used across the SC, e.g. if lean principles are applied in your organisation, same principles should be applied across the SC?
29. What is the procedure for determining about the machinery or equipment used in your organisation? Does the same procedure apply throughout the SC? Is there any inter-company involvement in these types of decisions?
30. What is a procedure for allocating of work among the available workers in your organisation? Is the same procedure applied when the allocation of work is done throughout the SC?
31. Welfare facilities to be provided\* - not explored
32. Price of the output\* - not explored
33. When alterations occur in responsibilities or areas of work of functional specialist departments, are other member organisations informed, or if necessary, alterations are also done in their related areas? (Altering responsibilities or areas of work of functional specialist departments\*)
34. Altering responsibilities or areas of work of line department\* - skipped
35. When a creation of a new department (functional specialist or line) is occurred, are the other member organisations involved into this process? (Creation of a new department (functional specialist or line)\*).
36. When a creation of a new job (functional specialist or line, of any status, probably signified by a new job title) is occurred, are other member organisations involved into this decision? (Creation of a new job (functional specialist or line, of any status, probably signified by a new job title)\*).
37. Who takes over in the chief executive's absence? When there is a change in the management, does this affect the management of the SC?
38. Does the organisation (or a supply chain) management ensure that the responsibilities and authorities are defined and communicated within the organisation? (TAI-5.5.1, 01)
39. Does the organisation (or a supply chain) appointed one or more members of management to serve as the management representative? (TAI-5.5.2, 01)
40. Does the organisation (or a supply chain) ensure that appropriate communication processes are established within (outside) the organisation, and that communication takes place for the effectiveness of the (quality?) management system? (TAI-5.5.3, 01)
41. Does the top management of the organisation (or a supply chain) review the (quality) management system in place, at planned intervals, to ensure its continuous suitability, adequacy and effectiveness, and are the results of management reviews recorded? (TAI-5.6, 01 and 02)
42. When planned results are not achieved, does the organisation (or a supply chain) take correction or corrective action, as appropriate, to ensure conformity of the product/the service? (TAI-8.2.3, 02)
43. The extent to which the power to make logistics decisions is concentrated in the organisation
44. The number of subordinates who report to a single superior
45. The degree to which logistics activities are grouped together in the same organisation or organisational sub-unit

(Questions 1 - 37 were adopted from an article Pugh, D.S., Hickson, D.J., Hinings, C.R. and Turner, C., 1968. Dimensions of Organisation Structure, Administrative Science Quarterly, p. 65-105. Questions 43 - 45 were taken from an article Soo Wook Kim, 2007. Organisational structures and the performance of supply chain management, International Journal of Production Economics).

## **Formalisation**

### **Definitions of formalisation**

*The concept of formalisation refers to 'the extent that the rules governing behaviour are precisely and explicitly formulated and the extent that roles and role relations are prescribed independently of the personal attributes of individuals occupying positions in the structure. In other words, formalisation describes the degree to which work and tasks performed in the organisation are standardised' (Kim, S.W., 2007, p. 325),*

*'the degree of formalisation which can be explained by the existence of independent department (SCM) responsible for supply chain management and the strategic positioning of the department' (Kim, S.W., 2007, p. 324),*

*'as the degree to which decisions and working relationships for SCM activities are governed by formal rules and standard policies and procedures' (Bowersox and Daugherty (1995) and Daugherty et al. (1992) see in Kim, S.W., 2007, p. 325),*

*'as distinguishing "how far communications and procedures in an organisation are written down and filed"' (Pugh et al. see in Walsh, P.J. and Dewar, R.D., 1987, p. 217),*

*'to be a key attribute of organisational structure and defined as "the standardisation of decision-making in organisations on the basis of a detailed system of formalised procedures"' (Blau and Schoenherr, 1971 see in Walsh, P.J. and Dewar, R.D., 1987, p. 218),*

*'as the process through which the desired behavioural standards of one actor (or set of actors) for the other(s) become reified in such a way that they are readily remembered and understood over time without the need for the first actor(s) to repeat them, or the other even to know that the first actor originated them.' (Walsh, P.J. and Dewar, R.D., 1987, p. 218),*

*'is a quality of an interaction expectation.' (Walsh, P.J. and Dewar, R.D., 1987, p. 219)*

## **Role Definition**

1. Who has written contracts of employment (includes legal contract, formal letter of appointment, and terms of engagement or rules signed by employee)? – not asked
2. Are there common handbooks used throughout the SC? If so, what is the rate of their usage among the SC? – not asked
3. How many handbooks commonly used (shared) across the SC?
4. Is there a map of the SC which shows the roles and responsibilities of each organisation in the chain?

5. Are written operating instructions available to direct worker both for organisational and SC activities?
6. Do the written operating instructions in your company have references from previous operating instructions of other member organisation(s) (suppliers), or refer to that of other member organisations (customer)?
7. Are similar terms of reference or job descriptions or titles of jobs used throughout the SC? (i.e., scope of a production manager in one organisation is same as that of other organisations in the SC) (Written terms of reference or job descriptions).
8. Are there any manuals shared among the SC? (Manual of procedures or standing orders)
9. Are the statements of mission and vision shared across the SC?
10. Is a production schedule or program created by a cross-team of the SC? Is the production schedule or program available to any member organisation (supplier, supplier's supplier, customer, customer's customer) when required?
11. Are there any research programs or reports available throughout the SC? (Research programs or reports)
12. Has the organisation established, documented, maintained and continually improved a quality management system in accordance with the requirements of any quality management standards (e.g., ISO 9001:2000, AS9100, etc.)? Is there an established quality management system in place? What is it? Is the same quality management system used across the SC?
13. If the organisation chooses to outsource any process effecting product conformance, does the organisation ensure that such processes are identified and controlled within the existing (quality?) management system?
14. Do documents needed ensure the effective planning, operation and control of processes?
15. Do all the documents of the organisation required for the (quality?) management system been placed under control?
16. Is there a system in place to ensure the integrity of the (quality?) management system is to be maintained when changes to it are planned and implemented? (TAI-5.4.2, 01) How does the SC ensure the integrity of the existing management system when a change is done in one member organisation? – not asked, not find an applicable environment to ask this question
17. The degree to which goals, rules, policies and procedures for logistics activities are precisely and explicitly formulated? The degree to which goals, rules, policies and procedures for SCM activities are precisely and explicitly formulated?
18. The extent that roles and role relations are prescribed independently of the personal attributes of individuals occupying positions in the structure. Is the same thing applicable to SC structure? (The extent that roles and role relations are prescribed independently of the personal attributes of individuals occupying positions in the SC structure?)
19. Participation of logistics managers in strategic planning

(Questions from 1 - 10 were adopted from an article Pugh, D.S., Hickson, D.J., Hinings, C.R. and Turner, C., 1968. Dimensions of Organisation Structure, Administrative Science Quarterly, p. 65-105; questions 16 – 18 were taken from an article Soo Wook Kim, 2007. Organisational structures and the performance of supply chain management, International Journal of Production Economics).

### **Information Passing**

1. Which kinds (levels) of decisions for SC activities require management approval in writing? (Management approval in writing required for certain decisions). – not asked

2. Is there a suggestion scheme throughout the SC which enables anyone from the chain to express his/her opinion about the activities of the whole chain? (Suggestion scheme).
3. What kinds of means are used for passing information across the SC? (Memo forms).
4. Notification of engagement of direct workers: - not asked
5. How do senior executives of member organisations interact with each other? (i.e., are the minutes of senior executive meetings of each organisation are passed to the same level of management executives across the SC? (Minutes for senior executive meeting (i.e., centralisation level 2, personnel))).
6. Are conference reports delivered across the SC? If so, how? (Conference reports).
7. An agenda of senior executive meetings of each organisation is available to other member organisations? (Agenda for senior executive meeting (i.e., centralisation level 2, personnel)).
8. Is an agenda for workflow (production) meetings available to other member organisations in the SC if required? (Agenda for workflow (production) meeting).
9. Are minutes of workflow (production) of an organisation available to other member organisations if required? (Minutes for workflow (production) meeting)
10. Written reports submitted for workflow (production) meeting - not asked
11. Welfare documents for direct workers on engagement - not asked
12. Is a dismissal in an organisation communicated throughout the SC? Are there same rules established for this procedure in the SC? (Dismissal form or report recording or communicating the dismissal).
13. Is there a SC journal published and delivered across the SC? (House journal).  
(Questions were adopted from an article Pugh, D.S., Hickson, D.J., Hinings, C.R. and Turner, C., 1968. Dimensions of Organisation Structure, Administrative Science Quarterly, p. 65-105).

### **Recording of Role Performance**

1. Are inspection records available to any organisations in the SC when required? How? Are these records always accessible or only when they are required? (Record of inspection performed e.g. report, certificate, quality card, etc., recording both positive and negative results, not merely a rejection slip).
2. Is there any work assessment system in place? What is it? How does it work? Are there commonalities in terms of the used system across the SC? (Work assessment record (work study)).
3. Does the organisation keep the records of maintenance performed on production equipment? When required, are these records available to other member organisations in the SC? (Record of maintenance performed on workflow (production) equipment).
4. Does the organisation keep the records of direct workers' work who are involved in SC activities? (Record of direct worker's work).
5. Does the organisation keep the records of direct workers' work who are involved in SC activities? (Record of direct worker's time).
6. Document stating tasks done or to be done on unit of output (e.g., batch dockets, route tickets, etc.)- not asked
7. Petty cash voucher, authorizing and/or recording petty expenditure- not asked
8. Written application for, or sanction against, spending £1,000- not asked
9. Requisition for engagement form for direct worker- not asked
10. Frequency of records of direct worker's work- not asked

(Questions were adopted from an article Pugh, D.S., Hickson, D.J., Hinings, C.R. and Turner, C., 1968. Dimensions of Organisation Structure, Administrative Science Quarterly, p. 65-105)

## **Communication**

1. What evidence is there of a communication policy throughout the SC? (e.g. newsletters, team brief, quality notice boards)?
2. What is the predominant direction of transfer of information – up or down the SC?
3. How effective is the flow of information in terms of two-way transfer? Which way (up, down or across) is more effective? Why?
4. Are business objectives (predetermined performance values) communicated so that the business plan is understood through the SC?
5. What potential communication problems exist throughout the SC?
6. What means are used to recognise and communicate the achievements of both individuals and teams? Is this procedure similar within an organisation and across SC?
7. Does the organisation ensure that personnel have access to (quality?) management system documentation and are aware of relevant procedures? – at an organisational level
8. Do a customer's and/or a regulatory authority's representatives have access to (quality?) management system documentation?
9. Do a supplier, a customer and/or a regulatory authority have an access to the records in accordance with the contract or regulatory requirements? (TAI-4.2.1, 03)
10. Does the organisation (or a supply chain) determine and implement effective arrangements for customer communication in relation to product information, inquiries, contracts, order handling, amendments, customer feedback and customer complaints? (TAI-7.2.3, 01)

(Questions 1- 6 were adopted from Dale et al., 5<sup>th</sup> ed., p. 141)

## **Barriers within and between organisations in the SCs**

1. How much of a problem are caused by organisational barriers or that outside in supply chain?
2. Which organisations do you consider presents the most barriers? Why?
3. How do these barriers affect cross-functional co-operation and communication throughout the SC?
4. What steps throughout the SC are being taken to break the barriers down?
5. Are people sympathetic to what is involved in jobs undertaken by others?
6. To what extent are there problems between organisations?
7. To what extent are cross-functional teams in operation?

(All the questions were taken from Dale's et al. work, 5<sup>th</sup> ed., p. 140)

## **Formal Study**

### ***Centralisation***

1. How does your organisation select its suppliers? (Source: Pugh et al., 1968; Choi and Hong, 2002).
2. In which processes does your organisation allow its suppliers to be involved? (Processes can be at different levels. In other words, processes can be related to the decisions taken at strategic level, or processes can be related to the decisions are taken at operational level, etc.) (In order to make the question clear, the interviewer might mention the following areas: product development and design activities, entering new markets, pricing of a new product (to discuss the production processes of parts

to reach a method for producing with a minimum cost), hiring or firing of senior personnel, investment planning, budget planning) (*Source: Wang's (2001) and Pugh et al.'s (1968) individual questions were combined and adapted to the supply chain context*).

3. Does your organisation help the suppliers to solve their problems? To which number of tiers of suppliers does your organisation help? If so, how and how often? (*Source: a newly developed question based on the definition by Choi and Hong (2002)*).

4. Does your organisation provide training to its suppliers including first, second, third tier, so on when required? Which department plans these types of activities in your organisation? (*Source: a newly developed question based on the Choi and Hong's (2002) definition*).

5. What do you think about the controlling the activities of your organisations' suppliers including first, second, third tier, so on? Does your organisation attempt to control, or does it want their suppliers to be independent? Which activities of your suppliers does your organisation want to be consulted about? And, how and how often?

- a) Suppliers' financial status
- b) Suppliers' personnel selection process
- c) Suppliers' production processes
- d) Suppliers' selection of other customers regardless of that customer being performing in the same production field as the buyer or any other field
- e) Suppliers' purchasing activities
- f) Suppliers' logistics activities
- g) Suppliers' acquisition of new equipment
- h) Suppliers' investment in a software/hardware (e.g. for software: electronic data interchange (EDI) or enterprise resource planning (ERP), etc., for hardware: faxes, security systems, etc.)
- i) Suppliers' quality management systems' audit results
- j) Suppliers' investment plan

*(Source: Steve Child's question)*.

6. In relation to the question 5, also evaluate a buyer's perspective on the issues stated below. This question aims to explore whether the organisation apply any control over the following activities of its suppliers including its first, second, third, so on tier suppliers? (*Note! The focal firm might not apply strict control, but be influential over the suppliers on the following activities*)

a. To what extent is your organisation influential on its suppliers' mission and vision statements? (*Source: a newly developed question*)

- b. Overtime hours in the suppliers. (Overtime to be worked) (*Source: Pugh et al.'s (1968) original question was adapted to the supply chain context*)
- c. Creation of a new job (functional specialist or line, of any status, probably signified by a new job title)? (Creation of a new job (functional specialist or line, of any status, probably signified by a new job title) (*Source: Pugh et al.'s (1968) original question was adapted to the supply chain context*)
- d. Creation of a new department (functional specialist or line)? (Creation of a new department (functional specialist or line) (*Source: Pugh et al.'s (1968) original question was adapted to the supply chain context*)
- e. Do alterations in responsibilities or in areas of work of functional specialist departments (changes in job descriptions) in the suppliers occur? If yes, how often? What are the reasons of these changes? Does your company have an influence on its suppliers in these kinds of decisions? (Altering responsibilities or areas of work of functional specialist departments) (*Source: Pugh et al.'s (1968) original question was adapted to the supply chain context*)
7. Who takes over in the absence of the chief executive in the organisation? When there is a change in the management of the organisation, does this affect the management of the suppliers? (Who takes over in the chief executive's absence) (*Source: Pugh et al.'s (1968) original question was developed by adding the second part of the question*). (*With this question, it is attempted to explore whether or not the organisation has established necessary positions/procedures to manage the suppliers? Or with the change of a top manager, is the policy of supplier management affected drastically?*)
8. What is the procedure for the allocation of work load among the available suppliers in your organisation? Are the customers and/or the suppliers involved in this process? (Allocation of work among available workers) (*Source: Pugh et al.'s (1968) original question was adapted to the supply chain context*).
9. Is your organisation a member of any associations with regard to its activities in the supply chain? If so, which associations are they? Also, does your company encourage its suppliers to become a member of any of these associations or organisations or clusters? For example, OSSA (Ostim Defence & Aviation Cluster)
10. How does your organisation evaluate the performance of its suppliers including first, second, third, and so on tier? Which performance measures are employed by your organisation to assess the suppliers' success or failures? If the performance measures are found inadequate, which actions does your organisation take in order to improve the situation? (A newly developed question by me).
11. Is your organisation centralised or not? If you think it is centralised, what is the most important indication of it? How much power does your organisation have in the SC, and in which areas? (The number of subordinates who report to a single superior) (*Source: a newly developed question based on Kim's original question*) (This question is not answering any research question. However, by collecting this information about the company, I might have a better idea about the company and write about it at the beginning of this chapter or wherever I am introducing the company).

- a. To what extent is your organisation influenced by its customers when it develops its mission and vision statements? (Source: a newly developed question)
- b. The responsibility to make the decision concerning new product introduction is centralised at the top-most levels of management (Source: Wang, 2001 and Pugh et al., 1968)
- c. The responsibility to make the decision about entry into major new markets is centralised at the top-most levels of management (Source: Wang (2001) and Pugh et al. (1968))
- d. The responsibility to make the decision about pricing of new product lines is centralised at the top-most levels of management (Source: Wang (2001) and Pugh et al. (1968))
- e. The responsibility to make the decision concerning hiring and firing of senior personnel is centralised at the top-most levels of management (Source: Wang (2001) and Pugh et al. (1968))
- f. The responsibility to make the decision concerning capital budgeting is centralised at the top-most levels of management (Source: Wang (2001) and Pugh et al. (1968))
- g. Overtime hours within the company itself. (Overtime to be worked) (Source: Pugh et al. (1968))
- h. How is the organisation structured? Is it more towards centralisation or decentralisation? Is there a similar diagram for a SC? (Number of supervisors) (Source: Pugh et al.'s original question was adapted to the supply chain context)

### **Formalisation**

1. Dealing with your suppliers including first, second, third, and so on tier, how does your organisation ensure that a final product is satisfactory at all times? Which tools, procedures, behavioural guidelines are employed by your organisation for this purpose? And, which of the means (tools or procedures or behavioural guidelines) are the most effective in order to attain required result from the suppliers? (Source: a newly developed question)
2. Do your first tier suppliers exercise the similar methods (tools, procedures, norms) to its suppliers (second tier supplier) to ensure consistency outputs over time? (Source: a newly developed question)
3. Doing business with your suppliers and/or customers, are the rights and obligations of both sides clearly known to each of them? If so, how? (Source: a newly developed question)
4. In your dealings with your suppliers and/or customers, in which processes (some processes are performed to achieve strategic level decisions, some processes are performed to achieve tactical level decisions and others are performed to achieve operational level decisions) does your organisation expect consistent results? How does your organisation attain this required consistency? (Source: a newly developed question)
  - a) Processes related to strategic level decisions: entering new markets, investment planning,
  - b) Processes related to tactical level decisions: financial status of the suppliers,

c) Processes related to operational level decisions: product development and design activities, quality issues, production processes,

5. Which processes occurring between your organisation and its suppliers / customers are most ambiguous? Why? (*Source: a newly developed question*)

6. How does your organisation award contracts / work to its suppliers? (Or what is the process of awarding a contract to your suppliers?) (*Source: a newly developed question or (Choi and Hong (2002))*)

a) How does your organisation award additional contracts / work to its suppliers? (*Source: Choi and Hong (2002)*)

b) Does the same procedure apply throughout the supply chain, i.e. does your organisation sign a contract with its second, third tier suppliers? (*Source: a newly developed question*)

c) Does this procedure with your organisation and the supplier show similarity with the one between your organisation and the customer? (*Source: a newly developed question*)

7. How are the engineering change orders processed within your organisation? How are the engineering change orders conveyed throughout the supply chain? (*Source: Choi and Hong's (2002) original question has been adapted to the supply chain context.*)

8. Has the organisation established, documented, maintained and continually improved a quality management system in accordance with the requirements of any quality management standard (e.g. ISO9001:2000, AS9100, etc.)? (This question investigates the formalisation level within the organisation) (*Source: Turkish Aerospace Industry (TAI) Quality Management System (QMS) standard audit question*)

a) Does this same QMS standard ensure that procedures for all the activities between your organisation and its suppliers and customers are identified and controlled within the existing QMS standard? (*Source: a newly developed question*)

b) How does your organisation ensure the integrity of this management system? In other words, is there a system in place to ensure the integrity of the QMS when changes to it are planned and implemented? (*Source: TAI QMS audit question*)

c) In this management system or in other place, to what extent roles and role relations are prescribed independently of the personal attributes of individuals occupying positions in the structure? (*Source: Kim (2007)*)

d) Does your organisation have all the documents given below? Does your organisation share the documents given in the group number 1 and number 2 with its suppliers and customers? (*Source: Germain and Spears's (1999) original question has been adapted to the supply chain context.*)

1. Strategic plan for: Marketing, Distribution, Production, Purchasing and Overall business unit,

2. Mission statement for: Marketing, Distribution, Production, Purchasing and Overall business unit,

3. Job descriptions for: Direct production workers, Clerical workers, Supervisors, Specialists, Chief executive, Manual procedures and fixed rules, Written operating instructions

9. Are there any common programs or reports or documents (production schedule, inspection (quality) reports, inventory reports, delivery reports and also reports related to strategic level decisions such as reports for future investment plans) employed across the supply chain? (*Source: Pugh et al. (1968)*)

10. How does your organisation conduct performance evaluation process for in-house and for its suppliers and customers? (*Source: a newly developed question*)
11. How does your organisation perform equipment maintenance at your organisation? Is there a procedure for this activity? Does your organisation have any control for its suppliers' equipment maintenance process? If so, how? (*Source: a newly developed question*)
12. Which procedure is followed in your organisation when new equipment is acquired? Does your organisation consult with its customers before buying new equipments? Also, does your company have any control or influence on its suppliers' decision including first, second, third, and so on to buy new equipments? For specific projects, does your organisation help its suppliers financially to buy the required equipments? (*Selection of type or brand for new equipment*) (*Source: Pugh et al.'s original question was adapted to the supply chain context*)
13. How are the work procedures determined in your organisation? Are there any other organisations from the supply chain included in this process? How does your organisation ensure that it is clear and explicit in its communication with its suppliers and customers? (*Methods of work to be used (not involving expenditure); .i.e., how a job is to be done*) (*Source: Pugh et al.'s original question was adapted to the supply chain context*)

### **Communication**

1. Discuss the mode of communication with your suppliers (on a regular basis and, if so how often, and on ad hoc basis and, if so, when) (*Source: Choi and Hong (2002)*)
2. Discuss the mode of communication with your customers? (*Source: a newly developed question*)
3. Which information system support technologies does your organisation have to share information with its suppliers and customers? (*Source: Zhou and Benton (2007)*)
4. What type of information does your organisation share with its suppliers and customers, e.g. production level information: inventory data, forecast, production schedule, cost, quality performance metrics, customer feedback, and strategic level information: target price, target market share, profit, design, etc.
5. How effective is the flow of information in terms of two-way transfer? Which way (up, down or across) is more effective? Why? (*Source: Dale et al.'s (2007) original question was adapted to the supply chain context and the last part of the question belongs to Steve Child.*)
6. Does your organisation communicate the objectives (aims, targets, required performance measures) of each project / work to its suppliers including its first, second, third, and so on tier so that project plan is understood through the supply chain? If so, how and how often? (Are business objectives communicated so that the business plan is understood at all levels of the organisational hierarchy?) (*Source: Dale et al.'s (2007) original question was adapted to the supply chain context.*)

7. What potential communication problems exist throughout the supply chain? (Source: Dale et al.'s (2007) original question was adapted to the supply chain context).
8. What means are employed to recognise and communicate the achievements of both individuals and teams within your organisation, and with its suppliers and customers? (Source: Dale et al.'s (2007) original question was adapted to the supply chain context)
9. Does your organisation ensure that personnel have access to quality management system documentation and are aware of relevant procedures? (Source: TAI QMS audit question)
10. Do customer and/or regulatory authority representatives have access to quality management system documentation? (Source: TAI QMS audit question)
11. Do supplier, customer and/or regulatory authority have an access to the records in accordance with the contract or regulatory requirements? (Source: TAI QMS audit question)
12. Are there committees that are formed among the members of the supply chain to take decisions on the primary topics and principles? (Source: Unuvar's original question was adapted to the supply chain context)
13. For the specific project, are there cross-functional teams formed among the members of the supply chain? (Source: Unuvar's original question was adapted to the supply chain context)

## **Appendix II - Background Information on the Case Firms**

The original names of the firms are not disclosed and treated as confidential.

### ***Military Electronics Industry and Supply Chain***

#### **Military Electronics Industry, MILCO: Focal Firm**

MILCO (Askeri Elektronik Sanayi – Military Electronics Industry) is one of the leading manufacturing companies operating in the defence industry in Turkey. Based in Ankara, it was established in 1975 as a production facility to provide electronic products primarily to the Turkish military. Over the last 30 years, expanding in the local and global markets, it has become a high technology, multi-products defence electronics company whose products have applications in both military and professional fields. According to the field of activities, MILCO has been organized in four main divisions:

1. Communication and Information Technologies Division (HBT),
2. Radar, Electronic Warfare and Intelligence Systems (REHİS) and
3. Defence Systems Technologies (SST) are located at Macunköy-Ankara.
4. Microelectronics, Guidance & Electro-Optics Division (MGEO) is located at Akyurt-Ankara.

For each division, the sample products are as follows: tactical radios, tactical area communication systems, avionic, satellite and naval communication systems, public safety communication systems for the first group; radar systems, electronic warfare self protection systems, electronic warfare intelligence and attack programs for the second group; weapon systems, command control (C4ISR) systems, naval combat systems, traffic systems for the third group; and lastly electro-optic systems, navigation & guidance, avionic systems, microelectronics for the fourth group.

84.58% of MILCO's share is owned by the Turkish Armed Forces Foundation; 15.30% of its share is in the stock market, the rest which is only 0.12% belongs to the unnamed shareholders. Currently, total of 4150 people including 2250 engineers are working for MILCO.

According to the Purchasing Manager at MILCO, SSM aims to establish a national defence industry where it can do business with only few large-size firms. SSM encourages these primary firms to generate national small and medium size firms (SME), in the defence sector. The Purchasing manager argued that SSM has been successful in this aim so far, and explains the situation further. In the middle of the 70's when MILCO was newly established, there were no SME in the sector. Due to this restriction, MILCO had to manufacture everything in-house. With the national policy of the Turkish governments since then, today, there are sufficient numbers of SME supplying to only military industry. Today, SSM, acting as a customer on behalf of Turkish Armed Forces, directly contacts with MILCO or other defence firms; it is not involved into the activities which occur in the supply chain beyond these main firms. Based on this information, it may be implied that the SSM's management of the suppliers is biased towards de-centralisation.

### ***MILCO's Suppliers***

#### **Supplier A**

The company was initially founded in 1975 on the 90 m<sup>2</sup> production space. In 1979, it increased its workshop space to 400 m<sup>2</sup>. The company currently works at its own premises of 3000 m<sup>2</sup>. Supplier A manufactures a high variety of products to different sectors. Some but not all the products are: analogue and digital measurement devices, current transforms, manufacture born connectors, metal cutting, and plastic injection parts. The company has the ISO 9001 quality management system standards and works in compliance with the requirements of it. Supplier A also has a facility security clearance certificate.

#### **Supplier B**

Supplier B is a designer and manufacturer company whose operation field in the area of cable and wire harness, and electrical box and panels. Its aim is to become the first choice reliable cable and wire harness supplier for Aerospace and Defence Industry in the local and international market. In

addition to MILCO and another national defence firm who are the main customers of supplier B, the following military companies are amongst its customer portfolio: Roketsan (Like MILCO, Roketsan is a Turkish Armed Forces Foundation Investment), Havelsan (Havelsan is another organisation owned by Turkish Armed Forces Foundation), FNSS, and HUBER+SUHNER. Currently, including 11 engineers and six administrative personnel, supplier B employs 90 personnel and offers the customers the high quality cable and wire harness, and electrical box and panels which are used in helicopters, aircrafts, military electronic systems, avionic systems, special naval-systems, tanks& armoured vehicles, rockets and other military application. It operates in accordance with the quality management standards known in defence industry, namely ISO 9001:2000 and AS 9100. In addition to the quality management standards, supplier B has a facility security clearance certification. Although the General Manager of supplier B does not specify the real percentage of the sales to each customer, at the moment, all of its sales are for the national market, mainly for MILCO (% 50) and the other national defence firm (%50). As seen in the Figure 4-1, supplier B is the first tier supplier of MILCO.

### ***AGRICO and the Supply Chain***

#### ***AGRICO: Focal Firm***

AGRICO was founded in the Turkish capital, Ankara, in 1954. Today, it is the leader of the domestic market with 54% tractor sales. AGRICO is the first producer institution of Turkey in the field of automotive industry, and has annual capacity of 35000 tractors and 25000 motors. Its share holders are a Turkish corporation (37.5%) and one of the largest agricultural equipment producers of the world, PP (37.5%). The rest of its share is open to the public.

AGRICO has 150 domestic and 120 foreign suppliers. Currently, it employs more than 1000 people. AGRICO is certified to manage and provide continuous improvement in the principles of Quality, Environment and Occupational Health and Safety processes.

#### ***AGRICO's Suppliers***

##### **Supplier C**

Supplier C, who is a privately owned company, was established in 1947 as a casting firm in Konya, a city of Turkey. Today, supplier C with two main firms and seven to eight subcontracting firms are located in the industrial part of the city of Ankara, called Sincan. Including 15 engineers, the firm currently employs 270 people. Supplier C has been certified by TS EN ISO 9001:2000 for more than 10 years now. It has an annual capacity of 20.000 tons gray nodular iron casting of which 5.000 tons served as machined. Since 1977, the company's main customer is AGRICO, who buys parts from supplier C, equivalent of more than its 60% of sales.

**Supplier D**

Supplier D has been operating in the field of plastic parts design, mold making, injection molding and assembly, not only in terms of production facilities, but also in terms of technical know-how with the knowledge and experience since the establishment in 1973. By complying with the requirements of the ISO 9001, ISO/TS 16949, TS 18001, and TS 14001, supplier D aims to satisfy customer needs with the highest quality. With 140 different customers and 500 suppliers, supplier D continues to be the industry pioneer and leader in the precision plastic injection moulding and plastic based component business. It has more than 400 employees.

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