Master's degree thesis

LOG950 Logistics

Information Technology Intermediaries in Supply Chain Integration - A Case Study based on Transaction Cost Analysis

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Dedication

This thesis is dedicated to all my family:

My late father, Pa Thompson Oluwaseyifunmi Ikuomola

My late Mother, Princess Owoyiyone Suziana Oyenowo

My late brothers and sister; Idowu, Itiolu, and Arinola Joshua, and those that are alive;

Ojulere, Aduni, Owolemi, Taiwo, Kehinde, Oluwafunmilade, and Owoseini

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Abstract

Purpose: Information technology intermediaries, with new development and improvement in IT, have proven that information flow can be improved upon. Such improvement would actually lead to better performance in supply chain. Important to note is that the roles of information technology intermediaries have encouraged efficiency in information flow among the supply chain actors. The research, therefore, was to evaluate the coordinating mechanisms that would help improve on the performances of the supply chain through information technology intermediaries.

Theoretical framework: Transaction cost analysis was applied in the study. The other concepts such as electronic businesses, purchasing and supply chain management, inter-organizational systems were used to concretize on the main theory. From the main theory, four (though there was proposition 1a and 1b) propositions were formulated. The propositions were also used in building the research model in connection to the theory and the concepts applied. Structured interview was designed for the three targeted case companies in order to have the empirical view in comparison to the theoretical evaluations.

Findings: The study provided insight to the fact that the three coordinating mechanisms are important based on extant literature. The study certainly created avenue for adopting open market through which information technology intermediaries can improve on the performances of the supply chain without any direct or indirect control from the supply chain actors. Otherwise, hybrid form of coordination could be alternative mechanism, but with some restrictions that could be clearly defined in the contracts such as defining the numbers of the supply chain actors that could use the platform. Therefore, information flow through information technology demands activities of the service providers – information technology intermediaries in supply chain.

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ABBREVIATIONS

AU – African Union

BI – Business Intelligence

B2B – Business – to – Business

B2C – Business – to – Customers

CRP – Customer Replenishment Process

CRS – Computer Reservation Systems

EDI – Electronic Data Interface

EFT – Electronic Fund Transfer

ERP – Enterprise Resource Planning

EU – European Union

FTP – File Transfer Protocol

4PLs – Fourth Party Logistics

GP/NAV/SL – Great Dynamics/Navision/Solomon

HTTP – Hypertext Transfer Protocol

ICT – Information and Communication Technology

I.D.R.C – Intermediation – Dis-intermediation – Re-intermediation – Cyber-mediation

IT – Information Technology

ITI – Information Technology Intermediaries

TCA – Transaction Costs Analysis

OECD – Organization for Economic Cooperation and Development

IOS – Inter-organizational Systems

IS – Information Systems

RMC – Resource Management and Coordination

SAP – Systems Applications and Products

SCM – Supply Chain Management

SMEs – Small and Medium Enterprises

3PL – Third Party Logistics

UCS – Unified Computer System

UNO – United Nations Organization

WTO – World Trade Organization

XML – Extensible Mark-up Languages

Chapter 1

Introduction

Supply chain has been used as the links that bridge the point of production of goods and services and the point of consumption. The initial stage of supply chain was as a result of the industrial revolution of the mid-18th century. Its pursuit was to create trade among companies of the world. Goods and services began to move across companies of European countries, Americas, Asia, and the rest of the world (Tayeb 2005). The direct links between producers and last consumer (Lambert, Cooper and Pagh 1998) have been perceived as the networks in the supply chain, and they are referred to as item flow and information flow. Item flow involves the movement of goods such as raw materials, semi-finished products, and finished products from the producers to the consumers who transform raw materials into semi-finished goods or finished goods, or rather the final consumers. Information flow connects not only ordering or demand, but also has crucial attribute in terms of describing goods and services, instruction on how to use goods and services, and after consumption (sales, purchases, and other forms) information (Childerhouse et al. 2003). Figure 1.1 below is adapted from Lambert, Cooper and Pagh (1998) to show normal supply chain network. From the network, there are myriad of networks linking initial suppliers, sub-suppliers, and vendor in the upstream side of the supply chain network. The downstream network has the wholesalers, retailers, and the end customers. There are no separate links that portray information flows within the supply chain network. The focal firm is the recipient of both products and information flows from the sub-suppliers and the suppliers. The focal firm's distribution system involves traditional means through which wholesalers, retailers, dealers, and agents participate in. The usage of intermediaries such as wholesalers, retailers, distributors, suppliers, third party logistics (3PL), etc., has helped especially in moving goods among companies, but the information flow link has suffered much until recent years that information technology came into existence. The Scholars clarify the fact that second industrial revolution is connected to the communication and information technology because it helps in building faster network across companies, transportation, movement of goods and services with its faster pace among companies. Serving customers not only in the domestic market but also across borders has been as a result of communication and information technology (Tayeb 2005).
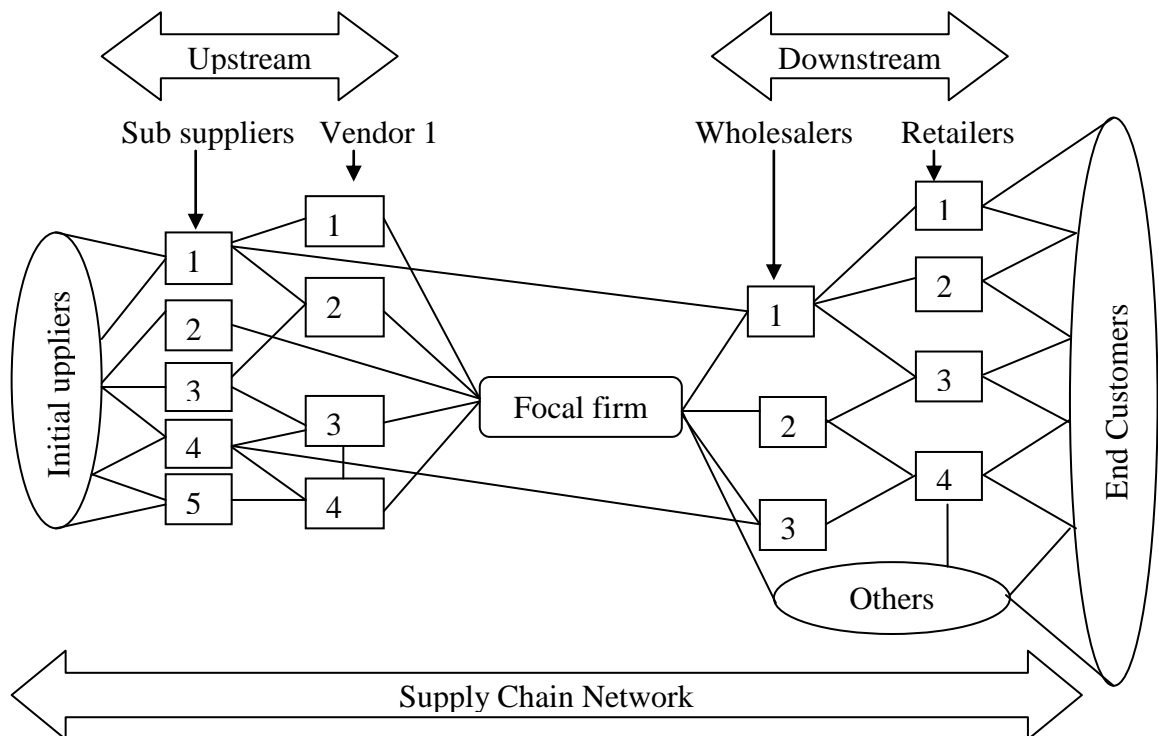
Figure 1.1 Supply chain network (Lambert, Cooper and Pagh 1998)

Information technology has been used to channel businesses (Pratyush and Abhijit 2010) and interactions across peer groups from family tiers to friendship connection via web browsers, Internet, Intranet, EDI (Electronic Data Interface), XML (Extensible Mark-up Languages), etc. The Software that has embraced sharing of information in more than four decades is known as ERP (Enterprise Resource Planning) such as SAP (Systems Applications and Products), Microsoft Dynamics GP (Great Dynamics)/NAV (Navision)/SL (Solomon), NetSuite, Oracle e-Business suite, PeopleSoft, etc., (Monk and Wagner 2009). ERP has helped companies to integrate and bridge activities of the departments, rather than using the old manual, paper form or functional business entity. The reality is that the turn-around has been on the increase – business processes, where integration is very high. As a matter of fact, information technology intermediaries have begun to play critical roles especially in improving activities, businesses, integration, performances, and communication among B2B (Business to Business Enterprises), B2C (Business to final Customers), (Dong, Xu and Zhu 2009; Fawcett et al. 2011; Wimmer, Townsend and Chezum 2000).

Companies continue to move away (disintermediation) from manual or traditional intermediaries such as agents, dealers, etc., whose activities have encouraged high transaction cost, and adopt ITI (information technology intermediaries) purposefully to improve on information sharing, reduce transaction cost, continuous business settings (re-

intermediation/cyber-intermediation) (Bailey 1996; Carla and Choi 2003). A pragmatic measure, information technology, has created multitude of applications through which intermediaries function. Bailey (1996) gave two dimensions through which information technology intermediaries implement activities; either through storefront (hierarchical network) that allows collection of businesses to share the same website or personal website that is developed by its private owners. Therefore, the two dimensions imply that the electronic network could be electronic hierarchies or electronic markets (Orman 2002; Humphreys, McIvor and Cadden 2006). This gives avenue to using transaction cost analysis (Williamson 1975) in looking critically into them (electronic hierarchies and electronic markets). The new supply chain network in figure 1.2 below with nodes representing information technology intermediaries in the supply chain is to show how information flows through the information technology intermediaries back and forth among the supply chain actors. The big arrow from the upstream to the focal firm through to the downstream represents product flow while the tiny arrows showcase the information flow through information technology intermediaries.
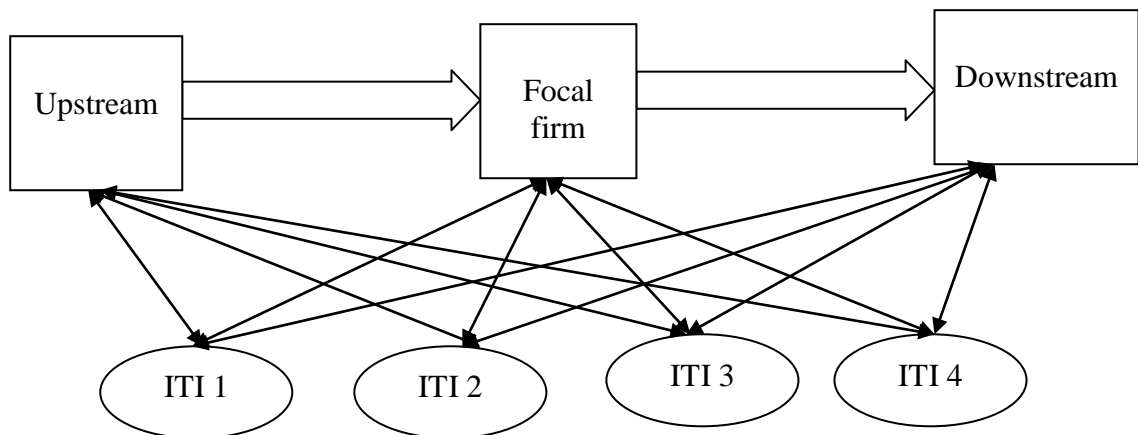
Figure 1.2: Supply chain that allows information technology intermediaries (Lewis and Talalayevsky 1997b)

1.1 Aims of study

Supply chain requires information technology intermediaries that will facilitate the advantages of outsourcing cultural, professional, and operational (Mahnke, Wareham and Bjorn-Andersen 2008) difficulties in supply chain network. This thesis is a case study based on transaction cost analysis that focuses on information technology intermediaries in supply chain integration.

From the aforementioned view, the research question is 'which of the coordinating mechanisms should information technology intermediaries adopt that will improve their performances in supply chain'?

This implies that inter-firm processes are being carried out through information technology specifically on the Internet platform (Dong, Xu and Zhu 2009) in order to integrate all the activities within the supply chain. More importantly, the information technology intermediaries implement all the activities in supply chain range from intermediary between buyers and suppliers, create transportation logistics from the upstream to the downstream, transferring key information among partners in supply chain, manage and provide quality service that can help enhance better coordination. The relationship among partners is essential so as to have mutual and long term relationship, providing reduction cost services, and other benefits that are hindering activities in traditional supply chain network. Issues such as whether information technology intermediaries play roles that substantiate faster business transaction and costs reduction (Buvik and Reve 2002; Lewis and Talalayevsky 1997b), the insinuation whether information technology intermediaries are better options, and whether the roles of information technology intermediaries portray activities (Bailey 1996) in supply chain are expected to be privy to in this study. From the chapter three, the study shall illuminate into the coordinating mechanisms in detail. The fact that hierarchical forms of companies enjoy long term relationship is not underestimated, but information technology intermediaries should be able to provide avenue through which market structure that has been viewed as short-term relationship based on traditional form can also enjoy long-term relationship depending on what firms evaluate as long-term relationship through the aid of information systems. More importantly, bilateral form should also be considered as a better coordinating mechanism for information technology intermediaries.

1.2 Method of the research

In order to find out whether information technology intermediaries have the capabilities to ensure better performance among their clients; and the bridges created among parties using their solutions, case study research will be applied in this study. A structured interview shall be used in the research through the aid of other measures such as observations, video conferencing, telephony, etc. It means the research will be both exploratory and explanatory in nature in order to understand the usage of information technology intermediaries in supply chain. Case studies are better options to examine an issue from

different points of view (Clark, Croson and Schiano 2001). Case studies have been helpful in conducting, most especially, exploratory research which seems not clear. In this case study, three case companies are selected based on their activities in using information technology to share information among supply chain actors in different ways. Their systems depend on the adoption of different technologies (detail about the research methodology in chapter 4, and case companies in chapter 6).

1.4 Structure of the study

The thesis is divided into eight chapters. The second chapter discusses information technology intermediaries. The third chapter provides theoretical overview with the aim of giving supportive measures from the past papers to the issues addressed in the thesis. Chapter four describes the research methodology. Chapter five discusses case study research design. Chapter six is about the case companies. Chapter seven presents the result of the research and findings. Finally, chapter eight is about the discussion and conclusion.

Chapter 2

Information technology intermediaries

Intermediaries act between two parties. Usually, traditional form of intermediary takes place by acting as a broker, agent, or middle man between buyers and suppliers. Wimmer, Towsend and Chenzum (2000) ascertain the fact that traditional intermediaries, which they referred to as middlemen, have provided assistance between buyers and suppliers by performing distributing, reselling, brokering with their information network which help in exploiting gains from businesses. Basically, the developments in technology attract changes that have taken place in business, education, health, governmental sectors, etc. Every sector is connected directly or indirectly to EDI (Electronic Direct interface) or the Internet (Hausman 2006). Through the development in technology, information technology intermediaries are able to create a faster business and price reduction between buyers and suppliers, and the whole of supply chain (Gimenez and Lourenso 2008) through sharing sufficient and efficient information among the supply chain actors. As a matter of fact, Orman (2008) describes information technology as thus

> *"Information technologies are designed to reduce the cost of information-based activities, and hence they are poised to reduce the cost of intermediation, but not necessarily capable of automating them completely or substantially because reducing the costs of vital economic activity is likely to increase the utilization of that activity. It is reasonable to increase the utilization of the activity and it is reasonable to expect an increase, not a decrease, intermediation in electronic markets as compared with traditional markets."*

Further impressive contribution by Wimmer, Tousend and Chenzum (2000) that information technology (IT) revolution has been felt in almost economic sectors especially in the service sectors which is perceived as an outstanding and unarguable issue to date. The key issue about traditional intermediaries is that they may face extinction if they find it difficult to adopt information technology (Yao, Dresner and Palmer 2009). They iterate the idea that investment in IT by the traditional intermediaries will position them much better than those who might view IT to be of no use. Conceptualizing on this point, competition remains between those traditional intermediaries that have chosen to adopt using

information technology and the new entrant. The new entrant has the wholly idea of information technology that will improve activities with the supply chain by providing services that will compel traditional intermediaries to adopt IT so as to continue to exist in the supply chain network. Good examples of the traditional intermediaries are the warehousing and the transportation parts of the supply chain. They need IT that will boost their traditional distribution by providing key data (Yao, Dresner and Palmer 2009) like tracking and delivery information flow.

2.1 Stages of intermediaries

It is very important to consider the four stages that provide insight into this chapter, and they are: intermediation; dis-intermediation; re-intermediation; and cyber-mediation which Shunk et al. (2007) refer to as I.D.R cycle, and this study complements it to be I.D.R.C (intermediation – dis-intermediation – re-intermediation – cyber-mediation) cycle.

2.1.1 Intermediation

This is a normal procedure that creates opportunities for third party as professionals that are interested in cooperation and collaboration. Interaction here implies that more than two parties are involved in day-to-day transactions. In the traditional format, intermediation creates avenue for third parties in supply chain, and such practice is referred to as outsourcing with the aim of providing adequate complementarities to in supply chain network. In other way, intermediation reflects absorbency of firms with competitive roles that can help improve transaction between or among firms in a supply chain. Intermediation allows wholesalers, distributors, retailers, 3PL, dealers, brokers, transporters, etc. to contribute to the links between the point of production and the point of consumption (Nissen 2000). Their contributions, nowadays, demand information flow that encompasses all the parties of a supply chain network. Information technology intermediaries become part of the system – supply chain network, in as much their programs complement the activities within the supply chain network. They provide eight drivers for intermediation, and they are:

1. Economic: This implies that intermediaries should ensure that transaction costs must be less comparing to the costs incurred while there were no intermediaries. Such attitude will keep the intermediaries in business for as long as they desired.

2. Information sharing: Every party involved is expecting seamless transaction through which information is not limited at any point in time in the supply chain. Flow of information increases the business potentials, and the consumers have access to products and services rather than depending only on the intermediaries' provision of goods and services.

3. Core competencies: Make/buy strategy plays a role in outsourcing and divesting activities through focusing on the area of specialization, and allows other firms to handle other activities that can enhance competitive advantage. This idea may be carried out by outsourcing the whole logistics of the supply chain network or other services that demand external competences.

4. Industry structure: The supply chain network turn to be a new form of communities (Shunk et al. 2007). The management of the new communities will be based on connectivity that pave way for better transaction, though based on intermediation their businesses do not have to be under a specific control of the supply chain.

5. Time/availability: Shunk et al. (2007) capitalizes on 'order to order fulfillment' as the main focus of the firms that decide to involve intermediaries. Intermediaries are expected to be part of the material flow and information within the speculated time either at the point of production or that of consumption.

6. Technology: This elaborates on the usage of all forms of new and creative advancement that is linked with high-tech. Invention and innovation contributes to improvement that takes place within or between firms. Technology in the development of product has emerged as a boost to the performance of organizations not only that but also the information and communication technology that contributes immensely has also been evaluated as the reason for outsourcing.

7. Logistics: Delivery of goods and services is as important as other drivers in this context. This implies that the four types of transportation; road, sea, air, and pipelines have their links with the intermediaries either through practical attribute or by providing information such as planning, sourcing, tracking, etc.

8. Cultural: The need for this driver depends on collaboration which entails sharing of information, ideas, knowledge – either tacit or explicit knowledge. Then sharing depends on cultural exploration. This helps the firms in supply chain with intermediaries across cultures and borders to interact, communicate, in order to reduce contingencies.

2.1.2 Dis-intermediation

This trend is the direct converse of intermediation. Firms interact direct within the supply chain. Nissen (2000) claims that dis-intermediation focuses on redesigned processes that withdraw the activities of intermediaries in a supply chain network. Cort (1999) confirms that dis-intermediation was originated from the act of taking savings out of the unions, and keeping them in another institutions. The information flow here through information and communication technology (ICT) operates on direct network through which both producers and the consumers link themselves – vertical integration. Though the argument that dis-intermediation eliminates numbers of distributors, and shortening the vertical length (Cort 1999), has led to the fact that the entire supply chain is viewed as two channels. The channels include the transaction channel and the logistics channel which are expected to be maintained and monitored by both producers and consumers (This thesis refers to the parties here as producers and consumers in order to generalize firms that are participating in the channels). In other words, there is tendency that information flow has its impact in the channels, and their transmission is being achieved through the direct interaction in the supply chain.

Nissen (2000) envisages reasons for dis-intermediation. He said that the intermediary's services-assumed at non-zero cost yields no value or when intermediaries earn above-average profits in contestable market without significant barriers to entry. Not only those aforementioned reasons, but also close inter-firm linkages between firms lead to dis-intermediation. More importantly, IT has been evaluated as the mechanism that create avenue for such inter-firm linkages which capitalize on IT specific assets, goodwill trust, etc. Chircu and Kauffman (2000) provides some conditions that favor dis-intermediation. They include: "intermediary increases buyer costs, middlemen increases transaction costs, IT reduces inter-firm coordination costs, E-markets lower search costs, intermediary's services become irrelevant, intermediaries earn above-average profit without significant barriers to entry, sustained IT-enabled innovation". This shows that several writers have the arguments backing dis-intermediation, but yet more papers have moved further to provide clearer insight to the need of intermediaries in supply chain. They provide conditions that support re-intermediation.

2.1.3 Re-intermediation

Vertical linkages that were discussed under dis-intermediation seem to be missing something. Papers provide several conditions through which intermediaries can take their stands in supply chain. Nissen (2000) describes re-intermediation as 'the process by which a competitor that has once been dis-intermediated or pushed out of a profitable market niche is able to reestablish itself as an intermediary. Papers envisage that through the discovery of new ideas, IT can open ways for re-intermediation. The conditions listed in support of re-intermediation by Nissen (2000), Chircu and Kauffman (2000) are: "provision of aggregation, production and information distribution, quality check, and warranty services; rapid information search and filtering capabilities; enabling economies of scale and scope, etc." Supply chain is open to the old intermediaries whose performances in the past may be evaluated as invaluable contributions to the firms' activities in supply chain, and the need to re-invite them implies that their activities show the differences between vertical coordination and horizontal coordination. Horizontal coordination creates avenue for intermediaries. Intermediaries with information technologies are bound to be accepted or re-intermediated into the supply chain network. The efficacy to attain better transaction compared with when the firms are dis-intermediated depends on the decision of the supply chain network to outsource based on the competitive advantages that had been experienced before dis-intermediation. In another view, instead of the supply chain managers taking full charge of back-office functions or activities, they rather call upon arranging and managing strategic partnerships, joint ventures, long-term sourcing agreements, and other non-equity agreements in order to attain supply chain network that encourages inter-firm integration (Nissen 2001).

2.1.4 Cyber-mediation

The condition that information technology will create more opportunities for intermediaries is defended by many researchers. Malone, Yates and Benjamin (1987) predict that IT will reduce the practices of vertical integration, and will encourage horizontal integration that is open to intermediaries that are competent and advanced in information technology. Therefore, transaction flow, information flow, financial flows, etc. among firms can being carried out through electronic devices especially Internet, EDI, XML, to mention few. Additional view from Bakos (1997) is that electronic markets will reduce buyers' search costs. This can only be attained when the information about pricing and products are provided or made open to buyers of goods and services. Meanwhile, the

tendency that suppliers will provide genuine information about goods and services direct to their customers has not been yielding accuracy.

Information technology intermediaries get information from both suppliers and buyers, and exchange it in order to provide awareness about trends in the market. Researchers that further explore cyber-mediation include Lewis and Talalayevsky (1997a) whose study focus on the use of electronic in the airline distributions. The trend allows direct electronic communication with consumers in the airline network. As a result of electronic improvement, the traveling agents are being used through which computer reservation systems (CRSs) is being used as the distribution tool for airlines. Meanwhile, Internet and other online services have been playing greater roles between the airlines and the consumers. Bailey (1996) and Bakos (1997) are much concerned about the value-adding attributes of the cyber-mediation especially by providing virtually all the needed information for the potential members of a supply chain in order to explore much better on improving on products and services development, advertisement, transactions, engineering, just in time businesses, and proffering quick solutions to problems facing businesses within supply chain and among parties involved.

2.2 Types of information technology intermediaries

Activities such as posting, transforming, and matching (Orman 2008) are information based activities traced to intermediaries. Through these activities, intermediaries can benefit more from information technologies which implies that the intermediaries can also take the advantage of new technologies. Myriad of information technologies and intermediaries with multi-tasks have limited themselves to Orman (2008)'s three types of information technology intermediaries, and they include: data-based intermediaries, trigger-based intermediaries and constraint-based intermediaries. Orman (2008) further clarifies the fact that data-based intermediaries are mostly being used in electronic markets while triggered based and constraint-based intermediaries are seen as newly emerged and knowledge based intermediaries.

2.2.1 Data-based intermediaries

The system through which data are being collected and presented by intermediaries is referred to as data-based intermediaries. Here, the intermediaries perform one of the three activities mentioned earlier which is to focus on posting of data with little transformation

and matching. These intermediaries use electronic markets especially electronic catalogs through which data are collected and presented about products and services the intermediaries can offer. As remarkably said by Orman (2008), "The technologies supporting electronic catalogs are the database technology for maintaining and searching them, and data warehousing and data integration technologies to create such catalogs by aggregating data from multiple businesses." Well-known data integration technologies are XML, ontologies, and semantic models, etc. This system depends on human-machine that is complex and demands intermediaries with new orientations. Another fact deduce from Orman (2008) is that information transformation is being provided by data-based intermediaries through encouraging parties that participate to select information that is relevant to them, and the issue about matching is based on product evaluations and recommendation. He further provides a function of data-based intermediaries which focuses on standardizing data representation and the increase of the semantic content of the data model by providing a marketplace for multiple customers – both buyers and suppliers. Though data integration is not automatic, therefore facing semantic heterogeneity has become a challenge to the human control (Orman 2008) in the area of aggregating electronic catalogs. Orman (2008) describes the costs involved to be requiring specialized skills and independent intermediaries through which amortization can be utilized over the multitude vendors that patronize them. Another option he raised about the costs is that semantic data modeling technologies can be used to reduce operating costs of data-based intermediaries.

2.2.2 Trigger-based intermediaries

This type of information technology intermediaries portrays the new knowledge-based intermediaries (Orman 2008). Its function transforms data and customizes it, albeit trigger-based intermediaries also analyze and match like data-based intermediaries. Orman (2008) ascertains that this type of information technology intermediaries does not only present information, but customized information that are forwarded to specific users. This function relies on activating user-specific triggers. The three components envisaged under this type of ITI are adapted from Cook and Das (2004) by Orman (2008), and they include extensive information about individual preferences and references, a dynamic sensor network that detects conditions of the environment, and a triggering mechanism that matches the other two components. These components are evaluated as key systems that cover all the information which can only be assessed by the intermediaries. Meanwhile,

complex business applications depend on human-machine monitoring. Orman (2008) affirms that the success of trigger-based intermediaries can also be attained through sensor networks either human or machine that evaluate the status of a firm and divert it to trigger system through the active contribution of human efforts, though the network can be automated. In a nutshell, trigger-based intermediaries depend on data-based intermediaries in order to gather information about products and services with the aim of redefining it through sensor data. Orman (2008) argues that keeping them separate yields advantages.

2.2.3 Constraint-based intermediaries

Orman (2008) describes this type of information technology intermediaries as the new generation of the knowledge-based intermediaries. This is possible by adopting the new information and communication technologies. He further raises the issue that it (constraint-based intermediaries) maintains and enforces constraints, performs transactions in behalf of its clients, not only those, but also it matches partners and perform transactions based on the clients description of the goods and services they need to buy. Yet, under this type of information technology intermediaries, complex and business applications also demand human-machine efforts especially knowledge engineers and experts, though there may be need for automated knowledge based systems that helps maintain the constraints. The most important issue here is that this type of information technology intermediaries needs crucial information from buyers and suppliers, up-stream and down-stream logistics, etc. concerning the objectives of their transactions and most importantly, their constraints in order to use such information to build a conglomerate electronic market place for transacting business, though the tendency that unfair business practices might occur is not underestimated.

2.3 Roles of information technology intermediaries in supply chain

Extension of activities to other parties in a supply chain in order to create business mode that leads to value creation and reduction of costs gives way to transactions between firms by allowing third parties with suitable solutions at the needed time and exact place which in turn becomes gain to all parties, for instance the buyers, suppliers, and the intermediaries. Information technology intermediaries have been perceived as players of greater roles among parties in supply chain. Researchers have studied roles being played by both manual intermediaries and the new trend through which information and communication systems are being used to provide information flow in supply chain

network. Bailey (1996) makes assertion on the fact that roles of intermediaries have not been theoretically documented. Researchers like Malone, Yates and Benjamin (1987) describe the roles of intermediaries as measure through which coordination costs, problems of specificity, and problems of standardization are being catered for by the intermediaries. From the view point of transaction cost analysis, Bailey (1996) derives what he terms as 'complete set of roles for intermediaries'. Another researchers, Wimmer, Townsend and Chezum (2000) provide analysis about the roles of intermediaries especially how they create much better gains among clients. Some researchers argue that roles of intermediaries may disappear as a result of the application of information technologies, but other researchers stand firm in supporting the improvement of the roles of intermediaries with information technologies (Al-Sobhi, Weerakkody and Kamal 2010).

Wimmer, Townsend and Chezum (2000) take cognizance of the intermediaries, and they support the idea that intermediaries have proven their assisting measures as service providers among buyers and suppliers. They provide lists of roles played by middlemen/intermediaries whose activities portray manual forms, and somewhat not different from the roles provided by Bailey (1996). From a closer view of the roles of information technology intermediaries, one will come into conclusion that there are no differences between manual roles played by middlemen/intermediaries and the roles of the information technology intermediaries, but the platforms through which they operate have significant links to their performances. Information technology intermediaries operate through the electronic devices, while the manual form remains paper and movement of the middlemen from one location to the other. This part has chosen to adapt the roles provided by Bailey (1996) and support him with other researchers such as (Brown and Nigel 2004; Mahnke, Wareham and Bjorn-Andersen 2008; Quigyun, Huang and Zhuohao 2009) in order to have better picture of the roles of information technology intermediaries. The roles are: facilitating buyers and suppliers, aggregating buyers and suppliers, matching buyers and suppliers, creating trust between buyers and suppliers, transferring inter-organizational marketing information.

2.3.1 Facilitating buyers and suppliers

Transferring information among companies seem to be too expensive in terms of costs incurred (Bailey 1996). It is as a result of the content of the information which is not articulate to correspond with among parties. Activities of the supply chain with

optimization and coordination (Xia 2010) of buyers and suppliers can be achieved through effective information facilitation which can be handled by the information technology intermediaries. In one hand, facilitators can only exist in an electronic market. On the other hand, if firms decide to link themselves through electronic networks facilitators disappear – disintermediation. Considering information flow in a supply chain network which operates on open markets, accurate information flow can be provided by the intermediaries with greater knowledge of information technologies. The position of facilitating activities in a supply chain implies that information technology intermediaries help through coordinating and translating information among parties involved in transactions. For the intermediaries to be able to perform this role, they depend on using designed programming such as XML, other electronic data interface (EDI) or Internet. Chircu and Kauffman (2001) ascertain that one of the roles of intermediaries is to connect buyers and the suppliers more efficiently than both of them can handle transactions. Meanwhile, economies of scale and scope for logistical transaction operations are reasons for facilitation of buyers and suppliers, and monitoring transaction among parties is another reason for facilitating parties in supply chain (Rensmann and Smits 2008).

2.3.2 Aggregating buyers and suppliers

The workloads on intermediaries are much in terms of business transactions among buyers and suppliers. Activities of the intermediaries are heterogeneous, and they diversify their capabilities in both tangible and intangible goods and the producers. The new innovative technology creates better option for intermediaries to connect parties at the fastest pace based on collecting data about suppliers and buyers. The insinuation that adopting information technology may lead to disappearance of the traditional intermediaries is not denied based on the fact that they (traditional intermediaries) lack knowledge in the evolution of technologies, but the fact that the traditional intermediaries can provide chances for experts in IT can keep them on the business. Traditional intermediaries still do not accept the new trend and development of Internet market approved by Organization for Economic Cooperation and Development (OECD). OECD is an international organization of thirty countries which their main goal is to work together in addressing the economic, social, and environmental challenges of globalization (OECD 2010). OECD proposes a competitive market conditions through Internet, and that allows intermediaries to participate in electronic marketplace. Theoretical reference to OECD is to agree with the approval of the links that involve intermediaries that have the IT strength in global

businesses and industrial restructure. The tremendous attribute from IT allows searching for clients easier than the traditional means. The work of the information technology intermediaries reduces the traditional market research being carried out by buyers (van Weele 2010). Information technology intermediaries have collections of both buyers and suppliers at their beck and call through which the next role, matching two parties, is made possible. Brown and Nigel (2004) recognized this role as increasing functionality, innovation, integration, and value.

2.3.3 Matching buyers and suppliers

Information technology intermediaries have the intention to link right buyers to the right suppliers. Intermediaries seek suppliers that can provide goods and services to customers, buyers in this context, with the best quality of products and services to suit the buyers' needs. Intermediaries' decision in selecting suppliers is based on the suppliers' past performances and information about them from other clients – past track records. The processes of purchasing such as defining specification, selection of suppliers, contract agreement, expediting, and evaluation (van Weele 2010) are not limited to the buying organizations but involves the intermediaries. In a nutshell, intermediaries should be able to help about specification, but other processes may be suppressed through the usage of information technology. Intermediaries depend on information technology through which faster procedures can be put in place to match suppliers whenever there is signal from the buyers. Bailey (1996) claims that limiting the search of suppliers and filtering mechanism has been the reasons for a better matching of buyers and suppliers. Normal idea in the traditional form that after finding suppliers, it might be difficult to carry out transaction as a result of bargaining problems (Wimmer, Townsend and Chezum 2000). Wimmer, Townsend and Chezum (2000) mention that both buyers and suppliers keep 'private value' of a specific product – information asymmetry, and the negotiation in turn demands high cost which leads to down turn in such transaction. Intermediaries have put an end to such bargaining problems by coalescing their activities through information technology.

2.3.4 Creating trust between buyers and suppliers

In the first place, outsourcing depends on the strength of trust among firms. Chircu and Kauffman (2001) ascertain the fact that buyers and suppliers' preference to trade with each other depend on high level of trust. Trust among buyers and suppliers open ways for intermediaries. More importantly, the tension of opportunism and free-riding (Williamson

1979; Williamson 2005) can be reduced to its lowest level through intermediaries that coordinate activities among parties because of their capabilities in building trust among the supply chain actors by providing needed information flow for all the stakeholders at the right time. The advocacy of intermediaries helps build trust (Kydd 2006) in terms of transaction, quality of goods and services, on time delivery, and information flow within and among the firms in supply chain (Sun 2010). The fact that trust may be difficult to build through the usage of information technology as claimed by Bailey (1996) cannot be denied, but his recommendations such as usage of digital signatures and legal systems' acceptance of the information technologies have shown that trust can be built among clients in a supply chain network through information technology intermediaries. From the view point of Quigyun, Huang and Zhuohao (2009) trust is built upon perceived reputation which might occur in B2B or B2C transactions especially the involvement of information technology intermediaries through which the relationship is meant to be strengthened.

2.3.5 Transferring inter-organizational marketing information

Provision of links within or between firms is very important in order to build information system that will enhance better interactions among firms of a supply chain. Inter-organizational marketing information tends to be means of disseminating information across organizational boundaries through the usage of information technology. As a role of intermediaries, information can be transferred among parties that are involved in the supply chain. Essential fact here is that intermediaries are the stock-keepers of all information gathered from their clients (Bailey 1996). Information in the coffer of the intermediaries can be used to perform the roles such as facilitating, aggregating, matching, and creating trust between buyers and suppliers. Therefore, manipulation of information or any forms of fraudulence can be detected, and the need to create marketing information will help build familiarities with true source and the possibility to detect inept information through information technologies. Increase in electronic market will attract more buyers and suppliers through trust, facilitation, price discovery and price settlement, product and service searching via information technology intermediaries (Wimmer, Townsend and Chezum 2000; Al-Sobhi, Weerakkody and Kamal 2010). The flow of information with the protection of the intermediaries increases transaction and secures business coordination and corporation through which long term relationship can be assured, though may not be signed in the contract as long-term, through information technology intermediaries. Good

communication among parties is a facilitator of information transmission through which other roles of information technology intermediaries can be attained

Chapter 3

Theoretical Overview

This chapter gives more insight into the detailed theory adopted for the study. The theoretical approach that has made a landslide in evaluating outsourcing, relationship, and cost reduction among organizations in past years is transaction cost analysis (TCA). The acclaimed theory was propounded by Coase (1937), but improved upon by Williamson (1975). Many papers have used the theory to analyze both vertical and horizontal integration, some papers have used the theory to differentiate between production cost and transaction cost before outsourcing, papers have used the theory in explaining value creation, and many more papers have creatively used the theory in analyzing relationships among companies. This thesis has evaluated the theory, and has chosen the theory as a testimony to the past works about outsourcing, using information technology intermediaries in supply chain integration as a result of accuracy in information flow, reduction cost, and provision of long term relationship among parties in supply chain.

Other concepts such as purchasing and supply chain management, inter-organizational systems, information technology intermediaries, and electronic businesses are evaluated as accompanied measures to actualize theoretical support in this study. To start with the concept of purchasing and supply chain management, it showcases the platform for activities, such as buyer/suppliers relationship, transferring of goods and services, information flow, etc. that occur before, during and after transactions in a specific supply chain network. Such activities depend on crucial monitoring and development. The selection of the concept implies that purchasing management is traditionally acceptable from the point of product/service specification to selection of suppliers, a key issue in organizational process. Purchasing management consolidates on outsourcing, specifically the usage of information technology in such a way that information asymmetry is checkmated through all the stages of purchasing processes (van Weele 2010). Dimensional protocol is catered for in order to achieve leverage buying for organizations (Ellram and Billington 2001). Supply chain management caters for the logistics and distribution aspects of goods and services. The whole issue about supply chain management has been to provide view in terms of its effectiveness and efficiency that

surround movement of goods and services from the point of production to the point of consumption.

Another concept that has been adopted in this study is inter-organizational system (IOS). The concept provides information about the adoption of information and communication systems within and between organizations. The inception of information technology has been a measure to create competitive advantages which result in creating value. Value creation springs up from collaboration and cooperation among firms through the usage of information technology most especially. From the view point of Clark, Croson and Schiano (2001) the level of changes in technology leads to the decrease in transaction costs. Inter-organizational system is evaluated as the best practice through which cost reductions among firms could be provided. The adoption of ERP as an inter-organization system does not stem costs down that much because of some issues raised about propriety and direct monitoring of the founders of ERP systems. The new trend which occurs as a result of web based interactions among firms has been viewed as better option through which medium and small firms that cannot afford the costs of ERP can carry out businesses. The development of solutions by professionals has created greater opportunity through which EDI, Internet, XML are being explored. The system thereby creates more chances for traditional intermediaries to move into using information technology or the spring up of information technology intermediaries to perform crucial activities within the supply chain.

3.1 Transaction cost analysis (TCA)

Plans to categorize firms under transaction cost analysis will be helpful to understand; different types of coordinating mechanisms, their strategies through which transaction costs can be reduced - ex ante and ex post. According to Douma and Schreuder (2008) coordination mechanisms are categorized into two forms , and they include: organizations and markets, and the third coordinating mechanism is evaluated as neither organization nor market form. It is called bilateral or hybrid form. Each form can be explained using transaction cost analysis. Transaction cost analysis, according to Qu and Brocklehurst (2003), is the assumption that human beings maximize utility while firms maximize profit. Further assumption about human beings in terms of bounded rationality (Simon 1961) and opportunistic behavior (Williamson 1975; Agosto 2002) are used to explain transaction cost analysis. Ellram and Billington (2001) make assertions to Williamson (1975)'s work,

and they refer to transaction cost analysis as an approach that explicitly considers the implication of an organization's choice to perform a transaction activity internally (vertical integration) or in the market (horizontal integration).

 Sandvik and Bråten (2007) clarify transaction as the term being used to describe forms of economic exchange that takes place between buyers and suppliers. For instance, search and information costs, bargaining costs, policing and enforcement costs, etc. (Fenwick, John and Stimac 2009) are linked to transaction costs between buyers and suppliers. This implies that one or more organizations have to interact with others in order to attain additional values. The interaction depends on which coordinating mechanism should be adopted. Information technology intermediaries have significantly increased the activities of organizations in the recent years especially by reducing information asymmetry within the supply chain network to the barest minimum. Strategic nature of information technology is basically that firms are able to utilize IT to obtain greater advantages over their competitors (Alvarez-suescun 2010). Is it, therefore, an outstanding measure to internalize information technology, to outsource it or to have it based on collaboration or cooperation among firms? Hence, transaction cost analysis gives clue to answering the question from the view point of Buvik and Reve (2002) and Douma and Schreuder (2008). Douma and Schreuder (2008), and van Weele (2010) provide three dimensions of transactions which are drawn from Williamson (1975), and they include: asset specificity, uncertainty, and frequency.

To further concretize the theoretical overview in connection with transaction cost analysis, there is need to look into the applications (Clark, Croson and Schiano 2001; Qu and Brocklehurst 2003) which present transaction costs with production costs and the risks involved. Table 3.1 below shows how Clark, Croson and Schiano (2001) describe level connectivity in connection with costs and risks of interconnectivity among firms. From the table, they provide information from the inception of inter-firm interactions and improvement through technology awareness, and its reflection on production costs, transaction costs and the risks encountered during each level. The equations of Qu and Brocklehurst (2003) give insight into whether activities of firms should be insourcing or outsourcing, and on what condition should both practices take place. Adopting both theoretical assumptions help understand the motive behind giving chances to the third parties in supply chain, more importantly information technology intermediaries. In other

way, the functions and roles of information technology intermediaries are fully supported theoretically especially from the aforementioned researchers here.

Level of connectivity	Production costs	Transaction costs	Risks
Physical data transfer	Large decrease	Minimal increase	Minimal increase
Technology supported – document transmission	Large decrease	Minimal increase	Minimal increase
Electronic Data Interface	Moderate decrease	Moderate increase	Minimal increase
New information-intensive processing and data sharing	Large decrease	Minimal increase	Very large increase
New Policies and integration operations	Very large decrease	Minimal increase	Very large increase
Joint optimization relationship	Very large decrease	Moderate decrease	Large decrease
Virtual channel integration	Very large decrease	Large decrease	Very large decrease

Table 3.1: Level of interconnectivity, costs and risks adapted from Clark, Croson and Schiano (2001)

Qu and Brocklhurst (2003) provide four different equations that can help understand the reason for outsourcing. They use transaction cost analysis to showcase level of production costs in comparison with transaction costs in order to ascertain whether firms should outsource or not. They testify to the fact that firms outsource only if the advantages derived by reducing production costs are more in transactions carried out among firms. Thus from equation (1) $\triangle = (P_{in} - P_{out}) - T_{out} \times P_{in}$, $P_{out} \times T_{out} \geq 0$, P_{in} refers to in-house production costs, P_{out} is the production costs for outsourcing, T_{out} is referred to as the transaction costs of outsourcing, while $\triangle$ is the profit for outsourcing. The tendency that firm will outsource depends on whether $\triangle \geq 0$ (net gain is greater than or equals zero). Equation (2) is $P_{in} \geq P_{out} \geq 0$ and it implies that in some situations transaction costs might be higher than production costs gain or in-house production costs which also mean that firms that outsource will make no profit. Equation (3), $P_{in} - P_{out} \geq T_{out} \geq 0$ is concerned about carrying out both in-house production costs and outsourcing production cost ex-ante or ex-post. Such calculations can be derived from data of the last transactions, budget of the firms, contract for outsourcing, and the records of the firms' account.

Equation (4), $T_{out} = (P_{in} - P_{out}) - \triangle_{profit}$, is seen as the deduction of profit after outsourcing from the profit before outsourcing (Qu and Brocklehurst 2003). Moreover, if firms decide not to venture through the usage of innovation in information technology, such firms will soon go primitive from market or become extinct. The reality here abounds on the increase

risks ventured the lower the transaction costs to be expended by firms. Motivation for electronic business is dependent on the reduction of transaction costs, and the level of transactions carried out through the information technology has claimed to be at its peak (Fenwick, John and Stimac 2009). Malone, Yates and Benjamin (1987) gave insight to using TCT to ascertain information technology intermediaries either to be internalized or outsourced. From their perspective, information technology provides adequate costs of coordination – transaction costs of information processes, coordination of workers and machine that handle primary processes, other costs such as gathering information, negotiating contracts and risks protections (Luo and Donthu 2007).

Information technology has brought a new trend to transaction cost analysis as a result of its roles through which not only it reduces costs but also opens way for new form of cooperation and relationship among firms comparing to the TCA's hierarchical and market forms of coordination (Rossignoli 2009) within supply chain network. Rossignoli (2009) refers to information technology intermediary as the third coordination basically that the intention is to digress a bit from concentrating on the two forms of coordination mentioned earlier. This is more related to bilateral form of governance (Rossignoli 2009; Heide 1994; Buvik 2000, 2002). Rossignoli (2009) poses three perspectives of the so-called network of firms in comparison to either hierarchy or market. The perspectives are: both hierarchy and market are viewed to be on extreme while network of firms (hybrid) appreciates intermediate measures, the network of firms stands out to be alternative to both hierarchy and market forms of coordination, and the representation of network of firms at the strategic and organizational analysis with priority of being ahead of hierarchy and market forms (Rossignoli 2009).

3.1.1 Asset specificity

According to Douma and Schreuder (2008), transaction should allow a dimension by which specific assets are put in place. Another charismatic writers, Dyer and Singh (1998) say that creating assets based on specialization or unique creativity is a measure towards seeking competitive advantages. Buvik and Reve (2002) also give opinions by considering two options which are based on two dimensions connecting to inter-firm dependence. They defined inter-firm dependence as the costs, problems, and difficulties associated in a relationship with the aim of replacing partners with new ones. The first dimension has been linked with importance, while the second dimension pinpoints on the issue of lock-in.

Their further explanation about asset specificity postulates the fact that specific investment is to add value or save cost that will enhance more advantages among the parties involved comparing to individual capabilities of generating profit and cost saving.

Most of the theories focus on buyers-suppliers relationships. Relatively, third party service providers are also important role players. Therefore, they are part of the network of businesses that has to be checkmated categorically based on TCA. Williamson (1985) gave six different types of asset specificity and they are: site specificity, physical specificity, human specificity, dedicated assets, specific investments in brand name capital, and temporal specificity. The negative part of asset specificity is that it can attract opportunistic behavior or free riding through which the ITI can decide not to transfer information ex-ante (connecting to quality of products, specification from the buyers, prices that can be afforded, etc.) and ex-post (after sales/purchases, business transactions information). The same scenario is applicable to internalized information system with asset specificity (Buvik 2001). In real term, to safeguard may be the real reason to adopt specific investment in order to secure a long-term relation with efforts to improve on partners competitive advantages, but bounded rationality is a menace. Its style of reversing veritable and concrete plans is connected to human insatiable in microeconomics, and unstable performance across supply chain network. Two of the six types of specific investments attract propositions in relation to this study, and the two specific investments are nonetheless human specificity and dedicated assets.

Site specificity

Activities within the supply chain network can be built or found within geographical location that will cost less from the point of production to the last consumers. Proximity in microeconomic is meant to define the jurisdiction where reduction in inventory of a particular production company and the lowest form of transportation among the parties involved in the supply chain network should be paramount in defining site specificity. Another issue that is very important is the degree of lowering costs coordination (Dyer and Singh 1998) in a supply chain network.

Physical specificity

Another name given to physical specificity is transaction-specific capital investment (Dyer and Singh 1998). The whole customized technology in helping build supply chain network

which attracts special investment from all parties needs cognizance. Such investment will help improve activities of supply chain whereas the other parties may not have the capacity to develop such project, but could acquire it through coordinating or cooperating with the owners depending on incentives or inducements. This type of specific investment attracts coordinating mechanism that depends on contractual means, and such mechanism is known to be hybrid or bilateral form (Buvik and Reve 2002). Every asset depends on clear definition of the contract.

Specific investments in brand name capital

These investments rely so much on protecting firms from exposing to risks of negative reputation should the expected quality and services not met. Consumers have perceptions. More importantly, franchise forms of collaboration and cooperation are exposed to specific investment in brand name capital.

Temporal specificity

This type of investment is seen as means through which coordination of human assets are facilitated. Most especially critical products that demand such timely response and coordination of the information sharing, and other key issues relating to human specificity are evaluated to be temporal specificity (Gøril 2007).

Human specificity

Dyer and Singh (1998) refer to human asset specificity as asset specific know-how derived from outstanding long-term relationship. Knowledge sharing is an important issue concerning human asset specificity. It is of general view that when two or more firms corroborate to work together especially in the area of sharing information, technical know-how, and other key functions within their domains, such firms will outperform other competitors. Meanwhile sharing knowledge is not only connected with technical know-how and other functions but also learning different languages that are common among the partners may lead to efficient and effective communication. Therefore communication errors are bound to be minimized. Meanwhile, human specificity has spread towards other trend such as information technology.

Information technology intermediaries' performances depend highly on information sharing among partners in the supply chain. Therefore, it is important to develop sharing of

information in a way that will help improve the transactions among partners of a supply chain. The tendency that the performance of the information technology intermediaries will reflect on transaction costs is also evident to human specific investment. Performance capability is viewed in terms of effectiveness and efficiency efforts of the information technology intermediaries in this context. In fact, effectiveness should be evaluated based on stronger interaction and provision of quality control. Efficiency is also evaluated based on low processing costs among the supply chain actors (Janda and Seshadri 2001). Another issue to consider is that transformation of information between supply chains actors depend on information technology intermediaries. The fact that the service providers focus on posting data, transforming, and matching data which are being carried out by data-based, triggered-based, and constraint-based intermediaries is somewhat important to note (Orman 2008). Transformation increases chances through which information technology intermediaries contribute to a better supply chain performance specifically in terms of costs, time to market, flexibility, and value creation.

From the above section, the following propositions are derived.

> *Proposition 1a: Increase in information sharing between information technology intermediaries and the supply chain actors could lead to an improvement of the performance in supply chain.*

> *Proposition 1b: An increase in transforming information shared between information technology intermediaries and the supply chain actors could lead to a reduction in the transaction costs of supply chain actors.*

Dedicated assets

Williamson (1985) refers to this specific assets as investments that focus on general purposes such as providing facilities or plants that can serve specific purpose most especially to suit the demand of some particular customers. In real term, such investments depend greatly on long-term contractual binding through which transactional hazards can be protected. In order way round, this type of investment is to protect interactions and businesses that demand strategic focus among firms and partners in such a way that the parties involved can be protected from opportunistic behavior and free-riding which might take place if there are no definitive contracts among the partners.

Proposition 2: Information technology intermediaries with specific investments are likely to provide better coordination between or among supply chain actors.

3.1.2 Complexity and uncertainty

Transaction among firms within supply chain network may sometimes become complex as a result of specific investment or level of business transactions. Supply chain network may face dilemma regarding related issue such as complexity (Kulkarni and Ramamoorthy 2005). The dilemma can be the outcome from bounded rationality which is the capacity of human beings not being able to solve complex problems (Simon 1961; Douma and Schreuder 2008). Keen (1991) considers environmental complexity and terms it as a result of 'globalization with its extension lines of communication and coordination across countries which affects market services and customer demands and anticipation of competitive shifts'. Keen (1991) further buttresses aforementioned environmental complexity as hyper-extinction of activities that has affected traditional organization's response. Therefore, bounded rationality becomes problematic based on related issues develop from complexity and uncertainty. Uncertainty can influence the activities within the supply chain network. Williamson (1985) positions his argument about uncertainty that it can influence opportunistic behavior among parties involved in supply chain network which in turn might lead to increase in transaction costs, and more so distrust. The level of increase of technology world and the criminal measure confronting information technology can also pose uncertainty and complexity on supply chain network. There are three types of uncertainty (Kulkarni and Ramamoorthy 2005; Sutcliffe and Zaheer 1998) which were drawn from Williamson (1985). They are primary, competitive and supplier uncertainties. Uncertainty from the view point of competition among information technology intermediaries attracts proposition in this study which means primary uncertainty and suppliers uncertainty are references to the types of uncertainty provided in theories. Therefore, concentration on competition among information technology intermediaries draws attention to the fact that market form of coordinating mechanisms has its strength among the supply chain actors that allow information technology intermediaries play significant roles between them.

Primary uncertainty

This type of uncertainty arises from exogenous sources like natural happenings, change in preferences, change in rules and regulations such as tariffs and custom duties, etc. (Sutcliffe and Zaheer 1998). Uncertainty in this context occurs as a result of natural phenomena (Buvik and Gønhaug 2000) that may be linked to the change in climatic conditions that can pose threat on businesses, different government initiatives to protect its borders from external control, invention from technology that might face its tough stage, etc. Therefore, firms may not be able to counterbalance this type of uncertainty but only that there is need to ensure that adaptation is substantiated in order to curtail redundancies. Supply chain network is susceptible to this type of uncertainty, and as a result of that, parties involved in the network should be able to monitor activities that might cause changes through which this type of uncertainty can occur. Adapting to changes in the environment should be key measure, though the increase in changes of environment leads to several unforeseen contingencies, through which firms whose network is evaluated based on integration should be able to protect themselves from disputes that might occur as a result of unresolvable businesses. On the converse, uncertainty from technology point of view may lead to supply chain network not to adopt vertical integration. Rapid changes in technology which firms are perceived as obsolescence may reduce the profits of partners in supply chain thereby reduce their level of integration. Therefore, the arguments tend to corroborate the fact that primary uncertainty is necessarily associated with decisions that help in building integration in supply chain network. The other view shows that technological obsolescence conditions will affect firms' integration.

Suppliers' uncertainty

This type of uncertainty is as a result of behavioral measures among firms in the supply chain network (Sutcliffe and Zaheer 1998). There is no difference between suppliers' uncertainty and behavioral uncertainty because the former arises as a result of the behavior of parties involved in supply chain network. Williamson (1985) ascertains that behavioral uncertainty is the strategic non-disclosure, disguise, distortion of information, and opportunism that can take place ex ante and ex post. Opportunistic behavior is termed as 'self-interest seeking with guile' by Williamson (Williamson 1975, 1985). Evaluating behavioral uncertainty, it reflects as unidentified contingencies in a binding agreement among firms.

Competitive uncertainty

Competitive uncertainty occurs as a result of the actions of the existing firms that cannot be predicted. Sutcliffe and Zaheer (1998) refer to those actions as either innocent or strategic, deliberately deceitful or misrepresented. Contingencies are bound to increase as a result of competitive uncertainty based on competition in the marketplace, and as a result of that transaction costs increase in carrying out contractual businesses among firms. Sutcliffe and Zaheer (1998) conclude that the increase in competition through possible strategic actions will lead to the increase in vertical integration. Meanwhile, Kulkarni and Ramamoorthy (2005) substantiate that high level of competitive uncertainty can lead to increase in lock-in cost. In a nutshell, numbers of information technology intermediaries will help bridge some gaps such that uncertainty will be reduced in marketplaces among partners of supply chain. Information technology intermediaries operate within the supply chain network that focuses on market/horizontal integration rather than involving in vertical integration. Most certainly, supply chain actors welcome competitiveness among service providers in order to select based on performances, provision of up-to-date technologies that will help them in improving in their (actors in supply chain) day-to-day businesses in the supply chain.

> *Proposition 3: Increase in the number of information technology intermediaries lead to a reduction in uncertainty of supply chain actors.*

3.1.3 Frequency

The level of which transactions are carried out should be evaluated regarding the concentrations on how often firms interact. Sometimes transaction costs depend on firms' interactions. If firms transact continuously or most often, there is tendency that the transaction costs will reduce, but on the converse where by transaction is very low among firms of a specific supply chain network; the transaction costs go up because of the low frequency of information flow among the supply chain actors. Asset specificity is expected to be high in order to have transactions among firms (Douma and Schreuder 2008) which is stipulated to hierarchical coordination. High frequency tends to help in recovering costs especially in structured and specialized governance. In a market form, adopting high level of interaction through which information technology intermediaries have significant roles will also help coordinate the supply chain actors through which opportunism can be checkmated. In the open market structure, high level of transaction can be evaluated based

on trust and reputation of the information technology intermediaries. The high level of trust will encourage more transactions through which information technology intermediaries will be used to disseminate information among partners in a supply chain.

Proposition 4: Increase in the frequency of information flow between supply chain actors mediated by information technology intermediaries should lead to less opportunistic behavior between supply chain actors.

The propositions signify that increase in activities performed by information technology intermediaries lead to either positive or negative reflection on the supply chain in general or the supply chain actors. There are eight constructs in the propositions. Table 3.1 shows the constructs.

Constructs	Reflections on the supply chain/supply chain actors
Information	+ information sharing/transformation/flow
Performance	+ performance in supply chain
Transaction costs	− Transaction costs among supply chain actors
Specific investment	+ Dedicated assets specificity
Coordination	+ Coordination among supply chain actors
Competition	+ Number of information technology intermediaries
Uncertainty	− Uncertainty of the supply chain actors
Opportunistic behavior	− Opportunistic behavior among the actors

Table 3.1: Constructs of the propositions

With the support from the extant literature about case study, this research draws up a model that signifies exact illustrations of the aforementioned researchers, thereby leads to providing the research model in figure 3.1 below.
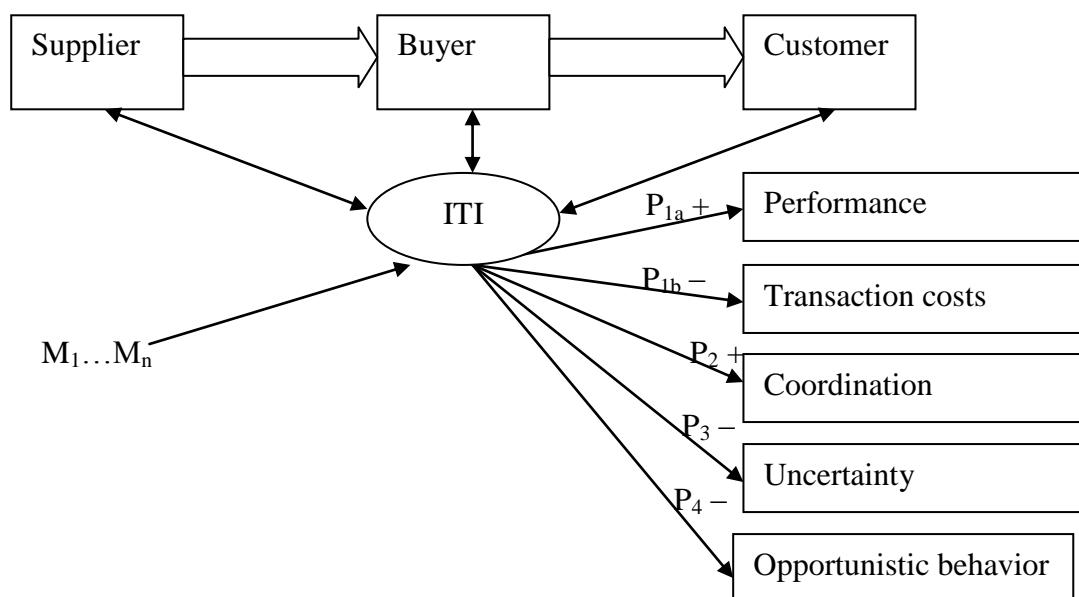

Figure 3.1: Research model

3.2 Electronic businesses

The adoption of transaction businesses through electronic has gained momentum as a result of the increase in the development of information technology. Lewis (2001) defines electronic business as the application of inter-organizational systems through which electronic trading of products and services are supported. This part is interested in looking at issues surrounding electronic businesses (Bakker et al. 2008) through two approaches. These approaches are used to evaluate electronic businesses from the information systems' point of view. The first approach focuses on coordinating mechanisms. A researcher, Keen (1991) expects organizational simplicity through which there can be direct link between or among parties while other researchers clarify the need for third parties' roles in supply chain (Malone, Yates and Benjamin 1987; Bailey 1996; Bakos 1997; Orman 2002; van Weele 2010). The most important issue in this part is to consider the coordinating mechanisms through which electronic devices such as EDI, Internet, XML, e-hub, ERP, web-pages, etc. are being used in their day-to-day transactions within or between firms. The second approach is related to electronic businesses especially by considering the geographical location of the parties involved. A researcher referred to that as boundary-spanning (Yao, Dresner and Palmer 2009) and its effect on transactions both positively and negatively are important. Considering the domestic interactions among firms comparing with international forms, some factors can be examined briefly.

In the first approach, the study considers electronic hierarchies, electronic markets, and bilateral form. Bakker et al. (2008) term them as one-to-one interactions, one-to many interactions or many-to many interactions. The reasons for electronic businesses as described by Schlueter-Langdon and Shaw (2002) are to aggregate content and offer competitive goods and services, build electronic marketplaces through which interactions will be made easier. Further impression is that they also ascertain the fact about reduction of searching costs, provision of price information, transparency of the market through provision of competing and complementary goods and services. The study is to provide insight into which of the coordinating mechanisms possesses the aforementioned characteristics of electronic businesses and its application in connection with the theoretical focus on transaction cost analysis that can allow information technology intermediaries play their roles in supply chain. The first approach draws attention to the different types of coordinating mechanisms and which one is suitable in promoting information technology intermediaries.

3.2.1 Coordinating Mechanisms

Firms adopt any forms of coordination in order to improve on their competitive advantage, and bountiful profits waited to be shared. It can be achieved by specific investment that has no open space for intermediaries, the platform that allows intermediaries, and the other form which is based on collaboration and cooperation with effect from contractual bindings. This approach is to look at how two or more firms have decided to work with one another by adopting information technology either by internalizing such information system, giving approval to third parties that can provide information technology that supports businesses and interactions in the supply chain, or by creating avenue for both internal and external provision. As Orman (2008) notifies, electronic hierarchies and electronic markets are being presented as two opposed coordinating mechanisms. Information technology intermediaries seem to favor electronic markets at the detriment of electronic hierarchies. Therefore, the most suitable coordination from the view point of transaction cost analysis and the theoretical evaluation in which information technology intermediaries flourish is nonetheless appreciable in supply chain.

3.2.1.1 Electronic hierarchies

Some researchers such as (Keen 1991; Cort 1999) evaluate that internalized information flow among the supply chain members will lead to a better structure of an organization which promotes healthier environment. Other researchers like (Williamson 1975; Buvik and Gønhaug 2000; Buvik and Reve 2002) negate the aforementioned opinion. They envisage that vertical integration always somewhat attracts opportunism, free-riding, etc. Meanwhile, information technologies that are being acquired seem to be quite expensive. Such information technologies include ERP systems e.g. SAP, Microsoft Dynamics, etc. Orman (2002) defends electronic hierarchies which result from information processing technologies through which integration, insourcing, merger acquisitions from information intensive processing are being carried out. Adopting this method leads to centralization of information technologies in a supply chain, and parties operate backend integrated form of information flow. Linking this to the dimensions of transaction cost analysis, there is tendency for asset specificity. Firms tend to invest in other firms with the belief that such investment will aid reduction in transaction costs, promote stronger relationships, prevent uncertainty, and increase the level of transactions – frequency (Williamson 1975; Heide 1994). More importantly, disintermediation results from decisions made by one or two

firms by internalizing all their key competences through which experts are employed to handle those activities within the supply chain. Therefore, all the roles of information technology intermediaries are internalized and direct links are built between the suppliers and the buyer, the upstream and the downstream, etc.

3.2.1.2 Electronic markets

The practice through which information technologies have been used in creating economies of scale, specialization as a result of outsourcing activities to potential firms that can help reduce information and communication costs has paved ways for electronic markets (Rossignoli 2009). Bakos (1997) defines electronic markets as the means through which participating buyers and suppliers exchange information about prices and product via inter-organizational systems. This system is more familiar with open market with free entry and free exit, though adopting information technologies in order to disseminate information at its fastest peak among firms that build supply chain network. In order view, information flow within supply chain has been termed as an important and strategic activity that should be outsourced without considering whether transaction costs reduce or not. Orman (2002) says that electronic markets occur based on the fact that information technologies rely on market intensive structures such that outsourcing of key competencies are considered important in improving the activities within the supply chain. Moreover, decentralization of decision making can be resulted from allowing information technologies intermediaries to take roles in a supply chain. The fact that firms can switch intermediaries basically that there are several service providers has been one of the issues that affect this form of coordination. This system creates awareness for information technology intermediaries, either through re-intermediation which is characterized by defining important roles of the third parties especially those that have adopted the usage of information systems.

3.2.1.3 Electronic bilateral

Firms choose to collaborate by using binding agreement that defines individual firm's contribution in a relationship. Some researchers refer to such collaboration and cooperation as 'neither hierarchy nor market' (Lewis 2001; Lewis and Talayevsky 2004), other researcher refers to such relationship hybrid (Buvik 2000). In real term, agreement binds the roles of firms involved in collaboration which might be partnership among the operational units of firms within supply chain or joint ventures and other forms. The most

important issue here is that information dissemination is defined in the contract (Dyer and Singh 1998). There can be restriction to what extent information should be shared among firms in the supply chain. Such restrictions may tune into increase in transaction costs especially renewing contracts that will enhance and improve on high flow of information. There is restriction here on information technology intermediaries.

3.2.2 Geographical location

This approach is to evaluate the locations of the firms that are involved in supply chain which may be either domestic network or cross border network. A reason for this approach is to clarify the fact that businesses depend on this approach to an extent to survive. In one hand, the best relationship relies on proximity of firms with one another. Therefore their collective interactions could be perceived faster and encouraging without any external forces. On the other hand, the fact that such collective interactions may consume much more than advocating businesses across border is brought into consideration. Domestic network may not attract many problems, but cross-border network does especially the recent events that have been disrupting global businesses from natural disasters to financial crises across Americas and European countries. Other considerable issues that have exposed firms to cross-border transactions are very much important. The fact that a country provides not all goods and services leads to depending on other countries especially on goods and services she lacks. This approach sheds more light on the aforementioned networks through which information technology intermediaries have been playing significant roles.

3.2.2.1 Domestic network

Supply chain and the firms involved, especially information technology intermediaries continue to thrive within a country, community, commune which is referred to as domestic market or network through which information flow is domesticated in supply chain. Aims of this form of network is to avert some barriers that might hamper the supply chain such as language barrier, inter-cultural barrier, changes in time, but the most important reason for adopting domestic network is nonetheless its impact on the domestic economies (Johnston and Wright 2004). This results from the fact that SMEs (small and medium enterprises) are the role players in the supply chain. Information technology intermediaries find it easier to communicate, interact with their clients in domestic network of supply chain. Doing business within geographical vicinity implies that site specificity has been

the priority such that the firms involved have basic understanding of the rules and regulations of that locale, and other key issues such as transportation, money transfer among the firms, information flow, and other important issues among them. The domestic network is disadvantageous for globalization and internationalization of movement of goods and services, but we cannot deny the fact that the need for firms to go beyond domestic markets demands lots of strength and capabilities to cope in the international business arena.

3.2.2.2 Cross-border network

The need for firms to interact either through intra-firms or inter-firms links has been as a result of globalization and internationalization which has gained the support of governments of the countries of the world and more importantly different regional and international organizations such as UNO, WTO, OECD, EU, AU, etc. which provide avenue for interactions among firms across-borders. Therefore, information technology is also important in doing businesses among firms across borders. The aim of amplifying that is to strengthen activities among firms in order to provide goods and services that are not sufficient in one part, but of large measure in another part, with the aim of deriving benefits among firms in those different countries of the world. Information technology intermediaries have to be part of such dynamic interactions. Governments of the countries of the world and the international organizations create concepts for globalization (Zekos 2005). Zekos (2005) describes further the idea which is meant to promote free-flow of capital, further global integration, reduction of the influence of the governments especially on economic policies. Firms move across borders – boundary spanning through using information technology to improve on their day-to-day transactions. Internet is viewed as a global medium (Johnston and Wright 2004), and the most important issue to have in mind is that firms ensure that they exploit information technology in order to redesign businesses through which customers benefit from (Yao, Dresner and Palmer 2009). There are several factors that firms face in building cross-borders network. Such factors may halt activities of information technology intermediaries. They include: financial crises, exogenous occurrences such as global warming; volcanic eruptions; etc. terrorists attacks, language problems, and many more factors to mention few. Almost all the activities of the information technology intermediaries are affected by the aforementioned factors that confront supply chain across borders.

3.3 Purchasing and supply chain management

This part, as one of the concepts for the study, is to evaluate activities of firms that ascertain improvement in supply chain either through individual firm's operational unit or through collective departmental approval. From the view point of some papers, vertical integration necessitates the collaboration of dyad firms to achieve their aims. Van Weele (2010) ascertains that firms spend more than half of their revenues in procuring goods and services. How does it look like when all the activities between firms bend upon using electronic devices mostly in carrying out most crucial and core values in order to reduce costs? Electronic networks simplify processes especially searching for suitable suppliers through Internet (van Weele 2010). But the argument here is that, the capability of reducing the workload of the employees and outsourcing most crucial activities that demand usage of information technology is important. Rather than looking at all activities – primary; such as inbound logistics, operations, outbound logistics, marketing and sales, service, and support activities; firm's infrastructure, human resource management, technology development, and procurement, it is important to select one activity that can provide critical insight through which this concept can be linked with the theory applied in the study (Porter 1985; van Weele 2010).

Purchasing or procurement is an important activity in a supply chain. Van Weele (2010) explains further that purchasing is the method of buying inputs used in firm's value chain which include raw materials, supplies, machinery, laboratory equipment, office equipment, buildings and other consumable items. From van Weele (2010)'s view, the link between primary activities and procurement is that the material requirement of both inbound and outbound logistics, and operations should be provided within the speculated time. The need for purchasing management has been seen as all measures put in place in order to manage the relationships between buyers and suppliers so as to enhance alignment with the company's overall interests and its business strategies (Gelderman and van Weele 2002; Msimangira 2003; Svensson 2004; Zhenjia 2008; Emiliani 2010). Therefore, purchasing management involves all parties of the supply chain network (Elleram et al. 2002). In this context, information technology intermediaries play significant roles (discussed in chapter 2) in building the company's business strategies and interests.

3.3.1 Purchasing management (PM)

The issue raised concerning purchasing management does not limit this study to the usage of information technology intermediaries only for procurement – most especially e-procurement, but rather to lay emphasis on the activity that demands transferring key processes of a firm to external firms that can handle them better so that the focal firm can focus on its own competence (van Weele 2010). For instance, searching and selecting suppliers may be cumbersome in some situations especially when the dimensions of transactions mentioned above are not put in place such that the rigor from searching and selecting suppliers could wage unexpected breakdown on the focal firm. In order to save the firm, professionals with the aim of amplifying enormous opportunities can intervene, more so with the development in the information and communication technological advancement.

Outsourcing is evaluated as a better option for optimizing better procurement of firms in order to reduce costs and risks. Questions arise as a result of specification of products and services when it comes to outsourcing most importantly concerning quality specification, logistics specification, maintenance specification, legal and environmental requirements, and a targeted budget (van Weele 2010). Searching for suppliers nonetheless is not activities of the buyers, but the information technology intermediaries have the potential suppliers within their reach. In traditional form, the buyers have to undergo supply market research, but the new dimension is that the firm relaxes off while the professionals with IT carry out the search which may cost less than what the firm will outright spend in conducting supply market research. The most important stage is the specification stage. Another interesting part is that, the professionals with the information technology acumen can handle specifications based on either their past experiences or through the information gathered from the focal firm. Drawn from Ellram and Billington (2001), the outsourcing capability relies on taking advantage of the strength within the supply market, and the supply market is open to the intermediaries whose efforts are perceived to providing competitive advantage, reducing costs, resulting in leverage in buying and more importantly acquiring both economic of scale and economic scope.

3.3.2 Supply Chain management (SCM)

Supply chain management (SCM) has no specific definition (Lambert, Cooper and Pagh 1998; Wisner and Tan 2000). They say that it integrates logistics and physical distributions

functions in order to reduce delivery lead-time by the parties involved specifically manufacturers, wholesalers, distributors, and retailers in order to achieve integration of purchasing and supply with other firms. Wisner and Tan (2000) claim that SCM involves all activities that can be referred to as value-adding from the point of extraction, delivery, and to the final consumption. Wisner and Tan (2000) explain further that SCM manage movement and transformation of goods and services efficiently and effectively through the supply chain to its final destination – last consumers. Integrating key functions (Wisner and Tan 2000) such as purchasing, distribution planning, manufacturing planning, demand management, materials management, etc. which are also referred to as the nine management processes by Lambert, Cooper and Pagh (1998) in supply chain is nonetheless known to be SCM's main focus. Meanwhile, considering both short-term and long-term of SCM, Wisner and Tan (2000) claim that SCM's short-term objective is to ensure that there is increase in productivity and reduction in inventory while that of long-term is about the strategic goal that focuses on customers' satisfaction, the SCM's market share, and to generate revenue for all parties involved in the supply chain network.

Lambert, Cooper and Pagh (1998) lament about the complication surrounding managing supply chain, and the management of activities such as information flow or material flow. Free flow of information within the supply chain will boost activities, and more revenue will be derived. Therefore, organizations acquire information technology – internalize IT or outsource it to the third parties whose idea is to provide avenue for qualitative flow of information within the supply chain network. Supply chain allows cooperation and coordination that fit in the third parties and the demand for collective management in order to attain better result. The SCM strategy depends on whether the parties are vertically integrated in reaching their goals or through horizontal means which allows external contributors with the aim of reducing costs, building stronger and longer relationships, and providing accurate information flow, etc. Integration of the SCM can also allow external parties to contribute in both process and product design in order to build outstanding competitive advantage, and more so to create value. Information technology intermediaries roles increase within the supply chain network by providing technological contributions to the supply chain actors.

3.4 Inter-organizational system

Inter-organizational system (IOS) has been addressed in the extant papers. In fact, drawn from Daniel and White (2005) the description provided by Hong (2002), IOS is the

information and communication technology that increase the level of interaction among organizations. Basically on the descriptions above, good examples of IOS are Electronic Data Interface (EDI), Internet, extranet, electronic fund transfer (Clark, Croson and Schiano 2001). Daniel and White (2005) substantiate the fact that IOS creates opportunities for businesses to showcase their competitive advantages. Therefore, this part is to look at issues relating to information flow within and between organizations. Papers refer to the adoption of ERP in supply chain. ERP was founded in the 1970s in order to boost the organizational information flow. Alshawi, Themistocleous and Almadari (2004) define ERP as 'an attempt to create an integrated product that manages the majority of operations in a company'. It has been used to decentralize activities within organizational departments, and integrates them into one system that enables business processes rather than the archaic business functions (Monk and Wagner 2009; Alshawi, Themistocleous and Almadani 2004). In other words, ERP helps integrate departments of organizations better than relying on documents. Meanwhile, organizations are facing challenges according to Daniel and White (2005) in their external environments. There seems to be limitation to numbers of organizations that can extend information flow through the usage of ERP. Reason is that of its enormous costs and its level of proprietary, but creating value has been a greater measure. In supply chain network, firms can only adopt ERP if they are vertically integrated by defining asset specificity, level of uncertainty (to be at low level) and high frequency of transaction among them(Al-Mudimigh, Zairi and Al-Mashari 2001; Akkermans et al. 2003). They can collectively pay for the high costs in as much they all share benefits and loss for a long-term as clearly defined by the parties that adopt the system.

Another important issue that has been clarified by Alshawi, Themistocleous and Almadani (2004) is that organizations that adopt usage of ERP are tied down to a single provider of such system, and such provider becomes dictator with influences over the prices and the technologies. Findings have proven that ERP vendors have not been able to meet up with the demand of their clients in terms of Information Systems (IS) which intends to add supportive task such as incorporation of new business processes, software products upgrading, and provision of new functionality (Alshawi, Themistocleous and Almadani 2004; Amoako-Gyampah 2004; Boersma and Kingma 2005; Orman 2002). Lewis (2001) gave three vital roles performed by information system (IS), and they include; supportive of business operations especially to capture point of sale-data, managerial decision making

which focuses on selection of suppliers, and the strategic competitive advantages which prove the ability of firm to integrate the supply chain network. Other interesting paper by Kalusopa (2005) gives roles played by information such as; serving as tool for communication among parties, a channel for assessing trends, and as a tool for shaping decisions by producers and policy makers. The argument that ERP solutions do not suit different variability and complexity of other companies has been re-emphasized to re-evaluating the adoption of enterprise application integration tools which enable provision of better solution (Akkermans 2002; Al-Mudimigh, Zairi and Al-Mashari 2001).

Chapter 4

Research Methodology

The research as a result of all the tools adopted, has been termed as case study research through which almost all the characteristics of qualitative research methodology are also applied. Case study as defined by Rhedding-Jones (2005) is the study of a particular case or a number of cases which may be places, events, programs, activities, periods, individuals, groups, institutions, issues, themes or problems. Case study research is also described by Remenyi et al. (2002) as the method through which complex business or management phenomenon should be described in a holistic way, a situation whereby a more meaningful exploration of phenomenon is allowed especially in its context in comparison to either cross-sectional or sample longitudinal study.

4.1 General characteristics of case study

Remenyi et al. (2002) ascertain that case study research is used as collection and documentation of evidence, and they provide ten characteristics of case study. They include:

1. Case study as a story
2. Case study provides evidence on multiple sources
3. Triangulation of multiple sources results from case study's evidence
4. Providing meaning in the context
5. In-depth understanding of central issues explored and a broad understanding of related issues and context
6. Clear-cut focus on either organization, situation or a context
7. Reasonably bounded with not much stretch over too wide canvas either temporal or spatial
8. No need for the researcher to be completely involved in the object of the research
9. Drawing on either qualitative or quantitative tools or both for evidences and analysis
10. And the demand for a thorough protocol.

Yin (1994) gives his view regarding case study research, and he says case study is the best empirical inquiry through which a contemporary phenomenon within its real life, when the

boundaries between phenomenon and context are not clearly evident, and which multiple sources of evidence are to be applied. The idea from Yin (1994) is used to support the fact that case study is better in carrying out exploratory, explanatory or descriptive research. This research tends to focus more on exploratory exporatory. Van der Vorst and Beulens (2002) support the argument of Yin, and they provide three reasons for choosing case study to be preferred strategy in exploratory research. The reasons include: how questions are designed to measure exactly the research focus, the fact that the researcher has basic idea, and focusing on the facts from real-life which might have its support from theoretical applications. Therefore, this research has chosen to adopt the style of van der Vorst and Beulens (2002) through which real-life activities that are complex will be addressed using case study rather than survey or experimental measures. Going back to Yin (1994)'s belief and what he terms as criticisms of case study and provision of answers to those criticisms. There is lack of data which results in reporting all evidence, there is no basis for scientific generalization and that leads to generalizing support from theoretical propositions but not population as evidence in statistical applications. The model shows the link between the research problem and the propositions from the theoretical perspective, its links with the case companies, findings which help in drawing better conclusion.

4.1.1 Qualitative techniques

Qualitative research has mostly the characteristics of case study with some slight difference which lies on the fact that qualitative research is carried out through close and personal means while case study is diffused and complex comparing to the simplicity of qualitative research (McAllister and Rowe 2003; Johnston and Wright 2004; Marshall and Rossman 2006). Meanwhile, the need to consider adequacy and efficiency in information gathering is as important as other factors that are to be considered in this study. This implies that the research focuses on language and communication by adopting speech events, texts, interactions, etc. from video recording or voice recording – microanalysis or textual analysis as referred to by Marshall and Rossman (2006). It is also an evidence from Remenyi et al. (2002) whose assertion shows how qualitative method also favors case study research. They claim that case study can adopt either quantitative or qualitative method. By applying qualitative method, it implies that this research use techniques such as 'hermeneutic or linguistic analyses' in order to capture exact meaning the researcher needs during data collection which might be of help during the interpretation stage of the

research. Therefore, this study makes use of all the qualitative techniques such as in-depth interview, observations, etc.

4.2 Data Collection

Information was gathered in order to have fundamental idea regarding the empirical practices of the selected case companies. Yin (1994) gives six sources of data collection which include documents, archival records, interviews, direct observations, participant observations, and physical artifacts. All the sources are important in terms of gathering information for a case study. More importantly, Yin (1994), van der Vorst and Beulens (2002) give three principles of data collection which are also very important in this study. They include: Using multiple sources of data, creating a case study database, and maintaining a chain of data.

4.2.1 Using multiple sources of evidence

Another name given to this principle is triangulation which implies that this research is typically structured interview with its view to explore the respondents' opinion about the past state and the present, or maybe they have opinion relating to what should be expected for the future. Yin (1994) ascertains that triangulation creates avenue for increase in construct validity. In another view, some of the aforementioned sources of data such as documents, archival records, direct observations, physical artifacts, etc. are being used critically in order to acquire more knowledge about the case companies' performances, and other relative information that helps in relating the empirical part of the research to the theoretical part with trace of references. The researcher had field work with one of the case companies in order to get familiarized with the way information technology is being applied to intermediate among clients of the supply chain actors. Interview with company 1 was through skype, and it lasted for 1:08:20 (one hour, eight minutes and twenty seconds). The interview with company 2 took 1:11:01 (one hour, eleven minutes and one second) on skype, while the interview with case company 3 lasted for 1:10:38 (one hour, ten minutes and thirty-eight seconds). It is also necessary to map out the dimensions through which supply chain integration through some form of coordinating mechanism is enhanced. The need for video and voice recordings help improve on the source of data – interview through which more information are gathered for reference purposes. The webpages of the case companies also provide more information for the research.

More importantly, the richness of the propositions depends greatly on exploratory design. The discussions among the research students and the tutors – supervisors, through which challenging questions are discussed help in designing the case study research. Take cognizance of the meetings among the research students and the tutors, every student (both master and Ph.D. students) in the SC/IS (Supply Chain/Information Systems Group) meets every 2 weeks in order to discuss improvements regarding theoretical measures and links with the empirical parts of their studies. The meeting has been more prolific as if investigators come together to discuss relative and important issues in their research as a protocol of case study research. The supervisors who are senior lecturers have variety idea concerning research, and their guiding roles have propelled the researcher in the right direction in constructing research methodology that is best suitable for this case study by allowing their wealth of knowledge to guide succinctly, and more importantly documented researches from extant literature are being used systematically. The pilot interview with six students show how much prepared the researcher was ready for the field work. The researcher further has interviews with four different respondents, two face-to-face interview through which video and audio recording are used. The two other respondents are through video conferencing – Skype which also allows audio recording.

4.2.2 Creating a case study database

Van der Vorst and Beulens (2002) describe creating a case study of database as a means of keeping notes, files, narratives in the database for the later use in case information is needed. Therefore, this study applies keeping all the interview reports and other findings in computerized files through which the researcher privies to for information at any time. Case companies' documents are also important regarding this principle. The WebPages, yearly reports of the case companies are viewed as documents from the case companies, and the case companies have given approval to using them in this study. In a more concrete view, the structured interview is designed in a questionnaire-form, and it has significant in retracing answers to open-ended questions provided by the respondents.

4.2.3 Maintaining a chain of evidence

This principle of data collection is as important as the other two principles. Maintaining a chain of evidence in order to help external observers link the initial study problems and the conclusion of the case study is essential. Chain of evidence was presented especially in the SC/IS group discussions in order to discuss it. Expectation regarding criticism helped build

concrete chain of evidence. Yin (1994) claims that data collection have to be put to practice on the basis of the case study protocol which this research has adopted. The principle of collating data also has reflection on maintaining chain of evidence. Most impressive issue here is that database from the case study should cited sufficiently in order as evidence providing results of the findings.

4.3 Analyzing the data

Yin (1994) ascertains that analyzing data is the most difficult aspects of case study research. The general analytic strategy can only help in choosing among techniques for analyzing data. He further discussed two general strategies which include reliance on theoretical propositions or developing a case description. The first strategy, relying on theoretical propositions, is described as a means that allows theoretical overview to guide the analysis. Such theoretical propositions have been designed to suit the case study. The second strategy, the development of a case description, is the application of descriptive framework in organizing the case study. Such analysis depends on the general characteristics and relations of the phenomenon in question (Yin 1994). More importantly, Yin (1994) gives other three supportive techniques which are also important in analyzing case studies. Such supportive techniques include whether the data analysis will be explanatory/descriptive in nature, purely explanatory, or maybe time-series analysis. More importantly, this study has adopted data analysis based on the strategy that relies on theoretical propositions through which explanatory technique has been applied in order to ascertain data analysis from case study's point of view.

4.3.1 Explanatory/descriptive

It is important to note to compare the empirical part of the study with the theoretical part. This has been carried out through pattern matching (Yin 1994). Yin (1994) considers three forms of pattern matching – expected outcomes, rival explanation, and simpler patterns. Expected outcomes depend on predicted results from the propositions or maybe alternative patterns are missing. Rival explanations depend on searching whether the theoretical evaluations are connected with the empirical findings. Simpler patterns imply that only few variables can undergo pattern matching especially when there are clear differences based on predictions about the derived patterns.

4.3.2 Purely Explanatory

This supportive technique focuses on developing explanation about case study. It is also important to find out set of causality links – cause and effect modeling in the study (Yin 1994; van Weele 2010; van der Vorst and Beulens 2002). Yin (1994) shows instruction on explanation of results of findings based on series of iterations which include: main theoretical statements – comparing findings of the case – revising statement – comparing details of the case – revising – comparing to other additional cases. In that sense, there may be danger of shifting or drifting away from original topic of interest. Therefore, the research accesses the techniques by building relationship between the theoretical view and the empirical conclusion drawn up from the case companies that granted interviews.

Chapter 5

Case study research design

Structured interview designed for this research signifies the impression from which the research is based such that the research questions represent case study's questions such as 'how' and 'why' questions (Yin 1994). From the view point of Yin (1994), developing questions for a case study is one of the central components of case study design. Table 5.1 below shows the questions in connection to gathering information from the three case companies.

Items	General info	P_{1a}	P_{1b}	P_2	P_3	P_4
1	Q1_1-Q1_5 Q2_1-Q2_5 Q3_1-Q3_5 Q4_1-Q4_3 Q5_1-Q5_6 Q6_1-Q6_6 Q14_1-Q14_5					
2		Q7_1-Q7_2 Q9_1-Q9_3 Q15_1-Q15_8 Q17_1-Q17_4				
3			Q18_1-Q18_2 Q19 Q20_1-Q20_3			
4				Q8_1-Q8_5 Q10_1-Q10_5 Q11_1-Q11_2 Q12_1-Q12_2 Q21_1-Q21_5 Q22_1-Q22_4		
5					Q27_1-Q27_3 Q28_1-Q28_3 Q29_1-Q29_3 Q30_1-Q30_4	
6						Q13_1-Q13_2 Q16_1-Q16_2 Q23_1-Q23_5 Q24 Q25_1-Q25_5 Q26_2-Q26_5

Table 5.1: The structured questions (see appendix 1)

Other components he iterates are: the theoretical propositions for the study, the study unit of analysis, logic ways of linking the data to the propositions, and the criteria for interpreting findings. The decision to link the theory of the study with the case study led to building theoretical propositions that have lots of details with the aim to cover the questions, propositions, units of analysis, link between data and propositions, and criteria for interpretation (Yin 1994).

5.1 Conducting case study

Following case study protocol, this study follows the four areas provided by Yin (1994) through which research and the case study involved can be tested. Table 5.3 below is adapted from van der Vorst and Beulens (2002) through which the aforementioned four areas are viewed. The reason for adapting their view is nonetheless to provide outstanding results through which the research design will be more accurate without statistical or survey presentations of quantitative evaluations.

Criteria	Definition	Main case study tactics used
Construct validity	Establishing correct operation measures for the concepts that were being studied.	Using multiple sources of evidence: literature, discussions with participants in research group – SC/IS group, and with other researchers, observations.
Internal validity	Establishing relationship - causal relationship between research variables (certain conditions lead to the other conditions).	Constructing cause-effect models and discussing these with key information technology intermediaries; comparing empirical based relationships with predicted ones.
External validity	Establishing the domain to which a study's findings can be generalized.	Replication logic applied to multiple case studies.
Reliability	Demonstrating that the operations of a study can be repeated with the same results.	Establishing a case protocol that is used in each case study; detailed reporting of all assumptions and relations identified and data used.

Table 5.3: Evaluation of the research design adapted from van der Vorst and Beulens (2002)

5.1.1 Validity of the research

Mentzer and Flint (1997) describe validity of a research as 'hierarchy of procedures that ensure the conclusion derived from a specific research has proof of confidence'. Therefore, every research technique depends on some form of validity. Mentzer and Flint (1997) give four subcomponents of validity. They include statistical conclusion validity, construct

validity, internal validity, and external validity. This study considers three of the aforementioned subcomponents of validity in order to give more insight to this case study, and they include construct validity, internal validity, and external validity which provide theoretical assertion to Yin (1994)'s approaches. Garver and Mentzer (1999) ascertain that validity of a research can be tested within a given research and across many research studies.

5.1.1.1 Construct validity

In this case study through which empirical evaluation depends on qualitative techniques, construct validation is nonetheless viewed through the usage of source of evidence such as literature, discussions particularly in the SC/IS research group, discussions with the supervisors, observations, etc. rather than statistics application which is common with quantitative techniques. The propositions developed are correct in relation to main theory applied in the study. Mentzer and Flint (1997) describe construct validity as a complex concept with other several forms of supportive validity. Construct validity seems to be more measurable through statistical means whereby several sub-dimensions are evaluated (Garver and Mentzer 1999). The need to delve into the mathematical approach of construct validation is to extend the fact that construct validity may yield best result from quantitative point of view. Garven and Mentzer (1999) describe construct validity as the degree of using scales to measure. They claim that construct validity has sub-dimensions which are: content validity, substantive validity, unidimensionality, reliability, convergent validity, discriminant validity, and predictive validity. What is very important in this study is that all the aforementioned sub-dimensions are irrelevant on the ground that they are statistically explained (Africa 2003; Brahma 2009). Van der Vorst and Beulens (2002) reveal the fact that qualitative research can be carried out based on the case study protocol. Such protocol has become addendum to case study research through which qualitative techniques are adopted in describing validity and reliability of such research in order to attain more productive research in connection with the theoretical evidences.

5.1.1.2 Internal validity

Case study depends on examination of internal validity (Mentzer and Flint 1997). The fact that survey or statistical measurement indicates that relationship occurs between or among variables could be tested quantitatively is not undermined. Intuitively, qualitative measure of internal validity relies on causality – cause and effect views. From the proposition, the

generalized idea is derived from causal relationships. The empirical part must have close relationship with the propositions from the logic and theoretical evidences. In the real term, causality refers to the fact that there is evidence that a certain event causes another event. Therefore, theoretical backing, and empirical supports from the case companies provide more evidence for internal validity. Mentzer and Flint (1997) claim that observations, logic, and theoretical evidences are not enough for internal validity, rather they assume that propositions/hypotheses be drawn. Such propositions/hypotheses are plausible enough to provide alternative explanations connecting to causality. They further provide some categories which the propositions/hypotheses fall under, and the categories include; history, maturation, instrumentation, and selection.

History has been described by Mentzer and Flint (1997) as the phenomenon in research through which changes take place over the time of study in the environment of the respondents. They envisage that there is need for monitoring of the environment for changes, completing studies within the range of time, in order to guard against history threats to internal validity. Case studies have also been perceived by them to be a better means through which history threat can be prevented especially through observation of the environment, notices of changes and explanation of changes in the environment. Mentzer and Flint (1997) describe maturation in connection with changes that occur with the respondents as a result of their knowledge about the research. They also give impression that the method through which information is gathered may lead to biased result. They provide good examples of instrumentation errors which they refer to as: leading questions on questionnaires cue from interviewers, and using single observers in case studies instead of using multiple observers (Mentzer and Flint 1997). From the selection point of view, Mentzer and Flint (1997) assume that some threats to validity can emerge. Such threats include: nonresponse bias which is seen as selection problem, and whether the right sample is selected. To protect the selection threats, Mentzer and Flint (1997) refer to the fact that there is need to carry out the differences between respondents and nonrespondents, explanation that can be back-up for the sample selected, and without drawing conclusions from broader issues than the populations which sample is drawn.

5.1.1.3 External validity

Idea of external validity is much connected to generalization of findings to the broader population. Mentzer and Flint (1997) define external validity as the degree through which

research findings can be generalized to the broader population. In their argument, they believe that single study may not provide external validity, but studies that are carried out basically on different conditions such as different time, place, and researchers, are bound to yield external validity. Two of the three concepts of external validity seem to be important in this part of the study. The three concepts include: statistical generalizability which may be overlooked as a result of its dependence on survey or statistical measurements, conceptual replicability, and realism (Mentzer and Flint 1997). Conceptual replicability implies that it is uncertain to conclude that the prediction of the theory is fully supported by the sample used. In that sense, there is need for other researchers to carry out research that might provide support for the initial study by allowing them to use the method being applied. Mentzer and Flint (1997) give the assertion that encouraging replications through usage of logistics journals can make results of research much more certain. Realism is the other concept that is provided by them. They envisage that limited numbers of case studies leads to problems of external validity from the view point of the other two concepts – statistical generalizability and conceptual replicability. Mentzer and Flint (1997) share the belief that the strength of case studies depends highly on realism as the third form of external validity.

5.1.1.4 Reliability

All the aforementioned types of validity described above have direct link with reliability. Reliability as defined by Mentzer and Flint (1997) is how 'consistently the measures yield the same results through multiple applications'. On the other hand, Mentzer and Flint (1997) envisage that reliability is not sufficient enough for construct validity as compared to other types of validity of a research. They provide four approaches through which reliability can be measured. The four approaches include: test-retest, split half, internal consistency, and inter-judge. The idea behind the approaches is to use them provide reliability for different types of research. For instance, test-retest is used to test reliability of psychological construct. Split-half approach is the second approach and it is used for Psychological construct through which similar method to attain similar conclusions is adopted. The third approach, internal contingency, is most common in testing reliability concerning business processes. The fourth, inter-judge approach is meant for testing reliability of case studies (Mentzer and Flint 1997). Therefore, inter-judge approach is used in testing the reliability of this study by establishing case protocol that is used in each case study; detailed reporting of all assumptions and relations identified and data used.

Chapter 6

Introduction to case companies

The need to use case companies in order to get practical knowledge as compared to theoretical part follows the belief that case study should be carried out based on evaluating companies that their practices are much connected to area of studies. The case companies are selected based on their tasks and performances in supply chain. The roles of information technology intermediaries are also identified with the selected case companies. This chapter is much interested in providing necessary information about the three selected case companies. The case companies are the best evidences through which the research attains its focus. The case companies have their different tasks and performances in supply chain network by integrating through information technology. The system adopted here depends on using different types of applications in carrying out their tasks. Therefore, the three companies: Logit Systems AS, TakeCargo AS, and WISE Consulting AS, are focused on based on the fact that they act as third party service providers which help unravel the research focus in relation to coordinating mechanisms that are best suitable for them. The case companies are part of supply chain network, though they seem to be invisible but gaining momentum in terms of services provided by them. More importantly, they represent ideal technological systems that have been improved upon in recent years. The propriety and expensive usage of technology in some years past have turned around to be more interesting, less costly, and more easy to use among supply chain actors.

The case companies engage in providing varieties of services and solutions that cannot be underestimated in supply chain. Their solutions for example include Logit Sea, Logit4see, Logit D2D, Bit & Pieces, My project, TagIT, etc. Those solutions focus on different areas such as disseminating information for: commercial ship management; freight planning and visibility services; supply chain execution; executing transportation; B2B procurement; etc. Each case company is analyzed systematically and defined based on the services and solutions it provides in supply chain, and through which information technology such measures have been achieved. Nonetheless, the three case companies have given permission to the researcher in order to attain better finding for the research. Table 6.1

below shows the case companies selected for the study, their area of focus, and types of technology they use in supply chain integration.

Case companies	Types of Solution	Tasks	Technology
Logit Systems AS	Logit Sea Logit4see Logit D2D	Configurable software for commercial ship management. Global, proactive and multi-modal freight planning and visibility service. Configurable software for supply chain execution	Java Enterprise applications such as EJB3 Business Layer, JBoss Seam framework, Integrate JBPM tool, Rich user interface, Scalability, Data Structures, and Efficient interface handling.
TakeCargo AS	Transportation	Provide effective information sharing in executing transportation.	Transportation hub, internet-based distribution portal. XML based integration
WISE Consulting AS	Bits and pieces My project RMC for Vest base and North sea Group TagIT	Information flow for B2B procurement. Handling and managing web-based documents and projects data. Information sharing on management and coordination of resources. RMC (Resource Management and coordination). Providing web portal that support procurement and logistics processes between buyers and suppliers.	Web services in an XML-format. Web portal.

Table 6.1: Case companies, types of services, tasks, and technology adopted.

6.1 Logit System AS

Logit Systems AS is known for its tasks in supply chain network especially in making shipping, truck and rail transports more competitive among supply chain actors. The company was founded in year 2000. It has turnovers of NOK 7 million in 2011, and has 10 employees – 3 employees in Norway, 5 employees in India, and 2 other employees in Belgium. In order to achieve this, the company believes in improving in port hub attractiveness, asset utilization, and supply chain execution. The company's interest in combining unique management systems and expertise nonetheless depends on software solutions, integration capabilities, and business process knowledge. Logit Systems AS targets its clients in the area of shipping, logistics and 4PLs, shipping and rail operation cut across the world especially Northwestern Europe, Middle East and Asia. It is important to note that the company has added value in the supply chain network such as value chain integration, sharing shipment management tools, speeding up order-to-cash cycle, control on inventory, supporting advanced logistics in-transit, agility to face dynamic environment, etc. Figure 6.1 below shows adding value execution of Logit Systems AS (Logit Systems 2008a). This study will be much interested in looking at the three solutions provided by Logit Systems AS, and they include Logit Sea, Logit4see, and Logit D2D.

Figure 6.1: Adding value in execution (Logit Systems 2008a).

Logit Sea

This is one of the three solutions provided to the clients by Logit Systems AS. It is known for planning and executing port-to-port shipments, providing optimization for fleet management process, handling arbitrary network of ship operations, and providing simple one-to-stop for commercial ship management. Logit Sea has lots of operational and

supportive features for their potential clients. Table 6.2 below shows the operational and supportive features of Logit Sea. In real term, Logit Sea provides management services through information technology. The solution is meant for the supply chain actors whose businesses are much connected to shipping goods and services across borders (Logit Systems 2008b).

Operational features	Supportive features
- Defining routes and voyages - Sailing plans (annual, rolling forecast, etc.) - Organizing port-to-port shipments - Planning bunker - Voyage order to ship - Visibility, event and deviation management - Handling vessel performance - Handling port log	- Chartering party information - Accepting vessel port - Handling financial settlement and claims - Voyage cost (bunker, port, canal fees, demurrage, etc.) - Hiring charter - Fleet manager map, visualizing sailing plans - Dry docking - Flexible reporting of fleet data - Business process documentation - Document exchange with trade partners.

Table 6.2: Operational and supportive features of Logit Sea (Logit Systems 2008b)

The clients of Logit Systems AS that use the solution, Logit Sea, are range from the manufacturers who need chartering ships; shipping owners; and ship brokers who manage fleet operations and cargo logistics for their customers. The information flow among the parties involved in this type of supply chain network is shown in figure 6.2 below. Logit Systmems AS, through the aforementioned solution, helps in integrating alternative sources of information which brings about establishing complete visibility, and providing continuous visualization of fleet and transport status among clients.

More importantly, the efficacy in sharing fleet management tools within the clients' extended business network, exchanging efficient document among the supply chain actors, providing just-in-time alert regarding operations events, and handling deviations and rescheduling are core important added value through the solution, Logit Sea. However, Logit system AS through its solution, Logit Sea has been able to provide; reliable estimates of delivery times, efficient and reliable fulfillment regarding the customers' orders, and clients with reliable information about the deliveries. Other results derived from the solution include: sharing information about the future, current and the past fleet operations; improving on the fleet utilization and reducing costs of operation; responding

to new fleet structures and logistics processes, and improving communication and transaction with selected clients in the supply chain network. (Logit Systems 2008b).
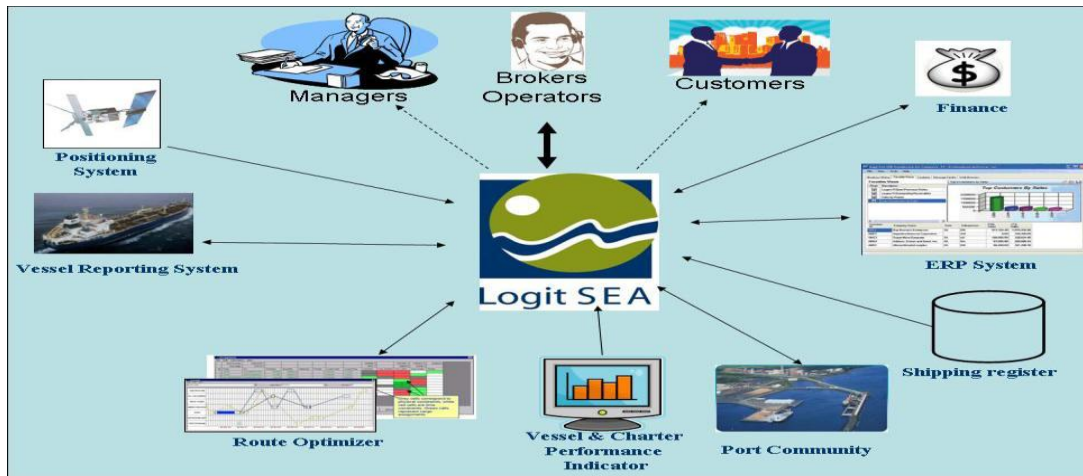

Figure 6.2: Information flow (Logit Systems 2008b)

Logit4see

Another solution of the company is Logit4see and it focuses on operational planning that is much concerned about time, costs, and carbon footprint. Coordinating multi-modal logistics processes at the clients' port community or transport network, and end-to-end web-based visibility solution for existing systems and platforms are among the key features of the company. An interesting form of transferring consolidating data into reliable information is shown in figure 6.3 below (logit4see 2010a, 2010b).
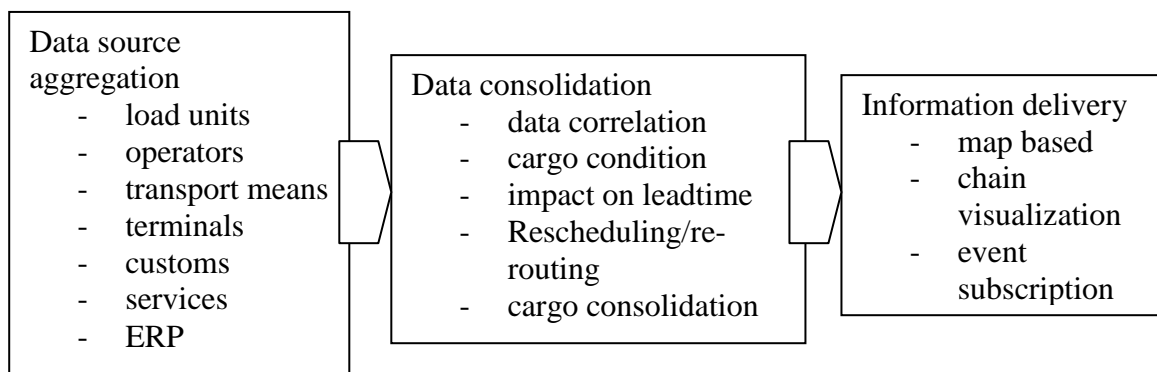
Figure 6.3: consolidation of data into reliable information (logit4see 2010a)

Users of Logit4see, as claimed in Logit4see (2010a)'s report, are expected to benefit in three different ways namely: strategic, financial, and operational ways. Strategic benefit allows control of tower functionality through which network integration is put in place, not only that but also leads to green logistics. Financial benefits for the users of Log4see are nonetheless reduction of safety stocks, reduction of paper work, and acceleration of cash

cycle. Operational benefits for the clients are envisaged to be transparency, interoperability, collaboration, and streamlined processes (logit4see 2010a).

Logit D2D

The Logit Systems AS' third solution in supply chain is to visualize, plan, and execute freight operations. Logit D2D is also known for handling any network operations: offered by the operators either being scheduled or not, for any types of cargo through any form of equipment, and for long-term and spot contracts. Other characteristics of the solution are: making intermodal logistics chains more easy to use, reliable, and flexible like road transport. The solution also provides a simple one-stop-shop for logistics users and providers. Figure 6.4 below shows how the firm has been able to acquire external information in providing general information flow for the supply chain clients (Logit Systems 2008c).

Figure 6.4: Using external information flow in Supply chain (Logit Systems 2008c)

Logit D2D is used in order to provide different services for the clients. Such services include supply chain visibility which is enhanced from configuring supply chains, providing visibility along the supply chain, and informing the stakeholders through events and alerts. The company provides service through Logit D2D which focuses on collaboration and planning by finding transport services, planning end-to-end freight operations, creating uniform booking interface, and the financial settlement. Another service through Logit D2D is to put in place supply chain execution by combining the two aforementioned services, exchanging transport documents, and in-transit tools to manage supply chain dynamically. Meanwhile, the Logit D2D has both core features and supportive features. Table 6.3 shows both core features and supportive features of Logit D2D as a solution that focuses more on the supply chain execution through the usage of information technology thereby help to enhance mutual and outstanding business growth among the company and the clients involved. The company depends on external

information through which the solution can attain both core features and supported features (Logit Systems 2008c).

Core features	Supported features
- services promotion	- transport reference data
- flow planning	- users and rights management
- shipment planning	- decision-support
- booking management	- contract management
- compliance and documentation	- event/alert management
- visibility	- financial settlement
- in-transit tools	- performance management

Table 6.3: Core features and supported features of Logit D2D (Logit Systems 2008c)

6.2 TakeCargo AS

TakeCargo AS was founded in 2000 in order to provide communication solutions through which sharing of information in executing transportation are important. TakeCargo AS has NOK 6, 5 million turnovers in 2011 with 5 employees. TakeCargo AS is able to attain this through integration of IT systems such as XML integration or web. The clients of TakeCargo include buyers, suppliers, and the transporters. From the figure 6.5 below, the level through which individual clients used to transmit information and the new trend through which information transferred among clients is shown. The business processes in the left side of the figure show direct links among actors of the supply chain which implies that there is vertical integration, but the right side of the figure shows the involvement of TakeCargo AS as third party service provider through which information goes forth and back (TakeCargo 2008).
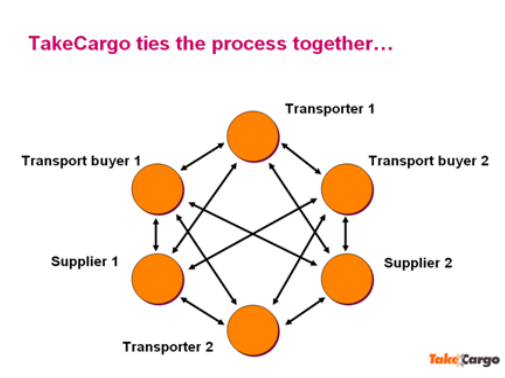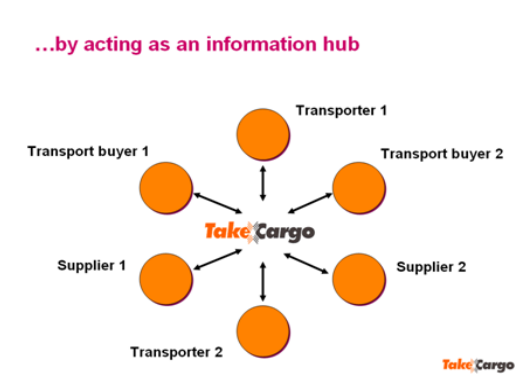

Figure 6.5: Business processes of TakeCargo (TakeCargo 2008)

The company has the belief that changes that occur have led to reducing the level of multiple and costly integration that has dominated the supply chain network today.

TakeCargo's focus is to ensure that there is an integration through which all buyers, suppliers, and the transporters can benefit from, and all the actors can communicate with one another especially on the ground that they are all connected to TakeCargo through the same interface. The fact that many actors create the solution leads to sharing costs among themselves. The actors include: ICA, Coop, NorgesGruppen, Espen AS, and Infohuset AS. They intend to provide avenue for reduction of paperwork and manual processes especially concerning transport booking and settlement. More importantly, they focus on establishing standardized and open portal for shipment by providing transparent information flow and eliminate competitive switching barriers so as to attain efficiency in supply chain network (TakeCargo 2008).

6.2.1 Solution of TakeCargo AS and the technology application

Transportation in a supply chain can be described as strategic issue because it demands constructive monitoring in order to ensure that goods and services flow are in accordance with requests from the consumers. TakeCargo disseminates information among transport buyers, transporters, and suppliers of goods and services. Table 6.4 below shows the potential transport buyers, transporters, and the suppliers that are using TakeCargo's solutions (TakeCargo 2008).

Suppliers	Transporters	Transporter buyers
- As Nestle Norge - Domstein Enghav Haugesund AS - Gastromat - Hansa Borg Bruggeri - Haugen-Gruppen AS - Jordan AS - Kims AS - Nidar AS - Norgesmollene DA - Rora Fabrikker AS - Ringnes AS - SCÅ Hygiene Products AS - Stabburet AS - Synnove Finden ASA - Vestkorn AS	- Brodrene Nordby AS - Bjornflatens Frysetransport AS - DHL Exel Supply Chain AS - DHL Express - Elias Breivik AS - Fosen Gods AS - Harlem Transport AS - Linjegods AS - Namdalske AS - Nettlast Hadeland AS - Nor-Cargo Thermo AS - Nortemp Spedisjon AS - Suldal Transport AS - Tollposty Globe AS - Waagan Transport AS - Norlines	- Coop Norge AS - ICA AS - Joh-Systems AS - Ringnes AS (Carlsberg Breweries) - Norsk Lastebäre Pool - Nortura

Table 6.4: Potential clients of TakeCargo (TakeCargo 2008)

6.2.1.1 Modules of TakeCargo AS

TakeCargo AS focuses on seven areas which include service configuration, core services, services integration, management of price and agreement, cost deviation management, invoice control and statistics. Service configuration is meant to handle related issues such as message deliveries, profiles, pricing rules, invoicing rules, and cost verification rules. Core activities of TakeCargo AS are transport booking, transport instruction, transport fulfillment, transport documents, and transport booking cancellation. Integration services of TakeCargo AS include WEB Portal User Interface, message broker or distribution, message format verification, message delivery interfaces such as FTP (File Transfer Protocol); WEB services; and HTTP message interactions. Management of price and agreement is basically carried out through managing: transport agreements and price put in place, additional charges, and price transport orders as defined in the agreement. Cost deviation management is being put in place by verifying price and cost between transporters and transport buyers, collaborating with each other especially on deviating prices, and updating transport orders in relation to agreement entered about price. Invoice control is carried out through creating invoice specification, verifying transporters' invoice, approving transporters' invoice, and tracking invoice status. The statistics is meant to summarize costs, volumes. More importantly, statistics as a module helps to export all other documents into BI (Business Intelligence) or Data warehouse. The statistics can also be used to measure the performance of the transporters and the routes they operate (TakeCargo 2008).

6.2.1.2 The technology application

Interesting to note is that Takecargo AS uses information technology to suit the clients. That is, the company modifies applications in relation to demands of clients. The company uses three types of technology, and they include transportation hub, internet-based distribution portal, and XML. The transportation hub is software through which clients maintain hybrid integration in order to differentiate TakeCargo's services from competitors based on contributions among the transport buyers in TakeCargo AS. The internet-based distribution portal is also essential for TakeCargo, and the interaction with other clients such as the transporters and the suppliers is carried out through internet-based distribution portal and the XML. From figure 6.6 below, how information technology is

being applied is shown. The link among clients and the extension links with ERP are very crucial in TakeCargo's business (TakeCargo 2008).
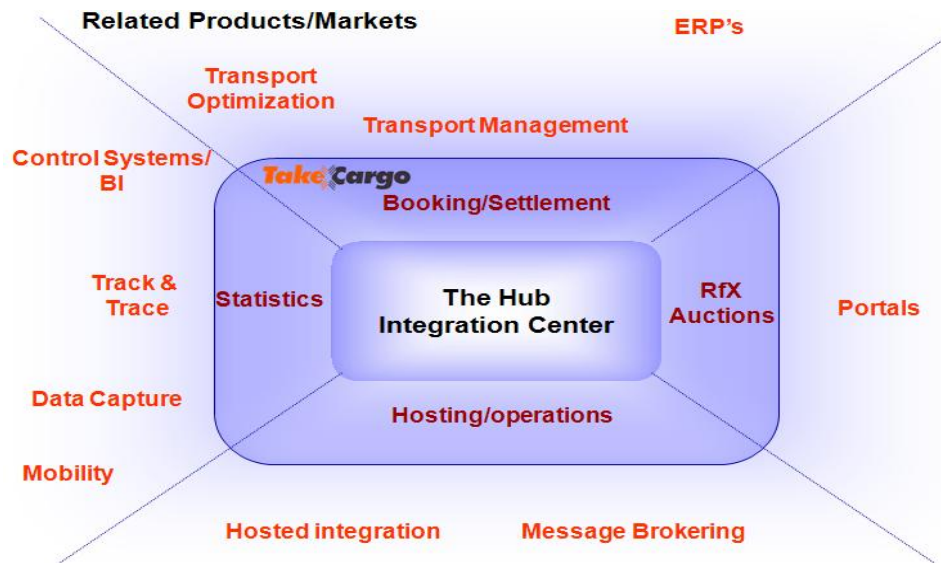
Figure 6.6: Product positioning of TakeCargo (TakeCargo 2008)

Meanwhile, information flow of TakeCargo AS presents the company as information technology intermediaries through which dissemination of information among clients is being handled thoroughly. Figure 6.7 shows the essentiality of information processes and information flow of TakeCargo, and it showcases a better strategy that improves on businesses of the clients – transport buyers, transporters, and the suppliers (TakeCargo 2008). See the description of the figure 6.7 under the modules of TakeCargo AS.
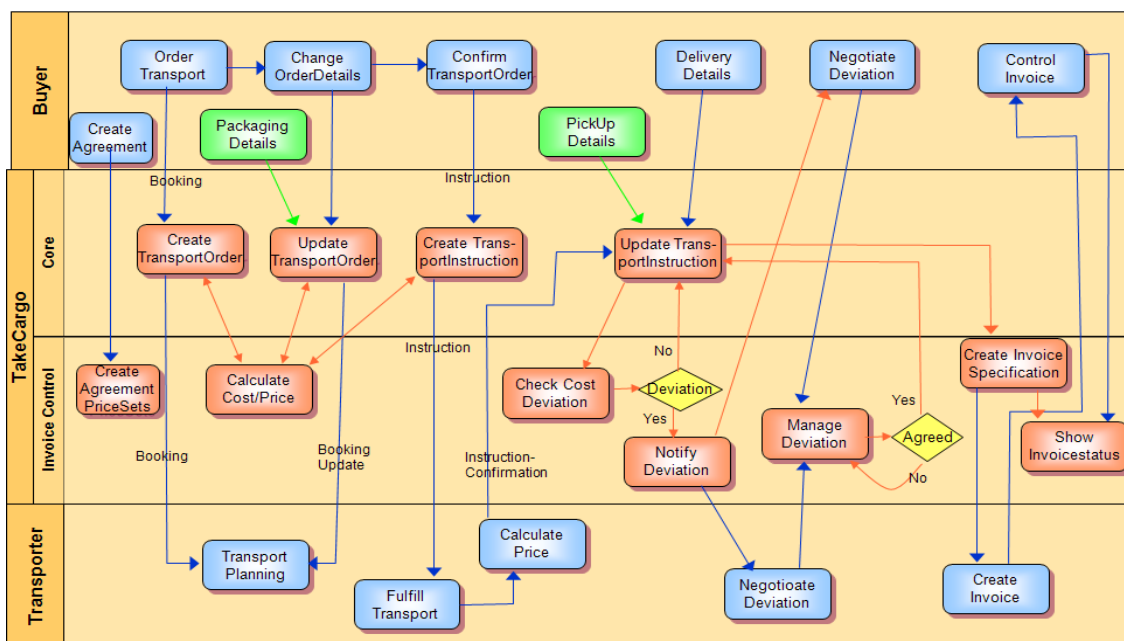
Figure 6.7: Processes and information flow (TakeCargo 2008)

6.3 WISE Consulting AS

WISE Consulting AS was founded in 2001. The company is situated in the city of Molde, Norway. WISE Consulting AS has a turnover of NOK 11 million in 2011, and has 10 employees whose active and professional attributes have contributed immensely to the firm's strength in carrying out day-to-day businesses between WISE Consulting and the clients. WISE Consulting AS - an information technology intermediary deals in: concept and application development, integration of new technology in information technology platforms, and project and strategy management development. WISE Consulting AS concentrates mostly on offshore and shipbuilding industries. Wise Consulting AS provides information flow for business to business procurement, handle and manage web-based documents and project data, sharing information on management and coordination of resources, and has its strength in providing web-portal support procurement and logistics processes between clients. WISE Consulting AS focuses on 4 different solutions through which supply chain actors benefit from. They include bits and pieces, MyProjects, RMC (Resource Management and Coordination), and Tagit. The company performs functions such as purchasing – which is mostly carried out through bits and pieces. Providing transport information through web solutions specifically to the suppliers is another function being carried out by WISE Consulting AS. Project management is another area the company has been providing services in supply chains and more so consultancy is also other area WISE Consulting AS functions (WISE Consulting 2009).

Bits and Pieces

WISE Consulting AS provides solution, 'Bits and Pieces', to the potential customers especially those in shipbuilding industry. Main function of the company is to send information about purchasing of bits and pieces between buyers and suppliers. Bits and Pieces is viewed as business-to-business solution through which WISE Consulting AS is able to disseminate information between buyers (shipyards) and potential suppliers of products such as screws, gloves, sandpaper, work wear, hard hats, welding equipment, nails, steel, etc. The solution depends highly on software – XML. The system recognizes the buyers' article numbers. The reason for bits and pieces is as a result of time consuming in searching, selecting suppliers, not only that but also the fact that former means of sending signal about needed goods delays, hence adopts information system that allows information flow easier through which suppliers get exactly description of goods needed

by the buyers at a faster pace. If not for the reformation made by the information technology intermediary, searching for bits and pieces from the suppliers part of the chain would have been much difficult in a way to search for which product is most related to the serial numbers provided by the buyers. The provision of general serial numbers by WISE Consulting AS, for instance, has made the whole system easier, faster, and cheaper (WISE Consulting 2009).

MyProject

MyProject is a means through which documents and project data can be managed through innovative software solutions. In real term, WISE Consulting AS is much concerned about projects such as building ships or platforms. In a way, WISE Consulting AS believes that several parties such as consultants, owners, designers, shipyards, and suppliers of equipment, are involved in carrying out such projects, of which any of the aforementioned party may be located anywhere in the world. WISE Consulting AS is much concerned about the challenges which may be basically confronting the building of the ships or the platforms. Such challenge may be who among the parties has given approval to which projects, which design is the most latest and current version. WISE Consulting AS designs a web solution that enables tracking of documentation flow among the parties. Nonetheless, such documentation flow prevents occurrences that can cause delays in carrying out the projects. Good examples of companies that use myProject include TEEKAY, Wilhelmsen, and STX Europe for major shipbuilding and offshore projects. The system makes it possible for all the users of the hub to assess all drawings and documents, provision of all changes and comments about drawings (WISE Consulting 2011).

Resource management and coordination for Vest Base and North Group

This solution is designed for the logistics means of oil companies that send goods and personnel to the platforms, and return of stuffs and personnel from the platforms to the mainland. WISE Consulting AS provides routine management of all the activities being carried out by Vest Base and North Group in those regions that are particularly meant for transporting personnel, goods and services. The region of such logistics arena includes Stavanger, Kristiansund, Molde, etc. The VestBase and North Group are specializing in providing logistics for oil companies. WISE Consulting AS acts also as intermediary

regarding needed goods and services by the users of Vest Base and North Group through the aforementioned solution called RMC (Resource Management and Coordination).

Tagit solution

The solution provides faster means to the suppliers of goods and services of some shipyards across the world. The solution is provided by WISE Consulting AS for the suppliers to easily simplify tough and problematic scenario that confront suppliers' search of smaller products in their stores. WISE Consulting AS creates a web-portal in a way to support procurement and logistics processes between suppliers and the shipbuilders – shipyards. Another important role played by WISE Consulting AS is to ensure that procurement of spare parts between suppliers and the operators of the ships is made easy. In a nutshell, searching for smaller products used during the construction of the ship may be difficult to carry out in case such product is needed in future, and Tagit has created serial number for each product – no matter how small the product can be. Tagit web-based portal has about 400 suppliers around the world, and almost all the shipyards in the world use the solution (WISE Consulting 2009).

6.3.1 WISE Consulting AS' technology application

WISE Consulting AS uses technology that helps its solutions more of special, though applications of common software are nonetheless the company's strength. Wise consulting uses designed web-based solutions, XML, and more importantly hub for clients. The company's suppliers of information system include Microsoft and other small technology companies from the US which could be found on the internet. WISE Consulting AS has been applying information system in intermediating between buyers of goods and services and their potential suppliers. Another interesting view about the information system is that the company builds solution that suits interest of their clients in a way that individual company feels that its company is the only one enjoying the solutions through WISE Consulting AS. WISE Consulting AS has been able to do that based on what is viewed as specialization in which its professional programmers feel that is their competitive advantage comparing themselves with their contemporaries in the business.

Chapter 7

Result of the findings

In chapter 4, the study delved into data analysis which claimed that the result of the findings would be developed based on propositions discussed in chapter 2. There were four propositions (though proposition1a and 1b), and questions covered all the propositions during the interview with the case companies. The result is basically put in place to either suit or contradict the theoretical argument. Information flow among the actors in supply chains has been evaluated as a strategic issue that demands more focus in order to have better information flow that can lead to eliminating costs associated with activities in supply chains such as poor scheduling, inventory control, etc. (Childerhouse et al. 2003). The general questions posit essential information about the case companies. There were issues raised in order to know whether the case companies use database, triggered base, or constraint/intelligent base in collating information that they gathered from their clients. Theoretically, the aforementioned types of information technology intermediaries are used for posting, transforming, and matching supply chain actors (Orman 2008). The respondents concurred that they adopted almost all the means through web-based applications, EDI, XML, etc. More importantly, the case companies claimed that they perform purchasing, consultant, transportation means, project management, and more importantly programming that can improve the internal IT of the supply chain actors. In order words, solutions from the information technology intermediaries help develop inter-organization systems that are up-to-task, modern, and congenial in carrying out business processes in supply chains. The respondents from each case company will be referred to as company 1, company 2, and company 3 in ascending order as it were in chapter 6.

7.1 Effect of information sharing/transformation

There were proposition 1a and proposition 1b which focused more on information sharing and transformation. The propositions in turn would lead to improvement of performances in the supply chain and reduction of costs among the supply chain actors. In chapter two, the propositions were constructed based on the fact that human specificity as one of the asset specificity depended on information sharing and transformation among the supply chain actors. Information technology intermediaries can help provide sorts of visibility in information sharing rather than sharing all the information received from their clients, and

by transforming them in a suitable way that will improve supply chain activities. The two propositions are evaluated in relation to theories and the case companies' views in order to veer information flow towards IT contributions in supply chain network.

7.1.1 Information sharing

The proposed view from the theory, increase in information sharing between information technology intermediaries and the supply chain actors could lead to an improvement of the performance in supply chain, was supported by the case companies. For instance, the three case companies responded that better performance of the supply chain depend on sufficient information flow. In a way, information sharing has been used to achieve better performance through creating platform that functions more effectively and efficiently. Company 3 claimed that configuration of the applications has helped provide which client is eligible to access which information and which client is restricted. Information systems put in place by the case companies showed that information sharing through them help enhance better performances within the supply chain. The performances of the supply chain could be evaluated based on the information technology intermediaries' strength in providing: coordination of information flow, quality control among the supply chain actors, accurate delivery of goods and services, real time information, facilitating supply chain actors, etc. Nonetheless, all the case companies claimed that their platforms also provide satisfactory services, reduction of information asymmetry, allowing transparency, and more so improving relationship among clients which could be evaluated as improvement of the supply chain performances. Therefore, the assertion about human specificity would be to provide mutual information sharing among the supply chain actors through information technology intermediaries. Imagine how many messages flow through the information technology intermediaries per day. Like the case companies answered, "… about 10, 000 messages flow through our systems per day…" One could evaluate that such information flow might be too tedious to handle by the supply chain actors themselves.

View about the supply chain actors getting access to information in the system, company 1 claimed that all the supply chain actors have all relevant information, but the suppliers are not allowed to get price information or transport booking basically that the company apply role based access control system through which information could be differentiated; whether the role is based on organizational role or user role from the organization. Company 2 also claimed that the platform configures system in order to allow some clients

by allowing access to other users about the containers number, but not about bill of laden's of the containers. Company 3 claimed that the functions from the system could be used to synchronize who has access to the information in order to other clients away from seeing other clients' information.

Information sharing through information technology intermediaries was to ease tensions among the supply chain actors, as claimed by all the case companies. The level at which posting of information to the clients in the supply chain is attained depend highly on the specialty of the information technology developers whose idea is to modify information in more suitable contents, claimed company 3. IT developers of the case companies most especially company 3 claimed that they perform significant roles in posting, transforming, and matching information in order to improve on the performances of the supply chain actors. For instance, company 3 whose knowledge in the area of IT development is tantamount to modifying messages that suit individual client pointed at issues such as seeing their activities as means through which performances of supply chain can be at its best comparing to the past when the supply chain actors used to depend on themselves on sharing information. The case companies in this research have succinctly shown that they provide solutions that bridge gaps in transacting businesses. Such solutions demand integration through information flow among the supply chain actors through the information technology intermediaries. Therefore, the proposition in link to the case companies evaluation; information sharing postulated that improvement in performance of the supply chain actors turned out to be as a result of the involvement of the information technology intermediaries as third party service providers. In more coherent view, information technology intermediaries simplify, synchronize and reduce business processes in order to improve on the supply chain performances.

7.1.2 Transformation of information

The proposition, an increase in transforming information shared between information technology intermediaries and the supply chain actors could lead to a reduction in the transaction costs of supply chain actors, supported the argument in proposition the other proposition, increase in information sharing between information technology intermediaries and the supply chain actors could lead to an improvement of the performance in supply chain, was supported by the case companies, by giving impression that transforming information shared would lead to reduction of transaction costs of the

supply chain actors. The case companies as information technology intermediaries ensure that information gathered on daily basis is restructured to suit the supply chain actors – transformation. The case companies ascertained that transforming information shared among clients has made integration much invaluable for the supply chain actors. In a way, company 3 claimed that such solution might help improve on internal information systems of the supply chain actors or the level at which information sharing can affect supply chain processes. Supply chain actors' information systems are not affected by the case companies. In a way, all the three case companies clarified which costs were affected by their solutions. In a nutshell, they all gave impression that bargaining costs were evaluated as important costs that should exist between buyers and suppliers. They insinuated that the case companies would not have effect on bargaining cost because their roles did not account for bargaining between supply chain actors. The case companies represent improvement in day-to-day businesses of the supply chain actors. In other words, the case companies as information technologies intermediaries add values to existing procedures of the supply chain actors through providing services that increase level of information shared. The case companies help reduce other costs such as policing and enforcement costs, searching information costs, etc. but not bargaining costs. The case companies claimed that their activities focus more on reducing costs among the supply chain actors most especially by transforming information shared among them through information technology.

7.2 Effect of dedicated investments

The proposition, information technology intermediaries with specific investments are likely to provide better coordination between or among supply chain actors, implied that investment in information technology and what were referred to as dedicated assets would improve the activities in the supply chain; hence, the result would lead to better coordination within the supply chain. The case companies interact with the supply chain actor through web-interface, EDI, XML, and other software that help provide needed means of exchanging information. The case companies intimated the relevant electronic devices they apply to dedicated assets. Company 1 and company 2 claimed that they invested heavily on IT systems – software, skill manpower, business plans, etc. which in turn help to provide better services and coordination. Company 1 showed that specific investment led to having offices India and Belgium in order to meet up with the supply chain actors' demand, and that has impact on its performance. More importantly, company

1 and 2 also claimed that they invested in integrating supply chain actors' IT with their IT systems in order to improve on day-to-day development in information technology world. Company 3 viewed what theory referred to as dedicated asses as computers, other equipment which cost less.

Company 1 and company 2 claimed that dedicated investment creates avenue for better coordination most especially by providing modifications through configurations of the information systems which in turn helped to obtain better information about the clients' needs, but company 3 did not perceive any dedicated assets in its company. All the case companies affirmed that effective coordination would be basically by creating adaptations in the IT systems. The case companies also proved that the level of coordination was very high regarding ordering processes which involve making orders, making order confirmations, and restructuring order confirmation for the supply chain actors. The case companies set up platforms for the suppliers that could be used to regulate invoices for the buyers. In more comprehensive view, the platform facilitates relevant coordination through sharing necessary information about specific interaction using all forms of messaging attributes such as e-mails, quarterly or weekly meetings which are agreed upon by all the supply chain actors. In some situations, supply chain actors make request for meetings through information technology intermediaries specifically when there are different companies working under the same industry such as STX Europe – where they were competitors, but later being bought up, and operate under the same umbrella.

7.3 Effect of competition

The proposition, increase in the number of information technology intermediaries would lead to a reduction in uncertainty of supply chain actor, posited that competition among information technology intermediaries could lead to a reduction in uncertainty of the supply chain actors. Important to note is that competition should be encouraged in order to have competitive advantage which in turn leads to creating value in supply chain. Company 1 and company 2 claimed that their firms have no competitors at the moment. In order words, they provide unique services that have not been much gone into by other service providers in the same businesses through information technology. Company 3 reciprocated exact view of the theories concerning competition. Company 3 claimed that many competitors have started with providing the same solutions it provides, and also in a way copy its format. Nevertheless, company 3 has the belief that such action has no effect

on its business, but rather encourages counter-balancing the competitors in more innovational way that makes the company unique. Uniqueness with the company 3 is basically that specialization in formatting information for the clients has given it better chance comparing to the competitors. If company 3 had not provided unique service that could be viewed to better solutions for the clients, the competitors would have attracted the clients and they would become a threat to the service provider's performance in the supply chain.

Therefore, external uncertainty from the competition's point of view could not be defended that much by the case companies. Almost all the questions about uncertainty were not being attended to because of the aforementioned facts about their firms. Only company 3 perceived the competitors as threat to their businesses, though such measure paved ways for improvement in their IT modifications. Uncertainty could be limited in as much the case companies have made their solutions more demanding for their clients in a way that competitors would have to be extra ordinary.

7.4 Effect of frequency of information flow

The proposition, increase in the frequency of information flow between supply chain actors mediated by information technology intermediaries should lead to less opportunistic behavior between supply chain actors, also yielded comments from the case companies. All the case companies agreed to the proposition. In more comprehensive view, supply chain actors get information regularly based on the capabilities put in place by the case companies. The case companies get more than 10 000 messages from their clients per day. Level of information flow indicates that necessary information goes through the service providers and such level of information flow helps protect the supply chain actors from problematic issues. Information flow also implies that sufficient information goes through the information technology intermediaries. The respondents claimed that they responded to information from clients as fast as it could help improve the level of performances of the clients. Therefore, information coordination is a big responsibility being carried out by the information technology intermediaries.

The case companies concurred to the view that increase level of information flow has reflection on opportunistic behavior. The other view whether the information technology intermediaries could also keep necessary information away from the clients that need such information may be termed as opportunistic behavior. Definitely, the study opined the idea

that adequate information flow would reduce cheating on one another in terms of quality of goods and services. Not only that but also other issues such as non-fulfillment of promises among the supply chain actors would be reduced to the barest minimum, companies taking advantages over each other in terms of information sharing would also be reduced, and another stringent issue would be over costing which would also be dealt with basically that information technology intermediaries have significant roles among the supply chain actors.

General evaluation of the proposition from the theoretical view and the results from the research provide another important issue to note. The theory and the findings see the platform as a trend that has become a phenomenon in supply chain. From the theoretical perspective, third party service providers can only operate in market or hybrid coordinating mechanism, but not in hierarchical form. The case companies also support such argument. More importantly, company 2 has the hybrid or bilateral form of coordination, while company 1 and company 3 are purely in open market. The case company with hybrid structure is being put in place by four different companies whose area of business is in the retailing business. The company does not look for more clients especially from the buyers' side, but interested suppliers and transporters may become one of the clients based on contracts. Company 1 and 3 are open to any clients – buyers and suppliers whose agreement demands their solutions. Therefore, coordinating mechanisms through which information technology intermediaries can improve performances in supply chain could be correctly referred as market form and the hybrid form based on theoretical and empirical supports.

Chapter 8

Discussion and conclusion

This chapter is much concerned about the discussion and conclusion of the study. The discussion focuses more on ascertaining findings from the empirical point of view in relation to the selected theory for the study – transaction costs analysis. Meanwhile, the study gave insight to new way of applying transaction cost analysis. In a way, scholars apply transaction cost analysis to measure; opportunistic behavior, specific investment among supply chain actors – hierarchical form of coordination, governance structure, to mention few, etc. but this research adapt almost their ideas in order to attain its goal.

8.1 Discussion

The findings demand more discussion which will be carried out here. In the area of information technology intermediaries in supply chain integration, it is difficult to find literature in which facts relating to the topic could be theoretical captured. The study as a case study based on transaction costs analysis made it difficult too. Good example of one of the past literature based on transaction costs analysis only measured vertical electronic coordination and specific IT investment which seem to be on the converse to this study (Gøril 2007). Meanwhile, this research adapted the aforementioned work's structured questionnaire to suit its study. The study based the propositions on transaction costs analysis' work, and the propositions were evaluated based on empirical evaluations from case study. Interviewing the case companies revealed the authentication of the propositions. Not all the propositions attained supports from the case companies, and the result was encouraging regarding the answers provided by the respondents from the case companies. Table 8.1 below shows the propositions with whether the propositions have support or not from the case companies

Propositions	Supported	Not supported
P_{1a}	Company 1, company 2, and company 3	
P_{1b}	Company 1, company 2, and company 3	
P_2	Company 1, and company 2	Company 3
P_3	Company 3	Company 1, and company 2
P_4	Company 1, company 2, and company 3	

Table 8.1: Propositions in relation to case companies supports or not

The proposition, increase in information sharing between information technology intermediaries and the supply chain actors could lead to an improvement in supply chain, was supported by company 1, company 2 and company 3. The proposition with its positive effect based on the increase in information sharing. Viewing the proposition in relation to empirical part of the study, it was quite interesting that information technology intermediaries have been able to improve performances in supply chain network based on the level of information that passes through them. More importantly, numbers of messages that go through the information technology intermediaries may seem to be cumbersome to handle by the supply chain actors, therefore allowing the service providers who are professionals to handle the information flow which in turn gives way for improved performances. In another view, information shared could be evaluated as efficient and effective in nature because it resulted into improving the performances of the supply chain. Riika and Helena (2006) claim that supply chain visibility may not depend on sharing all information, but sharing relevant and meaningful information that would help improve performances of the supply chain. Value derived in information shared could also be very important to the supply chain actors. Riika and Helena (2006) also define value of information sharing as the benefit derived in sharing information among supply chain actors by considering costs associated.

The proposition, increase in transforming information shared between information technology intermediaries and the supply chain actors could lead to a reduction in the transaction costs of the supply chain actors, supported the other proposition about information sharing. In the view of the respondents, information transformation could be used in creating value of information shared which in turn resulted in transaction costs reduction. The findings also coincided with the proposition specifically by identifying the types of transaction costs that could be reduced as a result of using information technology intermediaries in supply chain. One would envisage that bargaining cost was one of the reduced costs based on the activities of the information technology because of the view that information technology intermediaries' roles signify matching, facilitating, aggregating, etc. The costs case companies claimed that they reduce among the supply chain actors include searching and information, policing and enforcement costs.

The proposition, information technology intermediaries with specific investments are likely to provide better coordination between or among supply chain actors, only generated results from company 1 and company 2. Except company 3 which has different opinion

concerning dedicated assets – specific investments (Huang and Pi 2011). One could admit that better coordination was not only as a result of dedicated assets, but also the willingness to share data through all the equipment put in place for the platform to function well could help improve on better coordination. Company 3 sees no importance attached to the computers, and other new developed equipment put in place for the new IT systems as means for providing better coordination (Xu, Dong and Evers 2001; Skipper et al. 2008; Singh 2011). There is assumption that company 3 viewed the aforementioned equipment as normal things to acquire in order to be able to act as intermediaries among supply chain actors without attaching importance to all the appliances, gadgets, and both hard and software that the company uses in transforming, collating, transferring, and organizing the information flow. The fact that everything within the premises of the company could be evaluated as dedicated investment is not undermined, in as much they contribute to activities of the supply chain network.

Another proposition, increase in the number of information technology intermediaries lead to a reduction in uncertainty of the supply chain actors, did not generate support from company 1 and company 2. Company 1 and company 2 believed that their solutions have not attracted competition. Company 3 evaluated competition as better means through which its company could improve on IT development for the clients. There is need for competition so that the supply chain actors can select among the information technology intermediaries that is willing to provide efficient and effective services rather than profit making, for instance, as the only target that the companies focus more on.

The last proposition, increase in the frequency of information flow between supply chain actors mediated by information technology intermediaries lead to less opportunistic behavior between supply chain actor, generated supports from all the case companies. Theoretical view, high frequency might be as a result of specific investment because such investment will strengthen level of transaction among the supply chain actors (Williamson 1975). In a view that high frequency of information flow through information technology intermediaries could affect opportunism is not underestimated. The case companies ensure that transformation of information through which high level of information flow among clients is essential which in turn stems down opportunistic behavior among the supply chain actors. Establishing effective and efficient information flow among the supply chain actors could result into making others committed in delivering better services in the supply chain network; hence less opportunistic behavior (Nagin et al. 2002).

8.2 Conclusion

The study captured the theoretical and empirical evaluation through which the research focus was attained. The fact that coordinating mechanisms fall into three different types is unforgettable; the awareness of the theoretical conundrum applied in the study was not also undermined. In the end, the trend by which the theory was applied increased assertion for the research. Transaction cost analysis was mainly used in a way to link its dimensions to evaluating coordinating mechanisms. The dimensions include asset specificity through which human assets specificity and dedicated assets have been used in providing propositions for the study; uncertainty as one of the dimensions provided trace to external, competitive uncertainty which could hinder activities in market form of coordination; and the third dimension, frequency, also paved way for attaining importance attached to high level of information sharing among the supply chain actors. As discussed above, the study unveiled cause and effect through propositions which in turn attracted the supports for coordinating mechanisms that paved ways for information technology intermediaries.

More importantly, roles of information technology intermediaries can only be carried out, as supported by both theoretical and empirical evaluations, through market form and hybrid. Specific investments based on vertical integration will attract dis-intermediation. In a nutshell, supply chain actors have enjoyed services provided by the information technology intermediaries especially in the area whereby they have been able to resolve issues relating to referencing strategic items that might be difficult to trace in case the supply chain actors need the items – either for developing new products or for repair. Supply chain actors may not be interested in keeping past records in their systems, but the information technology intermediaries have records of the past transactions among their clients. Such database has helped in collating information that might suit the supply chain actors' needs at any given time.

Finally, information technology intermediaries have safeguarded the supply chain actors and the supply chain integration through effective and efficient information flow. They have been able to change the ways businesses used to take place among supply chain actors. Changes that have been put in place have occurred as a result of improvement in information technology. Development of new information technology has also helped the information technology intermediaries improve on the performances of the supply chain which turns to be more beneficial for the supply chain actors.

8.3 Limitation of the study

The research focused on necessary materials within transaction cost analysis which was the main theory applied in the study. The thesis also adopted concepts from purchasing and supply chain management, inter-organizational system, information technology intermediaries, and electronic businesses in order to capture more importantly how the platform functions in supply chain. The activities which are basically using information technology to transfer key information within supply chain will either be insourcing – a system through which partners adopt hierarchical structure or outsourcing – a system through which market structure is examined. Meanwhile, new trend which is neither hierarchical nor market has been assumed. Bilateral structure can allow partners to cooperate based on contractual definitions. This study did not only discuss the three coordinating mechanisms, hierarchical, market, and bilateral governance, but also ascertain how information technology intermediaries can adopt principles within transaction cost analysis and the aforementioned concepts to extrapolate correctly the roles of information technology intermediaries in promoting impressive and tremendous services in a supply chain network.

Number of the case companies, sample, made it difficult to use some statistical analysis. If the researcher were able to get secondary data, that could be used for quantitative measurement. In looking at which coordinating mechanisms that would be suitable for information technology intermediaries, the constructs in the propositions were only built on the information technology intermediaries with the dependent variables such as increase in information sharing, increase in transforming information shared, information technology intermediaries with specific investment, increase in number of information technology intermediaries, and increase in frequency of information flow. The independent variables reflect as cause and effect – causality from the dependent variables. The independent variables include: … improvement in performance of the supply chain; reduction of transaction costs; better coordination of the supply chain actors; reduction of uncertainty; and less opportunistic behavior. All the constructs helped developed view that information technology intermediaries are more conventional in increasing level of information flow in supply chain which in turn would attract the supply chain actors rather than having locked-in form of business that never improved on the businesses.

8.5 Further research

There are several views towards further research regarding this thesis. First and foremost, the research was a case study based on transaction cost analysis which could be reviewed by applying statistical data – quantitative measurement. In that case, there is need for selecting enough case companies that will encourage quantitative techniques. Such study could help generalize the findings from both qualitative and quantitative perspectives.

One other area whereby further research may be interesting concerning information technology intermediaries is to look at how some of the case companies integrate with other information technology – ERP. This may require finding out whether there is any specific investment in defining such integration. It was observed from the theoretical point of view that ERP could be too expensive and more importantly its proprietary evaluation. Therefore, how did the information technology intermediaries able to integrate the software left questions behind.

Another area of interest is the fact that companies or supply chain actors withhold some key information; it will be interesting to measure level of information that could be viewed as sufficient or efficient for supply chain network. In this case, information should be clearly categorized strategic, logical or operational in such measurement in order to understand which category should be focused more on so as to reconstruct information flow that will enable better coordination in supply chain.

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Appendixes

Appendix 1: Questions adapted from Gøril (2007)

Part 1: Questions about your firm

1. General information about your company as information technology intermediaries.

Q1_1 Numbers of employees in your company (approx.) _____

Q1_2 Year your company was founded _____

Q1_3 The annual sales (approx. NOK) _____

Q1_4 Function or title of your company_____

Q1_5 How many customers do you have using your solution (approx.)? _____

2. What kind of function does your company perform through IT?

Q2_1 Sales and purchasing

Q2_2 Transportation

Q2_3 Consultancy

Q2_4 Project management

Q2_5 Other (specify) _____

3. What type of information technology does your company adopt?

Q3_1 Database

Q3_2 Triggered- base

Q3_3 Constraint/Intelligent- base

Q3_4 All of the above

Q3_5 Other (specify) _____

4. What kind of industrial (actors) partners are involved in your platform?

Q4_1 Buyers – How many? _____

Q4_2 Suppliers – How many? _____

Q4_3 3PL companies/transportation companies – How many? _____

5. What kind of service does your platform perform?

Q5_1 Facilitating clients

Q5_2 Aggregating clients

Q5_3 Matching clients

Q5_4 Creating trust among your clients

Q5_5 Transferring inter-organizational marketing information among clients

Q5_6 Other (specify) _____

6. Do you have regular service on the system? For instance;

Q6_1 Everyday/24 hour

Q6_2 Every week

Q6_3 Every month

Q6_4 Quarterly

Q6_5 Every 6 months

Q6_6 Yearly

7. Do all the actors in the chain have access to all the information in the system?

Q7_1 If the actors do how is such access restricted?

Q7_2 Who is getting access to what information?

8. How is the electronic interaction between you and the supply chain actors set up?

Q8_1Your Company's IT system

Q8_2 E-market

Q8_3 Integrated systems

Q8_4 E-mail system

Q8_5 Other (specify) _____

9. Do you perceive increase level of transforming information sharing in?

Q9_1 Business interactions among the supply chain actors

Q9_2 Business development plans

Q9_3 Providing others services

10. How do you describe your company's level of investment based on?

Q10_1 Making extensive investment in new IT systems

Q10_2 Heavily invested on skilled manpower

Q10_4 Heavily invested in electronic product catalogues

Q10_5 Heavily invested in integrating clients' IT with your IT system

11. What do these investments in your company contribute?

Q11_1 Much better to obtain information about clients' needs

Q11_2 providing modifications on clients' requirements

12. How do you provide effective coordination between your clients?

Q12_1 Reorganization of processes and routines of your clients

Q12_2 Adaptations in IT systems

13. Do your clients complain about your services?

Q13_1 Yes

Q13_2 No

Part 2: Questions about your clients

14. What type of industry does your customer operate in?

Q14_1 Manufacturing

Q14_2 Retail industry

Q14_3 Service Industry

Q14_4 Public administration

Q14_5 Other (specify) _____

15. How can you describe your clients' performances based on?

Q15_1 Your coordination of information flow

Q15_2 Accuracy in delivery of goods and services between the clients

Q15_3 Quality control in the supply chain

Q15_4 After sales/purchases information sharing through you

Q15_5 Effectiveness and efficiency in interaction

Q15_6 Real time information in the supply chain

Q15_7 Facilitating supply chain actors

Q15_8 Information sharing between actors in purchasing, production, etc.

16. How often do actors in the system receive information about goods or services?

Q16_1 Every time there is need for it – by checking the system

Q16_2 Normal planned setting

17. Do you consider the system as a means to increase performances of the chain actors by;

Q17_1 Providing satisfactory services

Q17_2 Reducing information asymmetry

Q17_3 Improving on relationship

Q17_4 Allowing transparency

18. Do you know how information has been shared among your clients?

Q18_1 Before you take part in the supply chain

Q18_2 At the moment

19. Do you know if your clients have reduced the number of people working in this field after they have started using your system?

20. Do you assume that your platform helped reduce the following costs between the chain actors?

Q20_1 Bargaining costs

Q20_2 Policing and enforcement costs

Q20_3 Search and information costs

21. How would you describe the level of coordination in terms of?

Q21_1 Information about the businesses

Q21_2 Ordering processes

Q21_3 Invoicing and payments

Q21_4 Replenishment of the inventories

Q21_5 Developing and testing new products/services

22. Do you perform coordination between your clients through?

Q22_1 Interactions by sharing necessary information

Q22_2 Via regular e-mail

Q22_3 Quarterly meetings

Q22_4 Other (specify) _____

23. How would you describe frequency of information flow between the actors?

Q23_1 As fast as convenient for your company to disseminate information

Q23_2 Lacking behind based on low level of IT applications in sending information

Q23_3 More Convenient to suit the needs of your clients

Q23_4 Depending on locations

Q23_5 Other (specify) _____

24. How would you describe the level of your clients' information flow before your participation?

25. Would you evaluate your clients based on the followings?

Q25_1 Cheating on one another in terms of quality of goods and services

Q25_2 Not fulfilling promises between each other

Q25_3 Taking advantages of one another in terms of information sharing

Q25_4 Over costing of goods and services

Q25_5 Other (specify) _____

26. Would you evaluate your clients based on

Q26_1 Mispresentation of facts to each other

Q26_2 Misrepresentation of ability to provide services

Q26_3 Taking advantages of the other parties

Q26_4 Clients not being sincere with each other

Q26_5 Clients not fulfilling promises to the other parties

27. To what extent has your company been able to help reduce uncertainty for the chain actors?

Q27_1 About level of trust

Q27_2 About insufficient information flow

Q27_3 Hindrances regarding your firm as single services provider

Part 3: Your competitors

28. How would you describe level of competition?

Q28_1 Problematic regarding the increase in the number of competitors

Q28_2 Causing havoc on your business

Q28_3 Threat to your performance in supply chain

29. Do you see the competitors as threat to your company? in terms of;

Q29_1 Attracting more clients

Q29_2 Providing expected goods and services quality

Q29_3 Able to meet up with standard of IT systems needed

30. How do you evaluate competition?

Q30_1 Help reduce searching difficulties of the client

Q30_2 Help reduce information asymmetry in the chain

Q30_3 Help increasing product and service quality in the chain

Q30_4 Help increase exchange of goods and services between clients