

**THE INFLUENCE OF TRUST ON INTER-
ORGANIZATIONAL INFORMATION SHARING IN
LOGISTIC OUTSOURCING RELATIONSHIPS**

MASTER'S THESIS



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CGI

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CGI

Abstract

Purpose

Third-party logistics providers (3PLs) are emerging to a more advanced role, by expanding their current provisioning of logistics capabilities to become an orchestrator of a logistics chain to create and sustain a competitive advantage. However, information sharing with partners in the logistic supply chain is of crucial importance when assuming such a role; many 3PLs are facing difficulties to motivate their partners to do so. Lack of trust between cooperating partners seems to be the biggest constraint. This study proposes a framework of inter-organizational information sharing in logistic outsourcing relationships. It focuses on the mutual influences of trust and information sharing.

Methodology

This study draws on the current theory about information sharing in logistic outsourcing relationships in which 3PLs are not (yet) emerging, but performing their characteristic tasks of providing transportation and warehousing. It examines the influence of the most common factors on trust and information sharing in a logistic outsourcing relationship. Based on a survey with 50 respondents active in the Dutch logistic supply chain, consistent of shippers and carriers, stepwise regression analysis is applied to test the research model. To show instrument validity, only existing survey instruments are used, pretested and discussed with several experts. As an extra validation step of the results, a round table session with 17 experts with a manager level or higher is organized to discuss about the results and the practical implications.

Findings

The results show that relationship specific investment, shared vision and communication influence information sharing in logistic outsourcing relationships and that opportunistic behavior, relationship specific investment and information quality influence the levels of trust in logistic outsourcing relationships. Results of an additional model that includes trust as a direct rather than a mediating influence show the influence of relationship specific investment, participation and capability trust.

Contribution

This study contributes to a deeper understanding of the role of trust in inter-organizational information sharing in logistic outsourcing relationships with empirical data from the Dutch logistic supply chain. This study makes several contributions to the research stream of information sharing. We have developed a theory of information sharing based on an extended literature study; a framework representing the most recurring factors influencing inter-organizational information sharing and trust has been defined. It is empirically tested by data obtained from Dutch organizations active in supply chain management. It also investigates the mediating and direct effect of trust on information sharing and its antecedents. Trust is used as a two-dimensional construct, benevolence and capability trust. Finally, it gives guidelines for organizations assuming the role of an orchestrator on how to stimulate organizations to share their information. The study mainly focuses on collaboration between shippers or transporters and their orchestrator; relationships between shippers and shippers for examples are excluded.

Implications

When organizations strive to assume the role of a network orchestrator several aspects have to be taken in mind. Organizations have to expect to take a leap of faith by undertaking the initial

investment; it creates trust by the receiving organization and promotes information sharing. They have to look for organizations that share the same vision about the logistic supply chain and its goals. It is important as organization to not focus on certain aspects in this shared vision to prevent tunnel visioning in order to stay innovative. Orchestrators have to assume a neutral position in the supply chain by for example making sure to not own assets as trucks or warehouses. It is important to keep a total overview of the supply chain, not to remain specialized in certain operations or core business when evolving as a 3PL. Legislation should be embraced instead of avoided; it might help move organizations forwards as long as it serves as an independent facilitator for standards. Communication is key; organizations should exchange thoughts about developments, expectations and exchange opinions about the goals of the collaboration. Finally, an orchestrator has to make sure the collaborating organizations feel involved in the set-up of commercial goals, in the decision making and take their suggestions into account.

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Contents

Abstract.....	ii
Acknowledgements.....	iv
1. Introduction	1
1.1 Background	1
1.2 Research setting.....	2
1.3 Sustainable transport and mobility at CGI	2
1.4 iCargo	3
1.5 Research goal	4
1.6 Research approach.....	5
1.7 Structure	5
2. Theoretical background	7
3. Research model and Hypotheses.....	18
3.1 Methodology.....	18
3.2 Scope of model	19
3.3 Constructs and hypotheses.....	24
4. Methods	42
4.1 Research Design	42
4.2 Operationalization	44
4.3 Conceptual validation	47
4.4 Sampling.....	50
4.5 Implementation of the survey	52
5. Data analysis and results.....	53
5.1 Statistical technique.....	53
5.2 Measurement model	53
5.3 Results.....	54
6. Discussion.....	60
6.1 Conclusion.....	60
6.2 Contributions	64
6.3 Discussion and implications	66
6.4 Limitations and future research.....	69
7. References	71
Appendix A: Studies included in the review	76
Appendix B: Available survey items per paper	82
Appendix C: Survey instruments.....	86
Appendix D: Stepwise regression analyses in SPSS.....	92

1. Introduction

This chapter provides insights into the research area of the thesis. It starts with discussing the background, the reasons why information sharing in a logistic outsourcing relationship is important, why there are constraints and what these are. It also describes the context in which the study was performed and why this research is relevant for CGI. Finally, we define the goal and the approach of this research.

1.1 Background

Sustainability, food safety and security are considered the current societal demands by the European Union as part of its 2020 strategy (European Commission, 2010). Its goal is to increase energy efficiency and decarbonisation while at the same time increasing the economic growth (Hofman et al., 2012). These emerging European markets call for new logistic concepts to be reached efficiently and effectively (Van der Vorst et al., 2007). To meet the societal demands, information sharing amongst all actors participating in global trade and logistics is required (Hofman et al., 2012). In addition, it is argued that it is essential for supply chain members to create a shared context for improvement in order to maintain the competitive edge created by innovation throughout the supply chain network. (Simatupang et al., 2002). Wind et al. (2009) even state that in order to remain competitive in today's global environment, orchestration is imperative for supply chains, where Zacharia et al. (2011) add that the supply chains are only able to sustain themselves when governed by an orchestrator. This means that the role from a third-party logistics provider (3PL) emerges to a more advanced role, in order to supply the connectivity and communication requirements that are created by the leading supply chains. This role expands the current provisioning of logistics capabilities to becoming an orchestrator of supply chains to create and sustain competitive advantage (Zacharia et al., 2011). This means that 3PLs who traditionally provide transportation and/or warehouse management by focusing on cost reduction and service improvement have to switch to the role of a network orchestrator; this means focusing on the management, coordination and focusing a value-creating network by deliver value to its client organizations through resourcing with the most competitive value adding providers. Companies are required to collaborate during different preparation phases by for example bundling consignments or resources like trucks or by combining both. But in order to do so, it requires the companies to share information on consignments, logistic service provides and carries to inform them with their available capacity. Since transparency of capacity is commercial sensitive for most logistic service providers (LSPs) and carriers, a gain model is required in which is determined what the share part of the profit is per provider (Hofman et al., 2012). The increasing visibility of the supply chain generates the necessity to share private company information (Simatupang et al., 2002). Also, the willingness from companies to share information determines the effectiveness of technology systems (Fawcett et al., 2008) and the performance of logistic service outsourcing is higher with a higher level of trust, communication and commitment (Chu & Wang, 2012).

Unfortunately, information sharing is a barrier when coordinating entire supply chains (Moberg et al, 2002). In order to increase the information exchange within a logistic outsourcing relationship, trust-building measures and associated interactions are of particular importance (Müller & Gaudig, 2011, Moberg et al., 2002, Yang & Maxwell, 2011, Chu & Wang, 2012). Next to low amounts of trust between companies constraining the exchange of supply chain information, technology is often also

viewed as a solution rather than an enabler. Bridges to the information sharing and increasing connectivity are not built and neither the right structures to share information are established. (Fawcett et al, 2007). Dalmolen et al. (2012) and Yang & Maxwell (2011) state that the diversity of types of hardware and software in information systems, devices and protocols being used in the logistic supply chain are a barrier for information sharing. Various aspects have to be agreed on and require governance when companies decide to collaborate; different semantics and interoperability solutions, process aspects and technical solutions with different representations. For example, it is no exception that the governance of a company does not support the usage of Electronic Data Interchange (EDI). This could lead to issues with companies that have a different governance structure (Hofman et al., 2012). Fawcett et al., (2008) state that it is also important that the established information systems should be capable of sharing real-time accurate and relevant information when adaptive decision-making mechanics are introduced. Real-time information is an enabler for seamless switching between different transport modalities (road, rail, waterways and air), thereby increasing sustainability (Hofman et al., 2012).

Seamless switching between different modes like road transport, railway transport and barge transport with the usage of real-time data is also known as synchronomodality (Hofman et al., 2012; Overbeek et al., 2012). Increased sustainability is realized by the application of synchronomodality by not only optimizing logistic flows, but also by stimulating the cheaper alternatives for transportation. Barge transport for example, is a much cheaper alternative for road transport and causes less CO2 emission (Overbeek et al., 2012).

1.2 Research setting

The study is performed within the commercial sector industry – business consulting transport and logistics, a consulting practice within CGI Netherlands. The transport and logistics practices focuses on delivering products, services and solutions to its clients concerning (sustainable) transport and mobility issues. The service practice consists of a big variety of members with a big variety in roles; from information architect, young consultant to project manager or director.

1.3 Sustainable transport and mobility at CGI

The transport industry is important for CGI since they are a leading provider of end-to-end IT services from consulting to full IT outsourcing in this branch. CGI is working with several clients who are active on a global level in the aviation, rail, roads and maritime industries. Because the transportation and logistics sector is rapidly changing, more and more intelligent work approaches are required in order to keep CGI ahead of its competition (CGI Netherlands, 2014).

CGI develops and delivers real-time traffic information services, large scale access control and ticketing services for public transport, infrastructure monitoring systems in rail, and next-generation road pricing services. Because of the increasing number of complexity and passenger journeys and routes, CGI is working closely with its clients to efficiently tackle the subsequent consequences. Intelligent Transport Systems (ITS) are part of CGI's vision on how to cope with these, shifting from the more traditional Transport Management Systems (TMS). The consequences are that customers are increasing in their expectations and demand higher performance requirements. Better integration with current IT architectures, support of multi-modal transport, cost management and asset tracking, government legislation and a social demand for sustainable initiatives are required in order to meet the continuous and relentless pressure for change (CGI Netherlands, 2014).

CGI states in their annual transportation overview that smart systems are already part of most citizens' daily life. They emphasize the importance of timely and accurate information sharing, which can help in enhancing road safety and security, as well as transport efficiency. Efficient transportation should lead to a more sustainable environment and should be considered by looking at the transportation network in a 'multimodal fashion' (CGI transportation overview, 2014). When this information contains real-time data about transport logistics, multimodal becomes synchronomodal (Hofman et al., 2012).

One of the projects whereby CGI aids in approaching this way of looking at the transportation network is called 'iCargo'. The iCargo project is an initiative of the European Union (EU). As partner, CGI has a leading role by setting up and implementing the IT architecture. The next chapter tells more about iCargo and its relevance to this thesis.

1.4 iCargo

'CGI's intelligent cargo solution helps reduce operational costs and emission by sharing information about transport logistics across organizations in real-time'

The iCargo project supports new logistics services by building an open and affordable information architecture. Combining the use of ICT it supports synchronized vehicle movements and logistics operations across various modes and actors. More actual information can be found on the website of iCargo (i-cargo.eu).

Within iCargo, 29 partners originating from logistics and IT are working together to build innovative logistic software. This software allows companies to share real-time information with each other in a safe and easy way. CGI's vision is extended within the iCargo project; by sharing real-time information and collaborating more intensively, companies are able to achieve more flexibility in their logistics chain. This leads to the reduction of costs and it aids in achieving a more sustainable environment; bundling consignments or resources reduce the usage of 'half-full' trucks. In addition, companies could save up several percentages of their costs regarding administrative formalities like filling in regulation forms. Real-time information allows companies to be flexible when their demand fluctuates by playing the market at the right time. CGI's goal is to use techniques that are 'invisible' for their customers, so the focus is shifted to the functionalities of the IT-solutions and the advantages of them.

For example, iCargo shifts the focus towards increased operational involvement; it automates monitoring and deviations because it uses intelligent cargo concepts. This allows the technique to be 'invisible' for its customers, because information is available on-the spot for operators and authorities. This could help by breaking down the governance barrier as mentioned before. Also, the semantic barrier can be lowered because data shared between organizations will be translated according to the terminology of the recipient organization.

iCargo's unique focus is its virtual integration. It tries to tackle the connectivity problem present when organizations share information. With iCargo, information is shared in a controlled and secure way across different and inhomogeneous environments without the need for large and expensive system integration effort.

The iCargo project also emphasizes the importance of information sharing, in addition to the first background section. The project focuses on two specific barriers in order to increase inter-organizational information sharing in the logistics chain; semantic barrier in terms of IT connectivity and governance structure. These barriers are also noted in the first section, but are supplemented with several other barriers like trust, the presence of a share model and so on. This thesis helps the iCargo project by exploring the most common barriers when information has to be shared. It gives practical advice on how to stimulate organizations to share information in the logistics chain. In addition, it shows how a project like iCargo could help companies (possibly 3PLs) that strive for an advanced role as orchestrator of a logistics chain.

1.5 Research goal

Aforementioned studies and practical insights from CGI and the iCargo project emphasize the importance of information sharing in the supply chain. A number of issues come up when striving to share inter-organizational information, including: the governance structure, gain sharing, cultural fit, unmotivated partners, connectivity by means of IT, and most importantly, trust between partners. Although the importance is emphasized, no antecedents of how to stimulate inter-organizational information sharing in a logistic outsourcing relationship are mentioned when companies (possibly 3PLs) strive to assume the role of an orchestrator of a logistics chain. Therefore this study explores these antecedents based on the current theory of information sharing between collaborating companies in the logistics sector. This is done in order to build a model that explains how to increase the attraction to inter-organizational information sharing in a logistic outsourcing relationship. The model helps to explain what the motivation and constraints are for organizations to share logistics information with partners in the logistic supply chain and what the focus of companies should be that strive to assume the role of an orchestrator.

The goal of this research is *to develop an understanding of the motivations and constraints for organizations active in logistic outsourcing relationships to share information with companies who assume the role of an orchestrator.*

To reach this goal, the following main research questions are formulated:

What are the antecedents of inter-organizational information sharing in a logistic outsourcing relationship?

What are the antecedents of inter-organizational trust in a logistic outsourcing relationship?

What is the influence of trust on inter-organizational information sharing in a logistic outsourcing relationship?

These research questions are both theoretical and practical. Inter-organizational information sharing in the logistic sector has been a quite active research area in the last few years, but research about companies striving to assume the role of an orchestrator is scarce. Therefore answering this question will contribute to this field of research. In practice, this field is evolving because of the arrival and evolution of IT/IS in the logistic supply chain (Fawcett et al., 2008). Customer demand increases and technological solutions should stimulate sustainability. Interviews with experts active in the field within CGI acknowledge and emphasized the practical relevance of this research question.

1.6 Research approach

We research and discuss the most common constraints based on scientific literature of inter-organizational information sharing in a logistic outsourcing relationship. Based on the findings from the literature review, interviews with several (5) experts and the fact that this study has to be done in a limited timeframe, this study focuses on the antecedents of the most influential constraint in inter-organizational information sharing: (inter-organizational) trust. We construct a model on the findings from existing scientific research (figure 3.1). This model is drawn only to depict the boundary conditions of this research and to guarantee that most of the influencing factors of information sharing are taken into account. Figure 3.3 shows the main focus of the thesis and the constructs that are empirically tested.

In order to come up with a model as pictured in figure 3.3, a literature research of the current literature is conducted. This model is a falsifiable theory which represents testable hypothesis. It proposes relationships between theoretical constructs and concepts.

In order to collect data to test the model, a cross-sectional survey is built upon. This means questioning people fitting the right profile to answer questions in a structured format (the profile can be found in chapter 4). The results from this survey are analyzed with stepwise regression to test the research model. Next to this, one in-depth interview is held with a company that is fulfilling the role of an orchestrator in a logistic outsourcing relationship to test the research model through the eyes of an orchestrator instead of those of a shipper (or 3PL with the role of a shipper).

In order to validate and compare the results of the statistical analyses, a round table session is held with 12 companies and 5 experts from CGI. In this session statements about the outcome are presented and discussed. A more detailed argumentation about the choices made in this research can be found in Chapter 4. Additionally, the research approach is depicted in figure 1.1.

1.7 Structure

Chapter 2 provides a theoretical background about the concepts, constructs and theories relevant for inter-organizational information sharing in a logistic outsourcing relationship. It shows broad insights into the constraints of information sharing. Chapter 3 presents the conceptual model which is based on chapter 2 and the smaller scope which focuses mainly on the antecedents that are also influenced by trust. Chapter 4 discusses the methods used concerning the survey, interviews and round table session. Chapter 5 represents the results of the study with its possible implications. Finally, in chapter 6, the results are discussed with its consequences for future research and the implications for practice.

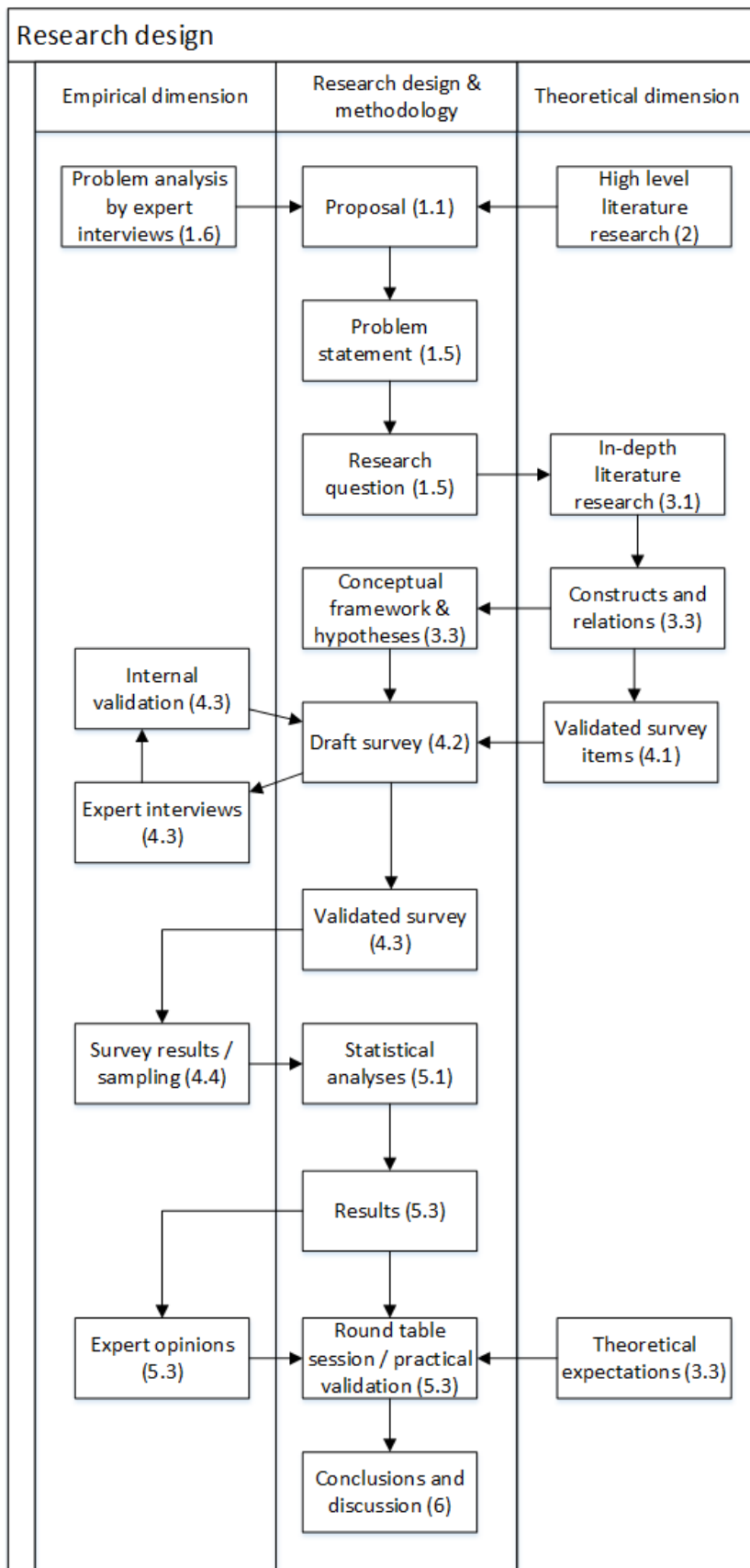


Figure 1.1 Research design

2. Theoretical background

This chapter provides a theoretical background on the concepts used in this study. It will introduce the importance of sustainability in logistic supply chains in general and the upcoming importance of the role of a supply chain orchestrator. This chapter aims to familiarize the reader with the motivations and constraints of information sharing. It stresses the importance of information sharing and trust between organizations in order to collaborate in logistic supply chains.

Sustainability

Logistic supply chains are currently facing two big challenges. The first one considers safety and security measurements while the second challenge is to meet sustainable requirements which implicate optimal usage of resources and physical infrastructure (Hofman et al., 2012). Reasoning is that the current way physical objects are transported, handled, processed and used over the world is unsustainable in an economic, environmental and social way (Lu & Borbon-Galvez, 2012; Montreuil, 2011). Current goals are to enable global sustainability of physical object mobility in ways of handling and transportation. Economically speaking, goals are unlocking significant gains in global logistics, production, transportation and the optimization of business productivity. From an environmental perspective, its goal is to reduce the global energy consumption, pollution, CO₂ emission associated with logistics, production and transportation. Finally, from a societal perspective, the objectives are to significantly increase the quality of life of the logistics, meaning improved workplaces and –conditions for transportation workers as well as the global population by making logistics more accessible across the world (Montreuil, 2011). Several symptoms are noted that are responsible for causing an unsustainable environment.

The utilization rate in the logistics sector of trucks, wagons and containers is considered low. For example, trailers are approximately 60% full when traveling loaded. Carriers often can't optimize their truckloads and are forced to depart their transporting resources half empty. Next to this, vehicles and containers often return empty. Vehicles get emptier and emptier as their route unfolds from delivery point to delivery point (Hofman et al., 2012; Montreuil, 2011; Overbeek et al., 2012). In addition, delivering products in, through and out of cities is not optimized. Most cities are not designed for freight transportation and its consequences. With the growth of most cities, this gets even more acute. More optimal use of the resources can therefore aid in increasing the sustainability of the logistic supply chain.

Unfortunately, not only the utilization rate of trucks, wagons and containers is low, so is the utilization rate of production and storage facilities. Montreuil (2011) states that many businesses invest in storage or production facilities while they are used at a low utilization rate. Many times, products are dealt with at the wrong location, causing a lot of unnecessary travel. Combining the fact that most cities are not designed for freight transportation, significant traffic, noise and pollution concerns are created for the citizens.

Safety and security

Concerning safety and security, supply chain and logistic networks are not always as secure or robust as desired. Most logistic operations are concentrated in a limited number of centralized productions and distribution facilities. Next to this, there exists only a narrow set of optimized traveling routes, which therefore contain high amounts of traffic. This undesirable but realistic situation is unsecure in

face of robbery and terrorism acts and turns out not be robust either in face of natural disasters and crises (Hofman et al., 2012).

Arguably the most important symptom is the strangling of innovation. A lack of generic standards, protocols, diversity of types of software and hardware in information systems, transparency, modularity and systemic open infrastructure is bottlenecking innovation (Dalmolen et al., 2012; Fawcett et al., 2007; Hofman et al., 2012; Montreuil, 2011). This way it is very hard to justify smart connective technologies (e.g. RFID, GPS, EDI), automatic handling automation, as well as innovation of smart collaborative logistic platforms. Even though there are examples of great initiatives of intermodal solutions (Crainic, Kim, & others, 2006), in general synchronization is poor and interfaces are badly designed. This causes intermodal routes to be time and cost inefficient and risky. In addition, at this point, the least energy efficient transport mode is used most. For example, using trains for transportation is a much cheaper alternative for road transport and emits twenty times less CO2 emission (Montreuil, 2011; Overbeek et al., 2012).

Synchromodality

Aforementioned challenge to meet sustainable requirements can be further divided in three recurring trends in logistics supply chain management. These are information sharing, (further) developing and deploying of ICT-based logistics, facilitating synchronization and optimization in the logistic supply chain and developing partnerships (Lu & Borbon-Galvez, 2012). As will be discussed in a later chapter, information sharing between partners is of crucial importance when coordinating supply chains and meeting social logistic demands (Fawcett et al., 2007; Lu & Borbon-Galvez, 2012; Moberg et al., 2002; Overbeek et al., 2012). This chapter shortly discussed the importance of (real-time) information sharing concerning synchromodality.

Here the definition of synchromodality used by Hofman et al. (2012) is adopted; synchromodality concerns the *“seamless switching between different modes like road transport, railway transport and barge transport with the usage of real-time data”*. Real-time switching refers to changing the containing routing over the network in real-time. The application of synchromodality is therefore not only focused on the optimization of logistic chains, but also on reducing service delays, such as traffic jams and CO2 emission. Traceability and visibility of nodes in the logistic chain enable the identification of the what- and whereabouts in the logistic supply chain in case of problems. In order to accomplish a reliable and secure logistic supply network, reliable trade data should be present. This is data that is owned and exchanged between business and government organizations acting in the network, enabling communication with each other electronically (Overbeek et al., 2012). Unfortunately, all efforts made to realize the traceability and visibility still lead to closed communications in which actors made certain agreements on how the information is to be shared (Hofman et al., 2012). Next to this, synchromodality is only possible when multiple actors are involved, when high volumes require transportation and arguably only within so called hinterland connections (Lu & Borbon-Galvez, 2012; van Riessen, 2013). Hinterland transportation is defined as transportation from the hinterland terminal (import) or vice versa (export), organized by the sea port terminal (van Riessen, 2013).

As mentioned before, synchromodal initiatives can provide multiple benefits to all the parties involved. This could be the delivery of an improved service through higher frequency by the usage of more effective logistic flows; reduced operational risk (because orchestrators take over parts of this

risk); better exchange of knowledge and people between cooperating parties; reduced stocks; reduced CO2 emission; reduced costs.

Unfortunately, these benefits are not easily realized. As stated before, information sharing is of crucial importance and logistic service providers have to emerge to a more evolved role of a network orchestrator. Next chapters therefore provide additional information about the emerging need for a network orchestrator and the constraints of information sharing.

Supply chain orchestration

Different definitions exist for an orchestrator. Therefore the definition used in this thesis is based on several definitions mentioned by Zacharia et al. (2011).

An orchestrator is a logistics provider with the role of managing, coordinating and focusing a value-creating network. Its primary role is to deliver value to its client organizations through resourcing with the most competitive value adding providers.

The type of firm that emerges as an orchestrator varies and is based on the type of market of the supply chain. The role of an orchestrator can be fulfilled by a neutral third-party without a hierarchical authority (Bitran et al., 2006), but in logistics-dominant supply chains this role is often claimed by emerged 3PLs (Zacharia et al., 2011). A value-creating network can be established by information sharing among all cooperators. When companies share private company information and real-time data, the increasing demand for visibility and transparency of the supply chain can be met (Simatupang et al., 2002), allowing the orchestrator to deliver value to its client. Unfortunately, information sharing is a barrier when coordinated by a (neutral) orchestrator (Moberg et al., 2002). Next chapters describe these barriers.

Besides the mentioned differences in definitions and firm responsibility, the general consensus in scientific research seem to be that an orchestrating role is critical for efficient supply chain functioning. Reasoning is that it is essential for supply chain members to create a shared context for improvement in order to maintain the competitive edge created by innovation throughout the supply chain network (Simatupang et al., 2002).

The network orchestrator plays three primary roles. These are related (as also mentioned in the used definition) to the focus, management, and value creation of the firm and network (Wind et al., 2009).

The first role of the orchestrator is to shift the focus from viewing one single firm as the center of the universe to looking at the network. Reasoning for this is that companies (retail stores) don't compete with each other, but networks do. Retail stores don't compete because each one has a supply chain stretching from its own stockings out to the world. The company that organizes its supply chain in the best way, will gain the advantages. The orchestrator has to create a broader network and based on this network it should draw supply chains (Wind et al., 2009).

With the emerge of dispersed networks, orchestrators require a different form of leadership and control. When an orchestrator assumes a neutral role in which he does not own any assets (trucks, warehouses or produced goods), he does not only rely on rewards but also on a combination of trust and empowerment, training and certification. Therefore the second role an orchestrator has to assume is the empowerment of its people and suppliers (Wind et al., 2009). Empowered people

demand flexibility and demand more customization. This demands a different job from orchestrators, because it becomes more challenging for orchestrators to orchestrate the network. On the other hand, it can also create opportunities for companies that are flexible enough to meet the required demands. Consumers demand more transparency from networks, therefore the exchange of information is essential (Zacharia et al., 2011).

Orchestrators create value for their consumers and themselves differently compared to the traditional way. Traditional firms create value by specialization, skills in certain areas and so on, whereas an orchestrator creates value by 'spanning borders'. Its task is to identify new opportunities for marketing and sales in markets where logistics play an important role. A logistics network orchestrator should assemble and manage resources, capabilities and technologies with those of the complementary services providers. It is required in order to deliver a comprehensive supply chain solution that benefits all participants (Van der Vorst et al., 2007).

Information sharing

Information sharing amongst all participants in global trade and logistics is required to meet aforementioned societal demands; to increase logistics performance and collaboration and is of crucial importance when companies strive to emerge towards a more advanced role of a logistics network orchestrator (Chu & Wang, 2012; Hofman et al., 2012; Moberg et al., 2002; Müller & Gaudig, 2011a; Van der Vorst et al., 2007).

In the literature, two types of collaboration in logistics are distinguished. The first type focuses on logistic services for value exchange while the second type focuses on information sharing on resource availability. Additionally, In order to focus on logistic services, information has to be shared to exchange value (Hofman et al., 2012). Therefore, two types of resources can be distinguished; resources that are transferred to another ownership at another organization, and resources that are used for the exchange of this ownership (Hruby, 2006).

In order to give an in-depth explanation of these resources, the used definition of logistics is stated: *"Logistics is transport, transshipment, and storage of products for production and final delivery to retailers and/r customers utilizing various types of resources"* (Hofman et al., 2012). Products can be very different, like electronic equipment, parts of cars and trucks, food and other agricultural products, but also pharmaceutical products. All these products have specific logistic requirements during transportation. These requirements can be about the temperature, the amounts of light it should receive, but also about certain regulations in which country it is allowed to be transported. Different packages and resources like trucks, containers and vessels implement these logistic requirements. It requires information sharing between different actors to optimize the logistic activities and coordinate logistic flows. The aforementioned logistic activity or value proposition is embedded in the information shared between these actors; relevant product and packaging information and the required resources. The information that requires sharing can be very structured and is most often characterized by a certain layer. The figure below (obtained from (Thompson et al., 2007) depicts three different layers and the interaction between the actors.

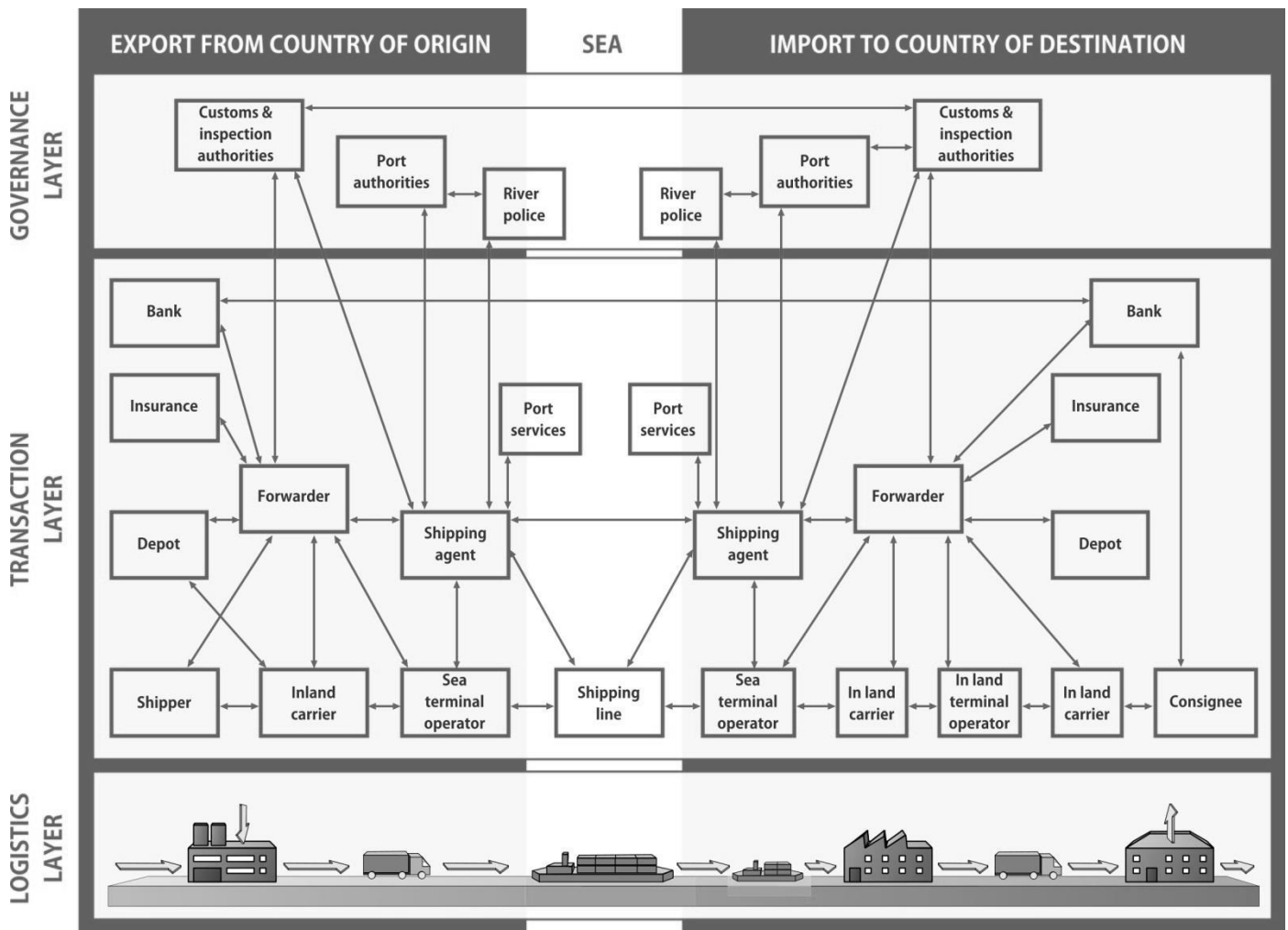


Figure 2.1 Layered model of global supply chains

This means that in order to perform logistics activities and optimize resources (like truck consignments), information between the different actors (organizations) has to be shared. Figure 2.1 illustrates different flows of information by distinguishing three different layers. These different layers, on their turns, are distinguished in three different phases in which information is shared (Overbeek et al., 2012).

The first phase is the booking phase. In this phase general requirements are exchanged in order to prepare the execution of a logistic activity. Examples are number and weight of packages, the locations and the time it is expected when the activity is performed.

The second phase is the execution phase. In this phase the aforementioned activities are performed and the details of the resources and cargo are utilized. Examples are time schedules of trucks, boats and unloading certain packages.

The third phase is the cancellation phase. As the name suggests, this is the phase where bookings don't result in an order. Additionally, it also means that the cargo or consignment can't arrive at the agreed delivery time. It hinders the next logistic activity.

These three phases combined together are known as a business transaction. In each of this phase the exchange of information plays a crucial role (Hofman et al., 2012). Before executing a logistic service as shown in the logistic layer, particular resources can be optimized. As mentioned throughout this thesis; information about for example consignments or truck loads can be shared and allow full truck loads and efficient planning delivery. In general, in order to increase sustainability, actors have to collaborate by sharing information during the preparation phase. This way the logistic service providers and carriers know the available capacity.

When visibility of the whole supply chain is gained in terms of data (which is a long way ahead), multimodality (when the data is real time: synchronomodality) in the supply chain can be realized. Hofman et al. (2012) state that in order to do so, a gain model is required, allowing participants to share parts of their profit. This is a barrier since transparency of capacity is of commercial sensitive for the actors in the supply chain. Additionally, barriers in the governance structure can prevent the sharing of information.

The next subchapters describe the common barriers when sharing information in a logistic outsourcing setting. It starts with the governance structure and ends with the most influential barrier when sharing information; (inter-organizational) trust (Chu & Wang, 2012).

Governance structure

The breaking or making of collaboration process can be decided before actual exchange of information has taken place. One of the issues that have to be settled in advanced is the governance structure. There has to be agreement about a party responsible for the control of operations and a party that is able to intervene when anything goes wrong. Legal issues are involved in this process (Chu & Wang, 2012; Müller & Gaudig, 2011a).

One of the major inter-organizational governance mechanisms is a legal contract. Legal contracts complement relational governance and stimulate performance exchange. The obligations of trading partners are explicitly defined in a legal contract. The quality of logistics services provided and safety from opportunistic behaviors in logistics outsourcing relationships are ensured; legal contracts offer ways of control (Müller & Gaudig, 2011a). Since not all companies use the same widely accepted standards, legal contracts enable cooperation where information is shared (Chu & Wang, 2012). Unfortunately, research is contradicting at this point. So do Cavusgil et al., (2004) state that legal contracts specify the anticipated reactions or possible sanctions of the partners. This means that it could be seen as a violation of the decision-making autonomy and therefor encourages opportunistic behavior (opportunistic behavior will be discussed in 3.3) (Müller & Gaudig, 2011a). It could lead to more detailed specifications on control, incentive and sanction mechanisms in contracts and thus demotivate the exchange of information. It depends on the governance structure of organization how to arrange these legal contracts. Most of the time, it is influenced by the amount of support received from top management (Li & Lin, 2006).

It is the responsibility of top management to share an understanding of the specific benefits of information sharing between participating organizations. This needs to be done in order to overcome the inevitable divergence of interests. It is needed in providing vision, guidance and support in sharing of information. It is also required that an information sharing strategy is available and that the right resources are available, enabling exchange of information. This however, could be problematic when top management doesn't understand the importance of information sharing and

vision providing. It could be a barrier since organizations most often see the ownership of information is seen as an advantage over competitors; causing organizations to resist sharing information with their partners. One way to fight this struggle is the job of top management; they need to overcome the reluctance of information sharing by creating an organizational culture which motivates the exchange of information with other organizations (Li & Lin, 2006). As mentioned before, legal contracts can aid when doing so, but could also be a barrier; non-aligned strategic and operating policies (Fawcett et al., 2008). Additionally, the cultural fit of an organization could also cause a serious barrier for the exchange of information. Cultural fit will be discussed later in this chapter.

Gain sharing model

According to Fawcett et al. (2007) multimodal or synchromodal transportation models aim to achieve a lowest cost setting for all organizations involved in a supply chain, while increasing customer service. By consistently reducing the main logistic cost components it is able to achieve a lowest cost operation. Reduced costs for the organizations involved are translated into more profits for the organizations involved. However, as depicted in Figure 1, there exist different streams of information between different actors. It is evident that different actors will only be motivated to share their relevant information, if adequate mechanisms exist to get an equal and 'fair' share of the cost savings (Fawcett et al., 2007; Vlist et al., 2007).

Although it is expected that the aforementioned legal contracts should cover most of the issues, certain barriers still exist (Fawcett et al., 2007). Collaborating organizations have for example yearly commercial negotiations. These negotiations could be between the supplier and transportation company (3PL), but also between supplier and retailer. Traditionally, this could rather 'easily' be solved by negotiating about different subjects as inventory, handling and transport costs and benefits. In a multi- or synchromodal setting, it could for example be that two shippers each cater for a totally different range of products. When combining products, new locations, different transportation modalities or new carriers might be discovered along the road. The traditional way of deciding and neglecting on contracts on the beforehand is history. Organizations are no longer able to plan everything the way they were used to. Small changes have bigger impacts on the sharing of the benefits resulted from the cost reduction mechanics; they all require mutual consultation.

Additionally, Fawcett et al. (2008) state that companies providing (real-time) information prefer revenue-tracking systems. Traditional measures tend to be very functionally, financially and short-term oriented, while syncho-modal initiatives impact long-term collaboration. Organizations face a major hurdle when developing collaboration with supply chain partners; they have to manage complexity. Supply chains are growing, consisting of too many physical and information flows and relationships. Managers don't want to spend all their time on making decisions and constantly revising them. They want insights in what is to be gained in what sector (Cavusgil et al., 2004). Current gain sharing with the current levels of collaboration is fairly simplistic as shown by the CO3 project initiated by the EU; the mechanisms rely on a basic percentage allocation of savings or there is a certain organization that is setting rates which reflect the opportunities for collaboration.

Cultural fit

Collaborating logistics managers are forced to change their way of thinking and working; they have to rethink their priorities, and communicate the results of collaborating within the organization. A

mental shift occurs at every level of the organization. When collaborating, all business processes have to be rearranged, especially when the focus of the organization switch towards collaborating with a (neutral) logistic orchestrator. When collaborating with a neutral orchestrator, it is stated that a smaller cultural shift is required, since the power of the collaborating organizations is equally distributed (Hausman & Johnston, 2010).

Cultural fit of organizations is embedded in the degree of similarity of the pattern of shared values and beliefs of the trading partners. A shared vision is required in order to overcome this constraint (Li & Lin, 2006). It is the extent to which collaborating organizations share the same beliefs about what behaviors, goals, and policies are (un)important, (in)appropriate, and right or wrong. Concluding, collaborating organizations with similar cultures should be more willing to trust their partners, and therefore exchange relevant information (Cai, Jun, & Yang, 2010; Cheng et al., 2008; Li & Lin, 2006). On the contrary, when organizational incompatibilities between collaborating exist, less information will be shared. Examples are differences in reputation, job stability, strategic approaches, goals, control systems, regulations and education level of co-workers (Li & Lin, 2006). All factors aid in juggling the exchange of inter-organizational information.

Cheng et al. (2008) add that the perception of how to interact with each other is sufficient to avoid possible misunderstandings between supply chain members. It allows them to exchange their opinions freely. Of course, this situation changes when supply chain members are in a coopetition relationship, resulting in a maximization of own interest and therefore limiting the willingness to share competitive knowledge. In other words, these unmotivated partners, having shared values (different interests for the seller) and competitive knowledge might diminish their knowledge sharing behavior (Chu & Wang, 2012). The next chapter describes the constraints unmotivated partners can result in.

Unmotivated partners

Unmotivated partners are partners that are lacking willingness and motivation to share their information within the supply chain. They are unwilling to share information because they perceive that sharing information with their competitors might place their organizations at a competitive disadvantage (Fawcett et al., 2007). Regardless of whether this perception is true, the truth is that the potential useful information if shared, remains unavailable to the supply chain. An aforementioned constraint of information, cultural fit could explain in dealing with this constraint. In this situation, the internal culture of a company is of importance (so intra-organizational, instead of the chapter mentioned above, which is about inter-organizational cultural fit). Organizational theory suggests that the willingness and motivation of people willing to share information is based on the culture of the company (McKinnon et al., 2003). Examples are the unwillingness to share risks and rewards with coopetition, resistance to change and the aforementioned lack of top management support.

(Chen et al., 2011; Kent & Mentzer, 2003; Kwon & Suh, 2004) state that a higher level of trust and commitment to collaboration must exist and must be created otherwise. Without these aspects unmotivated partners will not be willing to share their organizational or operational information. Fawcett et al. (2007) argue that connectivity and willingness to share walk hand in hand. Next chapter describe how connectivity can act as both an enabler but also as a constraint when sharing

inter-organizational information. The final chapter describes the roots of the biggest constraints in organizational collaboration in supply chains; trust.

Connectivity and maturity

Connectivity and maturity are coupled in one section to emphasize their mutual dependencies. Organizations with a higher level of connectivity most probably also have a higher level of maturity and vice versa (Fawcett et al., 2007).

Connectivity

Connectivity refers to the ability of companies to exchange information by means of IT. A high level of connectivity means that companies have a high level of support from IT systems to share information. They are able to collect, analyze and disseminate information among members of the supply chain (Fawcett et al., 2007). Although the fact that one organization maintains a high level of connectivity doesn't necessarily mean that it is able to fluently exchange information with other organizations in the supply chain. This is caused by the diversity of types of hardware and software in information systems; devices and protocols being used in the logistic supply chain are a barrier for information sharing (Dalmolen et al., 2012; Yang & Maxwell, 2011). As stated below, investing in IT in order to create transparency in the supply chain by sharing information, is not as important and self-evident for every organization, it is dependent on the maturity level of the organization.

Maturity

Volumes of transactions and their frequency are characterizing the willingness of organizations to invest and, or adopt e-collaboration tools. Re-engineering of associated business processes by means of IT will not bring benefits unless the required transaction levels are sufficient (Chong et al., 2009). E-collaboration tools support and stimulate organizations throughout the logistic supply chain to share information. This means that the complexity, volume and transaction frequency of the products the organization has to share information about influences the level of adoption of e-collaboration tools. In other words, organizations with a higher maturity level in product complexity, are more likely to adopt new systems in order to share the required information, or are already able to do so (Lockamy III & McCormack, 2004). For example, a simple transportation company owning three trucks would probably have a lower process maturity level than a company owning hundreds of trucks and a warehouse. Figure 2.2, adopted from Lockamy III & McCormack (2004) shows the different levels of process maturity in the supply chain. Companies with a lower maturity level are more likely able to share their relevant information (by means of IT) and mostly also acknowledge the benefits of information sharing. Although companies might have a high level of connectivity by means of IT, without a certain amount of trust, relevant useful information remains unshared (Cheng et al., 2008; Chong et al., 2009).

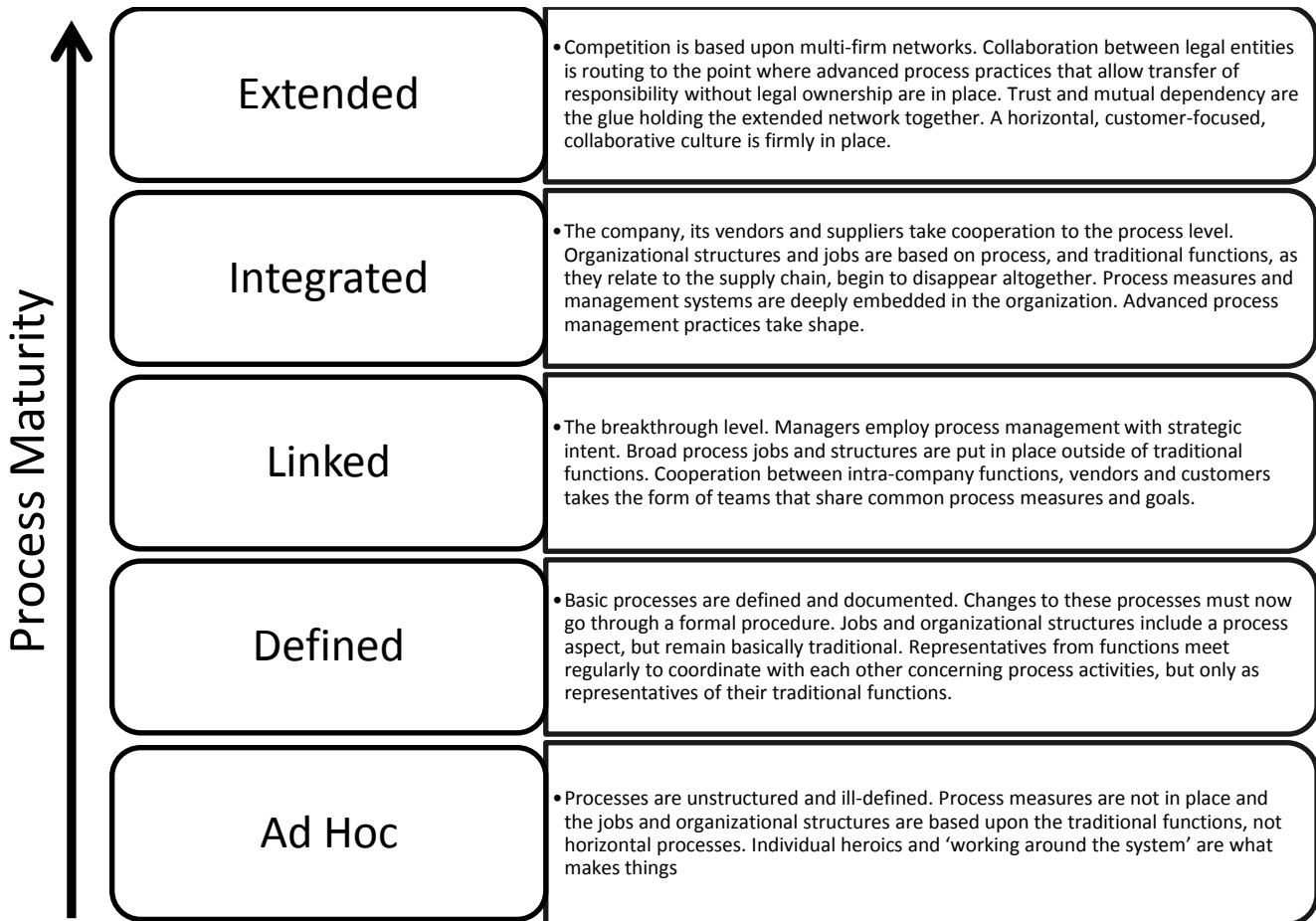


Figure 2.2 Maturity model adapted from Lockamy III & McCormack (2004)

Trust

One of the most frequently cited dimensions of supply chain relationships is trust (Chu & Wang, 2012). Trust is often decomposed in multiple dimensions (Tian et al., 2008 and Chu & Wang, 2012), but is commonly defined as the “willingness to rely on a party in whom one has confidence” (Chu & Wang, 2012). Since an outsourcing context is used in this research, the definition of Chu & Wang, (2012) is used as a foundation for operationalizing trust: “trust is the willingness of a logistic user to rely on his/her 3PLs in whom he/she has confidence in creditability, competence and benevolence”. Tian et al., (2008) use different words for the three dimension but their definitions are the same (integrity, competence and goodwill respectively). Integrity or benevolence trust means that the trustor believes that the trustee has good moral standards and is consistent in its behavior. With competence is referred to a certain skillset and characteristics that enable one to gain certain influences in the field. This enables services buyers to believe that it has the competence to accomplish field-related tasks. Goodwill or credibility means that besides the benefits that the trustor has, the trustee will do favors in favor of the trustor without taking advantage of the contractual loophole to harm him (Chu & Wang, 2012; Tian et al., 2008).

Different studies argue that trust influence the attraction to the sharing of information with different companies indirectly. They concluded that trust in a person or company increases the commitment to the relationship between the parties involved (Kent & Mentzer, 2003; Nyaga et al., 2010; Tian et al., 2008). Several other studies found that a higher level of commitment results in a higher attraction level of information sharing (Kwon & Suh, 2004; Moberg et al., 2002; Müller & Gaudig,

2011a). Chu & Wang (2012) define commitment as a belief that a relationship is so important that it pertains to the intention to continue the relationship. Although definitions vary slightly, credibility, benevolence and competence are typically used to operationalize trust (Fynes et al. 2005a; Tian et al. 2008; Chu & Wang, 2012).

This thesis focuses on co-opetition relationships between supply chain members with the possible presence of an (neutral) orchestrator. Therefore the aforementioned definition of trust is adopted and redefined (Cheng et al., 2008). Trust is defined (as will be further explained in chapter 3) as:

“An organization’s belief to have confidence in its partner’s reliability and integrity that would lead to positive outcomes for all the organizations involved in a logistic supply chain”

In other words, trust is now further subdivided into two parts. In order to make this operational, the definitions of benevolence and capability trust are assumed (Tian et al., 2008). As mentioned before, a strong connection between trust and commitment exists. Chapter 3 describes in depth the role of trust in a logistic outsourcing relationship when exchanging information; it describes constraints and possible solution on how to motivate organizations to strengthen their relationships. The next chapter shortly describes the correlating role of trust and commitment.

Commitment

In order to define commitment, the definition is borrowed from multiple researches describing its influence when organizations collaborate. It is defined as *“as exchange partner believing that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it; that is, the committed party believes the relationship endures indefinitely”*(Chen et al., 2011; Kwon & Suh, 2004; Li & Lin, 2006). In order to sustain commitment between collaboration organizations, a high level of trust has to be present (Li & Lin, 2006). Kwon & Suh, (2004) add, that ‘only’ having a trustful relationship isn’t sufficient, it should be translated into actionable commitment, in order to attain measurable economic gains from supply chain management. Commitment to ongoing relationships helps to increase efficiency and effectiveness among supply chain members (Chen et al., 2011). It strengthens the trust bond between suppliers, carriers and customers that facilitates the establishment of productive collaboration. A strong level of commitment increases the chances organizations will develop an enduring relationship. Additionally, it is important for long-term success because it shows willingness from supply chain partners to invest resources and sacrifice short-term benefits to maintain long-term success. If mutual beneficial outcomes are accrued from such commitments, long-term relationships can be maintained. Commitment is an extension of organizations having a shared vision (shared values) about the requirements, developments in the logistic supply chains (Li & Lin, 2006).

3. Research model and Hypotheses

Based on a systematic review of the literature on information sharing between organizations in logistic supply chains, a model of information sharing with the involvement of an orchestrator is developed. Prior research has shown the importance of trust factors for information sharing in logistic outsourcing relationships (Chen et al., 2011; Moberg et al., 2002; Müller & Gaudig, 2011a; Yang & Maxwell, 2011). Therefore it is hypothesized that the factors influencing trust also influence information sharing between an organization and orchestrator in logistic supply chains. In addition, contextual factors directly influencing the information sharing are identified. This theoretical model is summarized in figure 3.2 and table 3.1. Moreover, the used definitions are listed in table 3.6.

3.1 Methodology

When doing an academic project like this master thesis, a review of prior, relevant literature is an essential feature. Webster & Watson (2002) define that a review is carried out effectively when it *“creates a firm foundation for advancing knowledge. It facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed”*. In order to do so, a literature should focus on concepts, whereby it covers relevant literature on the topic and not focused to one research methodology or one set of journals. In order to make sure the guidelines are met, their recommended structured approach to determine the source material for the review is adapted.

This literature research is carried out in a limited timeframe, therefore an adaption of standard approach is conducted. This means that most important or influential papers on the topic are selected. These are to be found in the lead journals. Therefore, when searching for literature, these papers are reviewed first. Although, because IS is an interdisciplinary field combining other disciplines it is advised not to only look within this discipline when reviewing. This means that papers from other disciplines are also included when doing the review. When searching, the following keywords are used: *“information sharing”, “information contribution”, “trust supply chain”, “inter-organizational information sharing”*. Additionally, only papers published after the year 2000 are included in order to make sure the literature reviewed isn't very outdated and to focus the scope. First all the papers that are found to be useful when reviewing constraints are included. After this, the papers are specified towards papers about the influence of inter-organizational trust.

As stated before, IS is an interdisciplinary field, this means other disciplines have to be reviewed also. Therefore we conducted backward search procedures. The articles that result from the search explained in the first section are reviewed based on the references. For example, papers about inter-organizational information sharing in public sectors are included. By using the citation index of Scopus and Google Scholar, relevant works that cite the most influential papers are identified. This is also taken into account when building the conceptual framework as will be shown later. This is mostly used when specifying and scoping this research towards trust. While iterating these steps, the papers found are evaluated based on their title and their abstract. The studies included considered information sharing between organizations in the supply chain (preferably with one organization performing an orchestrator role), trust between organizations in the supply chain (preferably with one organization performing an orchestrator role) and commitment between organizations in the supply chain.

3.2 Scope of model

Three different models illustrating the constraints of inter-organization information sharing are shown below. This is done to provide guidance for the reader by explaining why at each step, a smaller scope is projected. Further explanations of these steps are discussed in chapter 4.

For the first model, papers are selected for providing background information about this thesis. Figure 3.1 (found at the end of this chapter) depicts a total overview of constraints when sharing information in a logistic outsourcing relationship. After noticing that trust is by far the most important constraint (in addition to the feedback received after several interviews) the first conceptual model is build. This model is shown in figure 3.2. As stated and explained in chapter 3.3, not all constructs would yield sufficient results or are vague to include in a survey. Therefore, the final modal that is tested empirically is shown in figure 3.3 and table 3.7.

The empirical works included in the review important for building the first framework (figure 3.2) are listed in Appendix A.

The constructs and relations of the literature are shown in a matrix as shown in table 3.1 and 3.2. The constructs and relations used in the model are shown in table 3.1. The constructs and relations found but not used in the model are shown in table 3.2. As stated before, chapter 2 provides background information about all the known constraints of information sharing in a logistic outsourcing relationship and the relevant concepts. This total overview is shown in figure 3.1. The in-depth part of this study, in other words, its scope, the part that will be empirically tested, is shown in figure 3.3.

After finishing the matrix, an overview of the factors influencing the three most important constructs is made (trust, information sharing and commitment). The following three tables show whether the article states whether the construct has a positive or negative influence on trust, information sharing or commitment, respectively and the number of times this specific construct name is used in the covered literature. Since different articles use a different terminology to describe its antecedents, constructs and relations, we can't state that when a specific term is used in multiple papers, the meaning is exactly the same. Therefore we compared the constructs and relations by comparing the definitions and made sure there were similarities in between. So different articles test the effect of different antecedents / independent variables on the three main constructs in this research; they do it by using the same variable names, but also by using different variable names. Despite these differences in antecedents, there are also some similarities. Therefore we clustered the most influential antecedents based on their definitions and relations, whereby using one same terminology for the conceptual model. This is shown in table 3.3, 3.4 and 3.5 The used variable names are given, explaining which different variable names they cover, based on their definition. Definitions of the variables used in this research for the first conceptual model (figure 3.2) are found below in table 3.6.

Table 3.2: Other factors excluded from the model

Paper	#Citations	Context	#Respondents	Dependent variable	Legal contract	Logistic performance	Purchasing social responsibility involvement	Revenue-tracking	Willingness	Perceived Satisfaction	Partner's Reputation	Reputation	Supply Chain Dynamism	Seller Importance	IS capability (connectivity)	Top management support	Satisfaction	Satisfaction of previous outcomes	Relationship bonds	Information availability	Learning Capacity
Cai et al. (201)	100	SCM	33,2% (N=398)	IS																	
Carter et al. (2002)	202	SCR	21.5% (N=201)	CO																	
Carter et al. (2002)				TR			D, +														
Chen et al. (2011)	38	SCR	N=121	TR															D,+, Med, +		
Chen et al. (2011)				IS															n.s. +		
Chen et al. (2011)				CM																	
Cheng et al. (2008)	150	SCM	72.5%(N=288)	TR																	n.s.
Cheng et al. (2008)				IS																	D,+
Chu and Wang (2012)	9	SCO	26,7% (N=130)	TR	D, +	D, +							D, +								
Fawcett et al., (2007)	155	SCM	12% (N=588)	IS					Dim						Dim						
Fawcett et al., (2008)	70	SCM	51	IS			D, +								D, +						
Handfield and Bechtel (2002)	547	SCM	20% (N=97)	TR																	
Hausman and Johnston (2010)	45	SCM	12% (N=324)	TR																	
Hausman and Johnston (2010)				CM																	
Hung et al. (2011)	14	SCM	24.4% (N=122)	IS																	
Ke and Wei (2008)		SCC	-	IS																	
Ke et al. (2009)	74	SCM	66% (N=134)	TR																	
Kent and Mentzer (2003)	126	RSC	42.2% (N=324)	CM																	
Kwon et al.,(2004)	365	SCR	9.5% (N=171)	TR						D, +	D, +										
Kwon et al.,(2004)				CM																	
Lejeune and Yakova (2005)	153	SCM	-	IS																	
Lejeune and Yakova (2005)				TR																	
Li and Lin (2006)	325	SCM	6,3% (N=196)	IS												D, +					
Marasco (2008)	237	SCM	-	CO																	
Moberg et al., (2002)	195	SCM	21.03% (N=248)	IS																	
Muller and Gaudig (2011)	9	SCM	13,8% (N=166)	IS											D, +						
Nyaga et al., (2010)	180	SCR	14% (N=397)	TR																	
Nyaga et al., (2010)				CM																	
Patnayakuni et al. (2006)	209	SCM / SCR	30.55% (N=110)	IS																	
Prajogo and Olhager (2011)	86	SCI	13.1% (N=232)	IS																	
Tian et al. (2006)	unknowr	SCO	46,3% N=(51)	TR								D, +								D, +	
Tian et al. (2006)				TR								D, +									D, +
Tian et al. (2006)				TR								D, +									D, +
Tian et al. (2008)	80	SCR	56,7% (N=115)	TR								D, +									D, +
Tian et al. (2008)				CM																	
Zhou and Benton Jr (2007)	316	SCM	18% (N=125)	IS									D, +								
Zineldin and Jonsson (2000)	155	SCR	27,5% (N=144)	TR																	D, +
Zineldin and Jonsson (2000)				CM																	D, +

SCM = Supply Chain Management

SCR = Supply Chain Relationships

SCI = Supply Chain Integration

RSC = Retail Supply Chain

SCO = Supply Chain Outsourcing

- = not stated

Dim = dimension

O = No effect

Dir = Direct effect

Med = Mediator

Mod = Moderator

n.s. = not significant

IS = Information Sharing

CO = Cooperation

TR = Trust

CM = Commitment

Trust

Antecedent / Construct	+ / -	Number of papers
Information Sharing	+	* *****
Satisfaction of previous outcomes	+	**
Behavioral Uncertainty	-	**
Communication	+	**
Reputation	+	*
Partner's Reputation	+	*
Supplier dedicated investment	+	*
Relationship length	+	*
Partner's Asset Specify	+	*
Respondent firm's asset specificity	-	*
Perceived Satisfaction	+	*
Perceived Conflict	-	*
Joint relationship effort	+	*
Seller Importance	+	*
Logistic Performance	+	*
Legal contract	+	*
Shared Vision	+	*
Adaption (supplier)	+	*
Cooperation	+	*
Mediated Power	-	*
Non-mediated Power	+	*
Frequent meetings	+	*
PSR	+	*
Perceived Information Quality	+	*
Information availability	+	*
Coercive	-	*
Non-Coercive	+	*
Participation	+	*
Opportunistic Behavior	-	*
Power	-	*
Supplier Investment in site-specific asset	+	*
Long-term relationship	+	*
Length of cooperation	+	*
Satisfaction	+	*
Relationship-specific investment	+	*

Table 3.3 Antecedents of trust

Information Sharing

Antecedent / Construct	+/-	Number of papers
Trust	+	*****
Commitment	+	***
Information Quality	+	*
Relationship length	+	*
Supply Chain Dynamism	+	*

Reputation	+	*
Explicit contracts	-	*
Frequent meetings	+	*
Supervision / monitoring	+	*
Buyer investments	-	*
IS capability	+	*
Connectivity	+	*
Revenue tracking	+	*
Supplier Uncertainty	-	*
Top management support	+	*
Shared vision	+	*
Shared value	+	*
Participation	+	*
Learning capacity	+	*
Resource fitness	+	*
Opportunistic Behavior	-	*
Power	-	*

Table 3.4 Antecedents of Information sharing

Commitment

Antecedent / Construct	+/-	Number of papers
Trust	+	****
Supplier dedicated investment (Perceived)	+	**
Information sharing	+	*
Communication	+	*
Adaptations (supplier)	+	*
Cooperation	+	*
Relationship bonds	+	*
Coercive	-	*
Non-Coercive	+	*

Table 3.5 Antecedents of commitment

Table 3.6 shows the clustering of the different antecedents / constructs based on their similarities. The definitions used for the constructs in this research are based on the definitions used in the different articles. The goal of the clustering is to support the expected relationships between the different constructs, thereby increasing the possibility that the hypotheses will be supported. The constructs most cited and influencing trust and information sharing are included in the model. Antecedent factors for trust as information sharing and information availability are excluded; the goal of this research is partly to determine antecedents for trust on information sharing, so information sharing as an antecedent for trust is omitted.

The constructs used for the conceptual model and the definitions used in this research are given. Also, the clustering of the different antecedents / constructs based on their similarities are shown below in table 3.6.

3.3 Constructs and hypotheses

Table 3.6 shows an overview of the constructs and definitions used in this thesis. It shows how all the different antecedents / constructs are clustered into workable constructs that can be translated into hypotheses. This chapter describes each construct and its reasoning why it is included in this thesis and whether it is empirically tested or not. As mentioned before, a broad overview is shown in figure 3.2. Due to a limited timeframe and due the fact that only a limited amount of questions can be adopted in a survey, the model is scoped this way. In addition, the mediating effect of trust is tested and therefore the constructs are hypothesized when a relation with both trust and information sharing is to be tested. Figure 3.3 shows this model that is empirically tested with a survey. This model focuses on the antecedents both influencing trust and information sharing.

Reputation

Building reputation as an organization is seen as strategically important in relations where organizations lack access to required and useful information sources (Müller & Gaudig, 2011a). It is “an instrument in order to avoid behavioral insecurities and with which information on the other party’s reliability and goodwill is made available” (Müller & Gaudig, 2011b). In addition, it is a mechanism by which the trust of a target trustee is transferable from one trustor to another. Namely, trust can be developed through direct interaction between supply chain partners over an extended period of time, but also vicariously through the experiences of other trusted sources (Tian et al., 2008). Reputation is an important factor to evaluate organizations and its services. In other words, the reputation of a 3PL or orchestrator is the collective memory of previous organizations regarding its integrity and benevolence; two of the most important factors prominent in determining trust (Kwon & Suh, 2004; Tian et al., 2008). Additionally, Kwon & Suh (2004) show that the reputation of the partner has significant and positive influence on the level of trust among members of the supply chain. Chu & Wang (2012) even state that the perception of the importance of a 3PL influences the levels of trust obtained by an organization assuming a buyers role. Reputation as a construct is not included in the final empirical model; reviewed research shows the impact of reputation on trust, but not on information sharing directly. In addition, the available questions measuring organizational reputation were found to be vague after discussing with the expert group (more information about this group is stated in chapter 4).

Connectivity

One of the requirements for the exchange of information between collaborating organizations is better integration of different information systems. Technological connectivity can be an enabler in supply chains, but could also be a barrier. Connectivity refers to the ability of companies to exchange information by means of IT. A high level of connectivity means that companies have a high level of support from IT systems to share information. They are able to collect, analyze and disseminate information among members of the supply chain (Fawcett et al., 2007). Although the fact that one organization maintains a high level of connectivity doesn’t necessarily mean that it is able to fluently exchange information with other organizations in the supply chain. This is caused by the diversity of types of hardware and software in information systems; devices and protocols being used in the logistic supply chain are a barrier for information sharing (Dalmolen et al., 2012; Yang & Maxwell, 2011). Fawcett et al. (2007) show that better integration of information systems stimulate the exchange of information in logistic supply chains. Connectivity as a construct is not included in the final empirical model; reviewed research shows that the impact of connectivity (high level of

integration) on information sharing, but not on different levels of trust between organizations. In addition, the available questions measuring inter-organization connectivity were found to be vague after discussing with the expert group.

Supply chain dynamism

Supply chain dynamism is generally defined as the unpredictable changes in products, technologies, and demand for products in the market. It measures the pace of the changes in business environment. Since it has a known significant impact on business operations it is hypothesized and confirmed to have an impact on the amount of information shared between collaborating organizations (Zhou & Benton Jr, 2007). Zhou & Benton Jr (2007) measured the pace of changes in both products and processes in order to confirm this hypothesis in logistic outsourcing settings. Supply chain dynamism measures if new products account for a high fraction of total revenue, if the products and services are frequently innovated and if the innovation rate of operating processes is high (Zhou & Benton Jr, 2007). So if the supply chain dynamism increases, the capacity of information processing has to increase in order to achieve superior firm performance. This leads back to the previous chapter describing the impact of connectivity between organizations collaboration in the supply chain. As stated by Fawcett et al. (2007), information systems are an effective approach to increase the effectiveness of information sharing capabilities. Supply chain dynamism as a construct is not included in the final empirical model; reviewed research shows the impact of supply chain dynamism on trust, but not on information sharing between organizations. In addition, the available questions measuring supply chain dynamism were found to be vague after discussing with the expert group.

Satisfaction

Satisfaction refers to the *“insider perspective, the customer’s own experiences of a relationship where the outcome has been evaluated in terms of what value was received”* (Zineldin & Jonsson, 2000). It is the evaluation of a relationship between two organizations cooperating. The outcome of an inter-organizational relationship is the level of satisfaction experienced. The cooperative effort of cooperating organizations is expected to result in greater trust and increases the efficiency of the supply chain and achievements of collaborative goals, leading to higher levels of satisfaction (Tian et al., 2008). If prior experience was positive, it should result in a more positive attitude of the buyer towards the seller. It creates an environment that is more conducive to trust-building (Kwon & Suh, 2004). Consequently, 3PL users (buyers) are expected to have more trust in a 3PL or orchestrator with whom they have collaborated and experienced satisfying results. In addition, Tian et al. (2008) state that a positive experience with the 3PL is necessary when establishing logistic outsourcing relationships; higher levels of satisfaction held by the buyer from previous experiences allow buyers to quicker establish trust in a 3PL. Satisfaction as a construct is not included in the final empirical model; reviewed research implies a strong connection between satisfaction and trust, but doesn't mention its influence on inter-organizational information sharing.

Top management support

Top management is defined as *“the degree of top manager’s understanding of the specific benefits of and support for quality information sharing with supply chain partners”* (Li & Lin, 2006). It is the responsibility of top management to share an understanding of the specific benefits of information sharing between participating organizations. This needs to be done in order to overcome the inevitable divergence of interests. It is needed in providing vision, guidance and support in sharing of

information. It is also required that an information sharing strategy is available and that the right resources are available, enabling exchange of information. This however, could be problematic when top management doesn't understand the importance of information sharing and vision providing. It could be a barrier since organizations most often see the ownership of information is seen as an advantage over competitors; causing organizations to resist sharing information with their partners. One way to fight this struggle is the job of top management; they need to overcome the reluctance of information sharing by creating an organizational culture which motivates the exchange of information with other organizations (Li & Lin, 2006). Consequently, high levels of support from higher management should increase the exchange of information between buyer and 3PL. There are different ways top management can fulfil this requirement, but common approaches are providing vision, guidance, and support and creating an organizational culture conducive to information sharing. It is important that top management understands and embraces the impacts of partnering and develops a good understand of their potential partners. Top management as a construct is not included in the final empirical model; reviewed research shows the impact of top management on information sharing between organizations, but no significant influence on trust is to be expected.

Commitment

As mentioned before, the definition of commitment is borrowed from multiple researches describing its influence when organizations collaborate. It is defined as *"as exchange partner believing that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it; that is, the committed party believes the relationship endures indefinitely"* (Chen et al., 2011; Kwon & Suh, 2004; Li & Lin, 2006). In order to sustain commitment between collaboration organizations, a high level of trust has to be present (Li & Lin, 2006). Kwon & Suh, (2004) add, that 'only' having a trustful relationship isn't sufficient, it should be translated into actionable commitment, in order to attain measurable economic gains from supply chain management. Commitment to ongoing relationships helps to increase efficiency and effectiveness among supply chain members (Chen et al., 2011). It strengthens the trust bond between suppliers, carriers and customers that facilitates the establishment of productive collaboration. A strong level of commitment increases the chances organizations will develop an enduring relationship. Additionally, it is important for long-term success because it shows willingness from supply chain partners to invest resources and sacrifice short-term benefits to maintain long-term success. If mutual beneficial outcomes are accrued from such commitments, long-term relationships can be maintained. Hausman & Johnston (2010) show that commitment has a mediating effect between trust and joint actions, which could be interpreted as information sharing. Contradicting, it is mentioned that trust contributes to commitment and through commitment it contributes to joint actions. Concluding, it is to be expected that commitment has a moderating effect on the relationship between trust and information sharing; higher levels of commitment between organizations increase the level of trust and therefore organizations are stimulated to share their information with each other (Kent & Mentzer, 2003; Nyaga et al., 2010). Since this thesis focuses on trust and information sharing, their antecedents and the possible mediating role of trust towards information sharing, commitment is not included in the empirical model.

Trust

The most recurring antecedent of supply chain relationships is trust (Chu & Wang, 2012; Kwon & Suh, 2004; Nyaga et al., 2010; Patnayakuni et al., 2006; Tian et al., 2008; Tian, Yan, & To, 2006). As mentioned before, the following definition of trust is defined:

“An organization’s belief to have confidence in its partner’s reliability and integrity that would lead to positive outcomes for all the organizations involved in a logistic supply chain”

In other words, trust is now further subdivided into two parts. In order to make this operational, the definitions of benevolence and capability trust are assumed (Tian et al., 2008). This means that instead of focusing at trust only, this thesis focuses on two dimensions of trust:

Benevolence trust: *“The extent to which one partner is genuinely interested in the other partner’s welfare and motivated to seek joint gain”* (Chu & Wang, 2012).

Capability trust: *“A certain skillset and characteristics that enable one to gain certain influences in the field”* (Chu & Wang, 2012).

As shown by Cheng et al. (2008), trust is proven to be a mediating construct to address the issue of the coopetition partnerships within logistic supply chains for investigating factors influencing the exchange of information. With trust as a mediating construct, it is possible to examine how trust, when interacting with other antecedents, has impact on inter-organizational information sharing in logistic supply chains. It is in line with the notion that a lack of trust between collaborating organizations may lead to competitive confusion whether a partner is an ally or a competitor. In addition, without trust during collaborating processes, the information exchanged between collaborating organizations, may be low in accuracy. Without trust, organizations will not share confidential information, as it is seen as a risk full investment (Kwon & Suh, 2004). Thus, high trust levels reduce transaction and agency costs (Tian et al., 2008), improves creativity and inter-organizational learning and builds organizational capabilities (Tian et al., 2006). However, the study of Cheng et al. (2008) have treated trust as a unidimensional construct. Additionally, studies like those from Hausman & Johnston (2010), Zineldin & Jonsson (2000), Hung, Ho, Jou, & Tai (2011) and Aurier & N’Goala (2010) and many other writers reviewed treated trust the same way. This is remarkable since research in trust has shown that trust is a multidimensional construct (Ganesan, 1994). A multidimensional approach provides for example better insights on the effect of trust on long- and short-term orientation. Credibility trust for example, has a significant impact on long-term orientation, whereas the other dimension doesn’t. Capability trust describes the problem solving capabilities of the 3PL, its knowledge about logistic activities and whether it is able to satisfying its customers (Chu & Wang, 2012). Benevolence trust on the other hand, describes whether customers trusts that the 3PL cares for them and that they are on the same side. Since trust is under divided in two dimensions, benevolence and capability, both mediating effects are to be tested. Therefore, the following hypotheses are defined:

H1a. Benevolence trust has a positive moderating effect on information sharing.

H1b. Capability trust has a positive moderating effect on information sharing.

Opportunistic behavior

Opportunistic behavior is defined as *“self-interest seeking with guile, leading to deceit-oriented violation of implicit or explicit promises”* (Cheng et al., 2008). In inter-organizational relationships, an organization is behaving in an opportunistic way when its behavior is inconsistent with prior contract or agreement. Organizations often behave in an opportunistic way if it seems necessary to them in achieving their own goals. When organizations behave in an opportunistic way, trust in the inter-

organizational relationship decreases. Therefore, trust is essential for minimalizing risks stemming from exposure with organizations behaving in an opportunistic way (Panteli & Sockalingam, 2005). As mentioned earlier, information sharing might expose organizations and could make put them in a vulnerable position. Without trust, organizations will not share confidential information, as it is seen as a risk full investment. Organizations must therefore protect themselves against knowledge appropriation by organizations' opportunistic behavior. Concluding, Simonin (1999) find that organizations even use methods to protect their key knowledge as a result of opportunistic behavior noted by collaborating organizations. One of this methods could be that organizations introduce policies that restrict knowledge sharing. This means that organizations are less likely to share their information with organizations that are behaving in an opportunistic way. Therefore, the following hypotheses are defined:

H2a. Opportunistic behavior is negatively related to benevolence trust.

H2b. Opportunistic behavior is negatively related to capability trust.

H2c. Opportunistic behavior is negatively related to information sharing.

Relationship specific investment

Relationship specific investments are “*investments in a relationship that are of lower value when used in an alternative relationship*” (Tian et al., 2008). Translated into the setting used in this thesis, it means 3PL or orchestrator investments in idiosyncratic assets. Doing so develops a safeguard relationship-specific investment, because idiosyncratic assets lose substantial value unless the relationship is continued. Therefore 3PLs or orchestrators are less likely to engage in opportunistic or untrustworthy behavior. This means, the higher the investment in relationship specific assets, the higher the degree in which the organization is locked into the relationship (Handfield & Bechtel, 2002). Therefore it is said, that relationship specific investments can be used as a tool to measure and reflect the degree to which the organization intends to maintain the specific relationship (Tian et al., 2008). Concluding, when an organization is willing to make relationship specific investments, it is most likely showing that the organization trusts its partner organization. Cheng et al., (2008) add that the level of investment specific to the relationship has influence in the level of trust buying organizations have in a 3PL. This linkage is confirmed by (Kwon & Suh, 2004).

Handfield & Bechtel (2002) distinguish physical-, dedicated-, human- and site asset specificity. Examples of the different specificities are molds / manufacturing tools, investments in generalized production capacity, customer-specific operations and successive stages that are immobile but located to close proximity, respectively. Specifically investing in human- and site-specific assets are increasingly becoming requirements for 3PLs or orchestrators when collaborating with other organizations in logistic supply chains (Handfield & Bechtel, 2002). This is due to the fact these investments are nontransferable and the benefits are unrecoverable if the relationship is prematurely ended. Investing in site-specific assets can also be translated in the increase of connectivity for collaborating organizations. For example, think of a 3PL that is using different standards or protocols to retrieve data from buyers especially for that relationship. This would increase the trust as mentioned before, but also allows information to be shared easily (Fawcett et al., 2007). Therefore, the following hypotheses are defined:

H3a. Relationship specific investment is positively related to benevolence trust.

H3b. Relationship specific investment is positively related to capability trust.

H3c. Relationship specific investment is positively related to information sharing

Communication

Communication is broadly defined as “*the formal, as well as, informal sharing of meaningful and timely information between partners*” (Zineldin & Jonsson, 2000). It is a requirement for distribution channels and previous positive experiences in inter-organizational communication is positively related to organizational trust, when it has been perceived as frequent, timely and reliable. In addition, effective communication is essential for achieving the optimized benefits of inter-organizational collaboration. Hendriks (1999) found that stimulating communication leads to an increase of information shared. On the other hand, when organizations fail to share their information, it is typically attributed to the lack or inadequacy of communication mechanisms (Chen et al., 2011).

Communication between organizations can be established by participating in frequent meetings with each other (Müller & Gaudig, 2011b) . Frequent meetings serve the purpose of communication and the exchange of information between collaborating organizations. This way, organizations are able to get to know each other and are able to lay a foundation for a trusting relationship (Seuring & Müller, 2008). In addition, common goals can be established and actions that increase mutual performances can be increased. For example, organizations who inform their costumers about their new developments expectations are to be expected to increase the mutual exchange of information and strengthen the levels of trust (Cheng et al., 2008). By participating in communication activities, organizations are able to obtain behavior information and therefore decide whom to trust. It is therefore to be expected to have a huge impact on the amount of information shared and the levels of trust experienced. Therefore, the following hypotheses are defined:

H4a. Communication is positively related to benevolence trust.

H4b. Communication is positively related to capability trust.

H4c. Communication is positively related to information sharing.

Behavioral Uncertainty

Behavioral uncertainty is defined as “*the inability to predict a partner’s behavior or changes in the external environment*”. Behavioral uncertainty could be seen as a result of lacking or inadequate communication mechanisms. If collaborating organizations don’t exchange frequent, timely and / or reliable information, behavioral uncertainty arises. Behavioral uncertainty arises because organizations are expected to have difficulties with the monitoring of the performance of one and other (Kwon & Suh, 2004). This means for example that organizations lack insights if one of the organizations met contractual compliance. This might consequently lead to problems with adaptations of new systems, standards and a decrease in levels of trust. Consequently, when one organization is showing uncertain behavior, like lacking the required forecast information, the levels of trust of the corresponding organization is affected. When the levels of trust decrease because one organization is showing uncertain behavior, the corresponding organization is less affiliated to share its information (Chen et al., 2011). Also, with high levels of certain behavior in a relationship, organizations are able to adapt within short notice when development processes require so.

When high levels of interdependency exist between collaborating organizations, such as developing new technology or the setup of a new warehouse, behavioral uncertainty from one organization likely affects the other organizations in unexpected ways. Additionally, mistakes made by one organization likely impacts the other organization severely (Krishnan et al., 2006). Kwon & Suh (2004) found an inverse relationship between organizational trust and behavioral uncertainty. This is explained by the predictability of the partner's behavior. If an organization is able to predict the behavior of the partner, uncertainty levels are reduced because the transaction costs in the relationships are likely to be reduced. Organizations are able to meet mutual demands and a trustful relationship develops (Chen et al., 2011). Therefore it is reasonable to believe that organizations behaving in an uncertain way exert a negative influence on inter-organizational trust levels. In addition, it seems logical behavioral uncertainty diminishes the information exchanged between collaborating organizations. Therefore, the following hypotheses are defined:

H5a. Behavioral uncertainty is negatively related to benevolence trust.

H5b. Behavioral uncertainty is negatively related to capability trust.

H5c. Behavioral uncertainty is negatively related to information sharing.

Power

Power generally refers to the ability to control or influence an organization to get the organization something to do that the organization wouldn't do otherwise. Since this thesis is conducted in the context of inter-organizational collaboration, the definition of (Ke & Wei, 2008) is adopted. Power is defined as *'the organization's capacity to influence changes of another organization, which is dependent on the firm's resources. Power is the degree to which one organization can influence another party to undertake an action that the party would not have done'*. This means that if one organization is relatively more dependent on the other, the less dependent organization has the most power in the relationship. Therefore it could be seen as the result of asymmetry of dependence in a relationship (Cheng et al., 2008).

According to Ke et al. (2009) there are six different power sources: coercion, reward, legitimate, expert, referent and information. These six types of power are classified in three ways; coercive/non-coercive, economic/non-economic, and mediated/non-mediated. Since mediated and non-mediated power classifications have gained the most consistent empirical support, it is here used as a method for examining power (Ke et al., 2009).

Coercion power is the ability of the dominant organization to mediate punishments to non-cooperative organizations. Reward power is the ability of the dominant organization to mediate rewards if the other organization fulfils its demands. Legal legitimate power means that an organization has legitimate rights to influence the behavior or actions of other organization. These three mediated power sources are external to target organizations since they have to comply with the dominant organization's demand. These control mechanisms may grant the dominant organization compliance, but it will generate negative feelings on the target organization on losing autonomy. This results in lower level of trusts in inter-organizational organizations where the dominant organization uses his power to gain compliance (Ke et al., 2009). On the other hand, this way, dominant organizations are able to demand the target organization to share their required information with them (Hausman & Johnston, 2010; Müller & Gaudig, 2011b).

Expert, referent and information power sources are non-coercive; these power sources are not mediated on the target organization by the dominant organization. Referent power arises when a target organization is looking for identification with the dominant organization. Expert power arises when a dominant organization has expertise or knowledge that is of value for the target firm. Information power is closely related to expert power; it arises when the dominant organization is able to provide information to the target organization that is unknown to the target firm. For example the potential benefits of the usage of a network orchestrator or eSCM. This research focuses on coercive, legitimate power. This is based on the guidelines provided by Ke et al. (2009) who state that power is often misunderstood and interpreted as a simple construct while this is not the case. In addition, it is unlikely that organizations start sharing organizational sensitive information when non-coercive power is present (Ke et al., 2009). Since power is the result of asymmetry of dependence in a relationship between at least two organizations, power is hypothesized to have influences in two contradicting ways:

The power of a 3PL / orchestrator on the one side:

H6a. The power of a 3PL / orchestrator is negatively related to benevolence trust.

H6b. The power of a 3PL / orchestrator is negatively related to capability trust.

H6c. The power of a 3PL / orchestrator is positively related to information sharing.

The power of the target organization on the other side:

H7a. The power of the target organization is negatively related to benevolence trust.

H7b. The power of the target organization is negatively related to capability trust.

H7c. The power of the target organization is positively related to information sharing.

Shared vision

In order to state the definition of shared vision, an adaption of the definition stated by Li & Lin, (2006) is used. Consequently, shared vision is defined as “*the degree of similarity of the pattern of shared values and beliefs between collaborating organizations*”. In general, is the extent to which organizations have similar beliefs in goals, behaviors, policies, and in what is right and what is wrong. In a supply chain setting, this is translated into similar beliefs and understanding about the aim and objectives of the supply chain (Li & Lin, 2006). Creating a sustainable environment by reducing CO2 emission could for example be one of the objectives. This could be supported by a similar understanding of the importance of collaboration in the supply chain by for example sharing information. Having similar values are essential for building a shared vision and could result in similar attitude and behavior (Zineldin & Jonsson, 2000). Additionally, it is expected that sharing vision contributes to the development of inter-organizational trust. With high levels of trust and shared values, it is to be expected that collaborating organizations have the same perception of how to interact with each other, meaning that they have an understanding of how to avoid misunderstand in their communications. This allows organizations to exchange their ideas freely (Cheng et al., 2008).

However, when organizations are in a co-opetition relationship, maximizing own organizational interests are prioritized. This means that the willingness of sharing competitive knowledge could be reduced when compared with a traditional relationship, where organizations collaborate and don't share the same competitive spot. So even though having similar beliefs about the objectives of the supply chain, organizations who consider knowledge as a source of competitive advantage might be reticent in their exchange of information (Cheng et al., 2008). This research focuses mainly on inter-organizational relationships in a logistic outsourcing relationship, so therefore the following hypotheses are defined:

H8a. Shared vision is positively related to benevolence trust.

H8b. Shared vision is positively related to capability trust.

H8c. Shared vision is positively related to information sharing

Participation

Participation in collaborative relationships is defined by Cheng et al. (2008) as *"the degree to which a mutual commercial goal to be achieved is included in decision making, including the idea generation, decision making involvement, and goal setting"*. Nyaga et al. (2010) add that resolving problems together is also a requirement for collaborative relationships to succeed. Joint effort initiatives contribute to establishing successful relationships. Examples are planning, goal setting, performance measurement and problem solving. In addition, joint efforts are also closely related to the exchange of information; collaborating organizations are enabled to co-align their operations and processes, which additionally also enhances their inter-organizational levels of trust (Nyaga et al., 2010).

Implicated for inter-organizational relationships, participating implies the input of the organization to the decision making process and also visualizes the amount of control distributed between collaborating organizations (Hernández-Espallardo & Arcas-Lario, 2003). Goals setting and organization's input are important aspects for partnerships in an inter-organizational relationship (Cheng et al., 2008). In addition, organizations are said to perform better when they could influence the participation process; quality increases together with a reduction of functional conflicts. Active participation in decision making processes can be assured if the collaborating organizations jointly possess relevant knowledge and information. Consequently, this means that effective information sharing is required (Cheng et al., 2008).

Zineldin & Jonsson (2000) use a different terminology to describe participation, but basically refer to the same. They use cooperation to describe *"situations in which parties work together to achieve mutual goals"*. This definition is added, because Zineldin & Jonsson (2000) recognize cooperation as a crucial component in channel relationships. When assuming a broader view, cooperation is occurring within maintenance and commitment processes and therefore part of the intention to develop relationship trust. This means that effective cooperation promotes inter-organizational trust. Therefore the following hypotheses are defined:

H9a. Participation is positively related to benevolence trust.

H9b. Participation is positively related to capability trust.

H9c. Participation is positively related to information sharing

Relationship length

With relationship length is referred to “*the length of the outsourcing relationship between logistic users and the 3PL or orchestrator*” (Tian et al., 2008). It is used to measure the length of official partnerships by means of legal contracts. It is expected that time spent on building and maintaining a relationship requires idiosyncratic investments for both collaborating organizations. This means the longer a relationship exists, the greater the investment of both organizations is expected to be. In addition, the predictability of the collaborating organization increases when organizations have a shared history (Tian et al., 2008).

3PLs or orchestrators tend to relate with their suppliers differently than traditional logistic relationships. Organizations aim to build long-term relationships and prefer to use fewer suppliers over a long period of time. Most importantly, inter-organizational relationships are enhanced into strategic levels where collaborating organizations are considered as the integral part of the organization’s operations (Prajogo & Olhager, 2012). This change impacts early integration of the collaborating organization, next to sharing risks and profits. Long-term relationships could therefore prepare organizations for putting large investments in building relationships, like sharing information and IT capabilities (Prajogo & Olhager, 2012). Additionally, great levels of mutual trust in long-term relationships increase the IT customization and therefore the information sharing capabilities (Zineldin & Jonsson, 2000).

Long shared history implies that the crucial stages in developing a relationship are overcome. This means collaborating organizations built a better understanding of each other’s idiosyncrasies and each other’s behavior in the future. Insights in moral characteristics could be gained which allows organizations to screen their colleague organizations better by means of trust (Tian et al., 2008). So it seems logical that the longer organizations collaborate, higher levels of trust are built and organizations are more willing to share their information. Therefore the following hypotheses are defined:

H10a. Relationship length is positively related to benevolence trust.

H10b. Relationship length is positively related to capability trust.

H10c. Relationship length is positively related to information sharing

Information quality

Shared information is of no or very little value to organizations if it isn’t reliable or valid (Moberg et al., 2002). In this case, information of low quality is shared. Li & Lin (2006) describe that the quality of information is determined by its accuracy, timeliness, adequacy, and credibility of the information shared. As noted throughout this research, sharing information is of crucial importance when collaborating in SCM. (Li & Lin, 2006) emphasize that the significance of its impact is dependent on what information is shared, when and how it is shared, and with whom. Information sharing also creates flexibility, but in order to do so, information has to be accurate and timely. If not, one of the most cited phenomena in SCM might occur; the bullwhip effect. Information suffers from delay and the caused distortion has effect on the next organization processing the information (Chen et al., 2011).

Additionally, organizations can also deliberately choose to distort their shared information to mask their intentions towards collaborating organization. Organizations undertake these actions because they perceive information disclosure of a loss of power, as mentioned before (Ke et al., 2009). Unfortunately, the distorted information will be passed along the chain and lead to further distortion. Therefore information should only be shared when of high quality. Only when organizations are able to share vital and decision making information of high quality, trust can be established (Chen et al., 2011). If organizations are not willing to do so, transaction costs are expected to increase due to the complexity and uncertainty of the information. Kwon & Suh (2004) found that uncertainty about the quality of information impedes the levels of trust in inter-organizational relationships. Information of low quality is therefore expected not to increase inter-organizational trust. In order to increase levels of trust, information has to be of high quality; accurate and timely.

As stated, sharing information of low quality is of little or no use for collaborating organizations. Each of the quality determinants has to be present. If not the case, organizations have to at least make sure the target organization perceives their information to be of high quality. Moberg et al. (2002) found that perceived information quality increases the exchange of information. Therefore, it is assumed that information quality is also positively related to information sharing. Concluding, the following hypotheses about information quality are defined:

H11a. Information quality is positively related to benevolence trust.

H11b. Information quality is positively related to benevolence trust.

H11c. Information quality is positively related to information sharing

Information sharing

Information sharing is already extensively discussed in the previous chapter. It is the main focus of this thesis to determine its antecedents and the influence of trust and therefore of crucial importance to add to the final model that is empirically tested. In order to make information sharing operational, the definition of (Li & Lin, 2006) is adapted. They describe information sharing as “*the extent to which critical and proprietary information is communicated to one's supply chain partner*”. Since this thesis focuses on logistic outsourcing relationships, the focus lays on information sharing between 3PLs, orchestrators and the organizations they collaborate with.

Table 3.6 Definitions of constructs and their related constructs

Construct	Similar construct(s)	Definition used	Source
Relationship length	*Length of cooperation *Long-term relationship	Length of the relationship between logistic users and orchestrator (3PL)	(Tian et al., 2008)
Satisfaction	*Perceived satisfaction *Satisfaction of previous outcomes	“Insider perspective, the customer’s own experiences of a relationship where the outcome has been evaluated in terms of what value was received, in other words what the customer had to give to get something”	(Zineldin & Jonsson, 2000)
Reputation	*Partner’s reputation *SellerImportance	“An instrument in order to avoid behavioral insecurities and with which information on the other party’s reliability and goodwill is made available”	(Müller & Gaudig, 2011b)
Behavioral Uncertainty	*Supplier uncertainty	"the inability to predict a partner's behavior or changes in the external environment”	(Kwon & Suh, 2004)
Communication	*Frequent meetings	“as the formal and informal sharing of meaningful and timely information between organizations, we regards communication as a partner’s perception that past communications from another party have been frequent, timely, and reliable”	(Zineldin & Jonsson, 2000)
Relationship-specific investment / Partner’s asset specificity	*Supplier dedicated investment *Adaption *Supplier investment in site-specific asset	“Investments in a relationship that are of lower value when used in an alternative relationship” /	(Tian et al., 2008) / (Kwon & Suh, 2004)
Respondent firm’s asset specificity	* Buyer investment	“Durable investments that are undertaken in support of particular transactions, and the opportunity cost of (such) investment is much lower in best alternative uses.”	(Kwon & Suh, 2004)
rticipation / Joint relationship effort	*Cooperation	“the degree to which a mutual commercial goal to be achieved is included in decision making, including the idea generation, decision making involvement, and goals setting” /“partners working together to	(Cheng et al., 2008) / (Nyaga et al., 2010)

		plan and coordinate activities, as well as resolve problems”	
Power	<ul style="list-style-type: none"> *Mediated Power *Non-mediated Power *Coercive *Non-Coercive *Explicit contracts *Supervision /monitoring 	<p>“the firm’s capacity to influence changes of another firm, which is dependent on the firm’s resources”</p> <p>/“the application of direct pressure through communicating adverse consequences of non-compliance to encourage specific behaviors”</p>	(Ke & Wei, 2008) / (Hausman & Johnston, 2010)
Shared vision	*Shared values	“Degree of similarity of the pattern of shared values and beliefs between trading partners”	(Li & Lin, 2006)
Connectivity	*IS capability	Enabling individuals / companies anywhere in the chain to seamlessly interact with one another as a technological possibility	(Fawcett et al., 2007)
Opportunistic behavior	*Perceived conflict	“Self-interest seeking with guile, leading to deceit-oriented violation of implicit or explicit promises. In inter-organizational relationships, a partner is said to be opportunistic if its behaviors are inconsistent with some prior contact or agreement”	(Cheng et al., 2008)
Information quality	<ul style="list-style-type: none"> * Perceived level of information quality *Resource fitness 	“Information quality includes aspects such as the accuracy, timeliness, adequacy, reliability, credibility, understandability and ease of use of the information exchanged”	(Chen et al., 2011)
Supply Chain Dynamism		“The pace of changes in both products and processes”	(Zhou & Benton Jr, 2007)
Top management support		“The degree of top manager's understanding of the specific benefits of and support for information sharing with supply chain partners.”	(Li & Lin, 2006)

Construct	(subconstructs)	Definition used	Source
Trust	Benevolence trust	“The extent to which one partner is genuinely interested in the other partner’s welfare and motivated to seek joint gain”	(Chu & Wang, 2012) (who adept (Tian et al., 2008) definition
	Capability trust	‘A certain skillset and characteristics that enable one to gain certain influences in the field’ “Expectancy that the partner’s word or written statement can be relied on”	(Chu & Wang, 2012) who adept (Tian, Yan, & To, 2006) definition
	Integrity trust		(Tian et al., 2008)
Commitment		“An exchange partner’s belief that an ongoing relationship with another firm is so important as to warrant maximum efforts at maintaining it; that is, the committed party believes the relationship is worth working on to ensure it endures indefinitely”	(Nyaga et al., 2010) More available (Moberg et al., 2002)
Information Sharing		“The extent to which critical and proprietary information is communicated to one’s supply chain partner”	(Li & Lin, 2006)

Table 3.7 Hypotheses

Hypothesis	
1a	Benevolence trust has a positive moderating effect on information sharing.
b	Capability trust has a positive moderating effect on information sharing.
2a	Opportunistic behavior is negatively related to benevolence trust.
b	Opportunistic behavior is negatively related to capability trust.
c	Opportunistic behavior is negatively related to information sharing.
3a	Relationship specific investment is positively related to benevolence trust
b	Relationship specific investment is positively related to capability trust.
c	Relationship specific investment is positively related to information sharing
4a	Communication is positively related to benevolence trust.
b	Communication is positively related to capability trust.
c	Communication is positively related to information sharing.
5a	Behavioral uncertainty is negatively related to benevolence trust.
b	Behavioral uncertainty is negatively related to capability trust.
c	Behavioral uncertainty is negatively related to information sharing.
6a	The power of a 3PL / orchestrator is negatively related to benevolence trust.
b	The power of a 3PL / orchestrator is negatively related to capability trust.
c	The power of a 3PL / orchestrator is positively related to information sharing.
7a	The power of the target organization is negatively related to benevolence trust.
b	The power of the target organization is negatively related to capability trust.
c	The power of the target organization is positively related to information sharing.
8a	Shared vision is positively related to benevolence trust.
b	Shared vision is positively related to capability trust.
c	Shared vision is positively related to information sharing
9a	Participation is positively related to benevolence trust.
b	Participation is positively related to capability trust.
c	Participation is positively related to information sharing
10a	Relationship length is positively related to benevolence trust.
b	Relationship length is positively related to capability trust.
c	Relationship length is positively related to information sharing.
11a	Information quality is positively related to benevolence trust.
b	Information quality is positively related to capability trust.
c	Information quality is positively related to information sharing

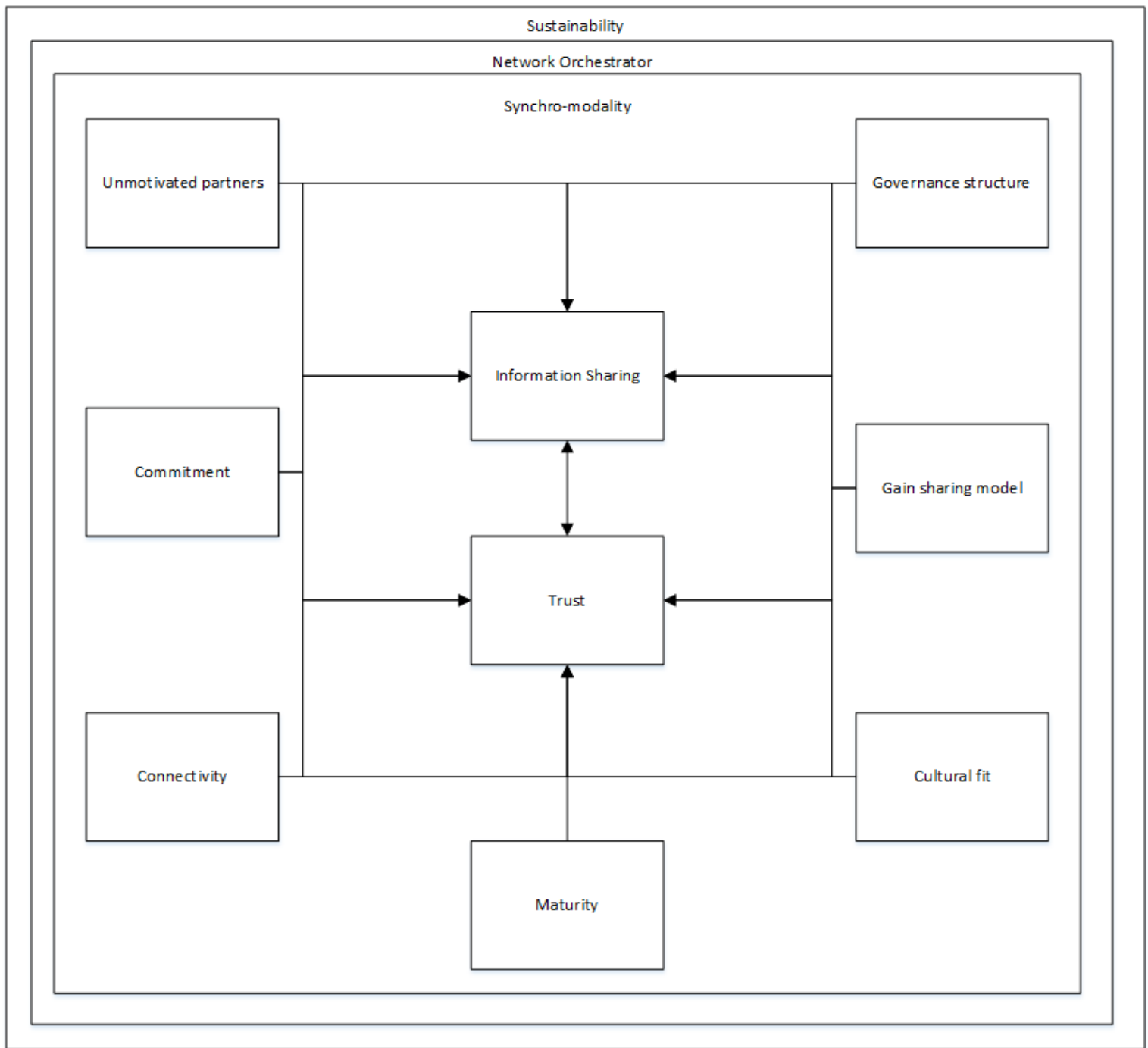


Figure 3.1 Boundary conditions of the thesis in logistic supply chains with the most cited antecedents of information sharing

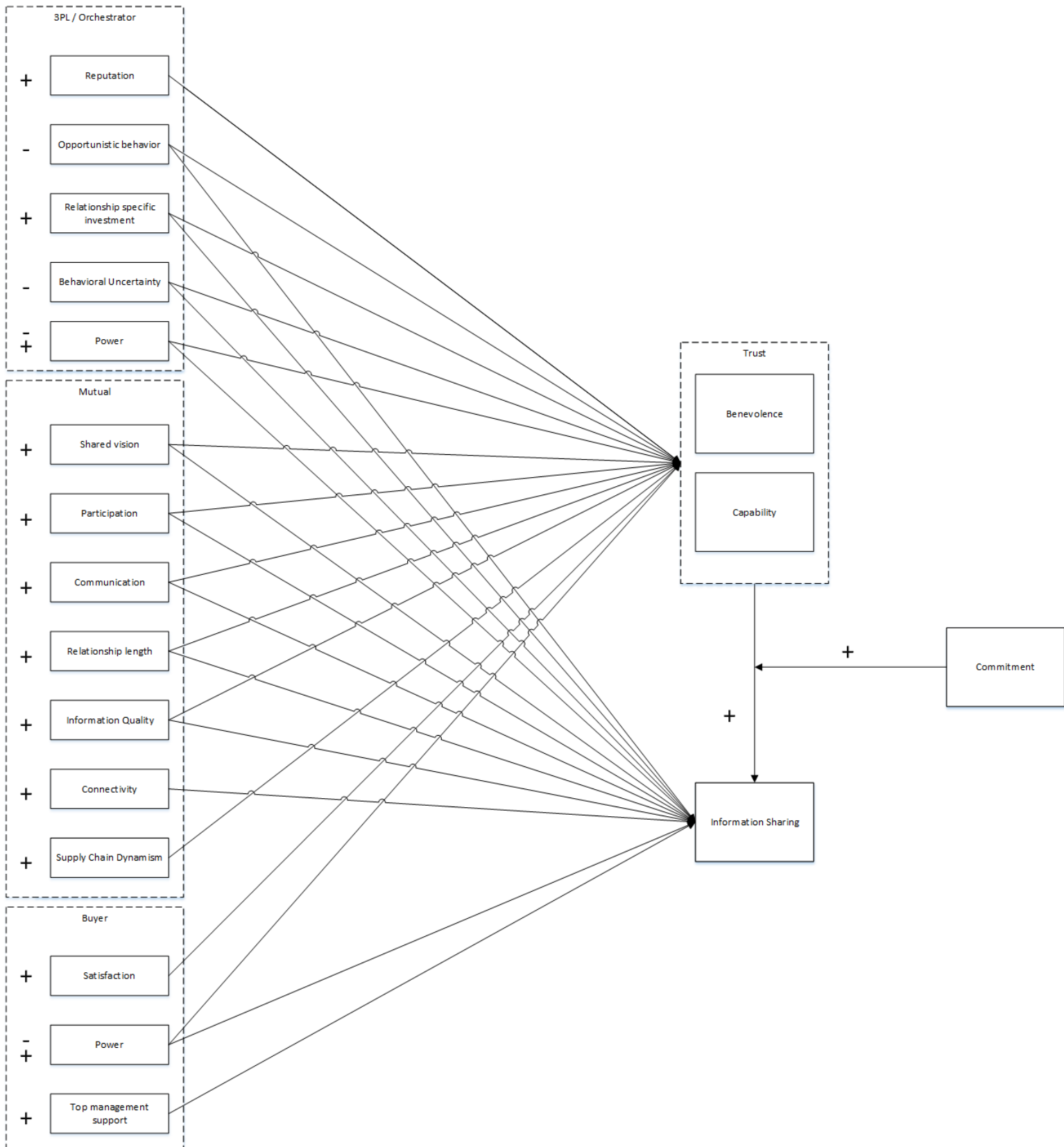


Figure 3.2 Conceptual model of the antecedents of inter-organizational information sharing

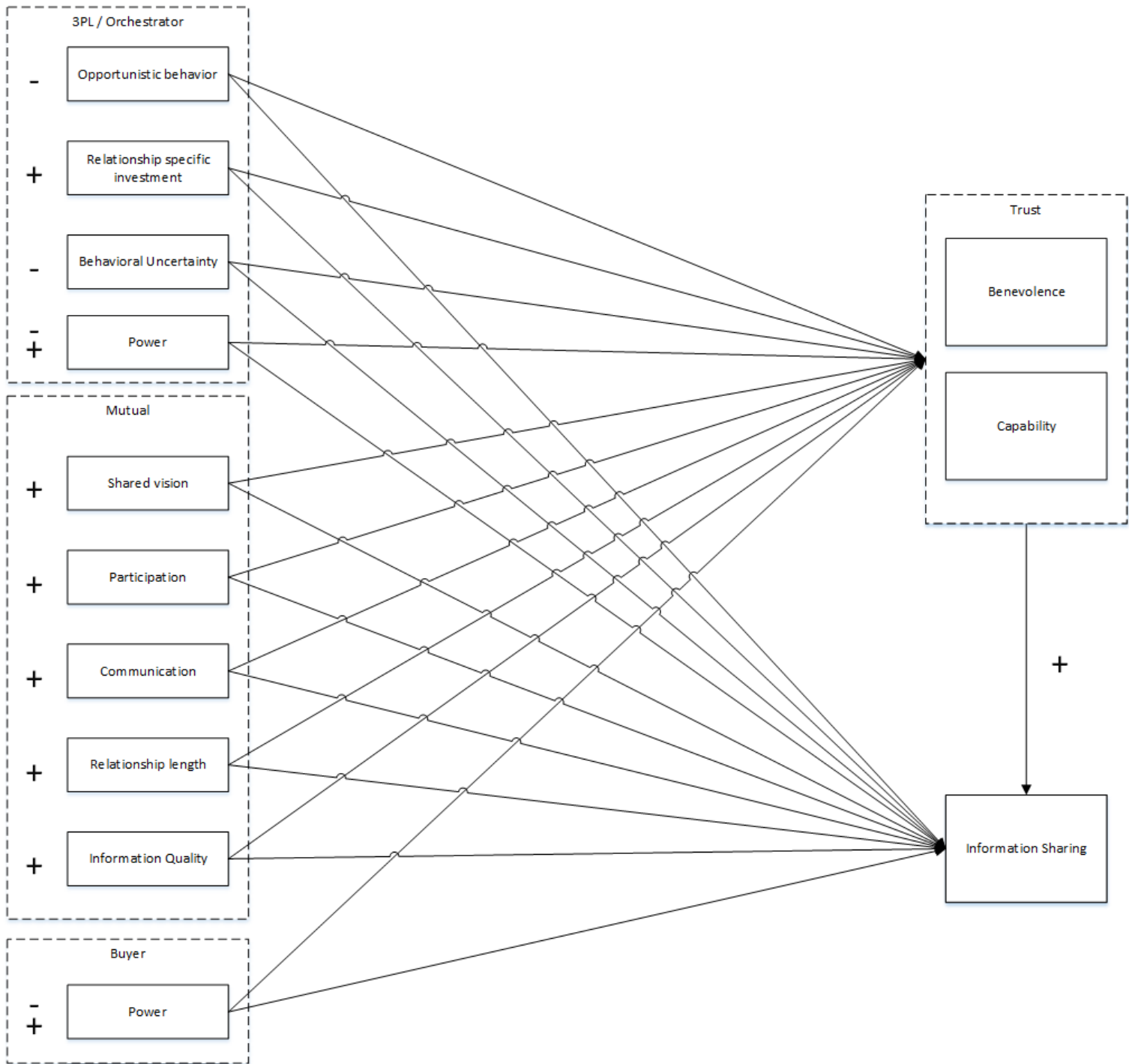


Figure 3.3 Final empirical model of the antecedents of inter-organizational information sharing

4. Methods

The theoretical model as proposed in chapter 3 will be tested using a digital cross-sectional survey. Since it is of major importance that for the results and validity that the survey is well designed, several extensive validation methods are used to establish instrument validity. Furthermore, in order to validate the results yielded by the survey, an interview is held with an organization that is active as a logistic orchestrator. Additionally, a round table session with 17 persons from 13 different organizations is held to validate the results yielded and determine its impact in practice.

4.1 Research Design

In order to test the designed theoretical model, a cross-sectional survey is used. Surveys result structured data by questioning people in a structured way. In particular, an online survey is created to automatically receive data from the respondents, allowing the data to be stored in a structured way. This comes in handy when data is collected from a relatively large number of respondents.

The aforementioned research model shows constructs and relations, making it reliable on causal relationships. Therefore a quantitative method is used to test the statistical correlations. Babbie (2004) describes three different methods for executing quantitative research; survey, experiment and non-reactive research. As mentioned earlier, the aim is to gain as much response as possible; therefore the research method used should be able to measure large populations. Also, surveys allow the measuring of attitudes and orientations of large populations (Babbie, 2004). Since all the constructs used in the research model have to be evaluated by the perception of individuals, a survey seems the logical method for testing the research model. Non-reactive research doesn't allow measuring the attitudes of the respondents and is therefore not an option. A field experiment isn't feasible also, because it requires lots of times from the respondents and the practical relevance would be limited for this research.

In order to measure the theoretical model, survey items need to be formulated. The constructs have to be operationalized by means of survey items. As mentioned before, the perceiving of the respondents about these items will be measured, like the perceived level of trust. Saunders, et al., (2011) state that this can be measured by using a Likert scale for the items. Using Likert scales for the used items result in ordinal data. Even though interval or ratio data might be preferred (because ordinal data might allow usage of less powerful statistical analyses), Allen & Seaman (2007) state that a five-point Likert scale is considered as detailed enough to be evaluated as interval data. Therefore all items are designed by using a five point Likert scale. These scales range from 'strongly disagree' to 'strongly agree'. This research is conducted in a limited timeframe and in order to have the highest instrument validity as possible in such a limited timeframe, all the items used are adapted from items that are already validated by others.

Additionally, in order to provide items that are well validated, two factors have to be taken care of to strengthen the empirical findings. These describe the instrument validity; internal validity and statistical conclusion validity (Straub, 1989). Statistical conclusion validity assesses the validity of the relationships between the measured variables in a mathematical way. It is used afterwards to check if the used design was valid. Theoretically, items are never 100 percent valid until statistical conclusion validity is used. Internal validity is about whether there are more variables that could have influence and explain the observed results.

Statistical conclusion validity

Statistical conclusion validity is assessed after all the responses were reviewed and is therefore discussed in Chapter 5.

Internal validity

One of the reasons a structured literature review is conducted, is to increase the internal validity. Different antecedents for information sharing and trust are identified in the model that might have alternative explanations in the model. Unfortunately, it is impossible to completely eliminate the risk of having alternative explanations for understanding the antecedents of information sharing and trust. Combining the facts that this research is conducted in a limited timeframe with the practical limitations on the number of items to include in the survey, only a limited number of constructs can be measured. The differences of the conceptual model (Figure 3.2) and the final model (Figure 3.3) depict this.

Common method variance is an important threat to internal validity. This is especially the case when responses are collected in a single setting (Podsakoff et al. 2003). Podsakoff et al. (2003) define method variance as follows: *“Method variance refers to the variance that is attributable to the measurement method instead of the construct the researcher is interested in”*. When the same method to measure the correlations between variables is used, common method variance occurs. In order to reduce this risk, Podsakoff et al. (2003) state that the data of the independent and dependent variables should be collected in two different stages. In the survey respondents get asked to assess their relationship with one particular organization they are collaborating with. It is required for the respondent to state the name of the organization they are evaluating. If data is collected in two different stages, the respondents would have to name the organization they are evaluating twice and would thereby compromise their anonymity. Evaluating another organization means the respondent possible has to share private data. This could scare the respondents off and would not result less response. Therefore we chose to collect the data in one stage. Additionally, the guidelines stated by (Podsakoff et al., 2003) and (Saunders et al., 2011) are adhered to: the Likert scale is used to measure the items, thereby reducing common method variance.

According to Straub (1989) instrument (item) validity can be evaluated by three criteria. These are content validity, construct validity and reliability. Content validity refers to the extent to which an item measures all the facets of a given construct. For example, if the antecedents found in this research represent all the influences possible on trust or information sharing. As to be found understandable, this is really hard to measure. Fortunately, the goal of this research is not to determine all the antecedents of trust and information sharing, but the combined antecedents of both constructs and its impact. It provides insights which of the antecedents have to most influence in the given setting. Additionally, reviewing literature in a structured way as done in this thesis contributes in ensuring the most influential constructs are taken into account (Straub, 1989). Saunders et al. (2011) also state different techniques to ensure content validity of the measurement item. The techniques adopted here are: structured literature review, subject matter expert reviews and face validity assessment by peers. A structured literature review minimizes the chances of missing essential aspects as noted before. Subject matter expert reviews have been assessed by receiving extensive feedback on both the literature review and the survey from three skilled academic researchers. Face validity of the survey has been assessed by ten supply chain practitioners.

Construct validity assesses the extent to which items reflect the constructs they are measuring. If the used scales show both convergent validity and discriminant validity, construct validity can be concluded. Reliability refers to *“the extent to which your data collection techniques or analyses procedures will yield consisting findings”* (Saunders et al., 2011). This means it encompasses the extent to which a scale will yield the same score if repeated on other occasions or by other observers. Reliability can be proven by having good Cronbach’s alphas. This means that the reflective items possess high internal consistency. This correlation can be assessed by calculating Cronbach’s alpha values for items that are supposed to correlate. These are items measuring a construct, for example: the three items about communication. The minimum required value for Cronbach’s alpha for constructs to be acceptable is disputed. However, Dunn et al. (2013) describes that generally, values below 0,6 are unacceptable. Values between 0,6 and 0,7 are acceptable for new exploratory research and everything above 0,7 is good. Noted is that values between 0,9 and 0,95 are excellent, but values above are questionable and should be taken into doubt. This is because measurable constructs with a Cronbach’s alpha above 0,95 means that the items used to describe the constructs are almost identic.

In order to assure reliable items are used in this research, all items are adapted from items that are already validated by other researches. Additionally, all the resulted available items are discussed and compared on content and Cronbach’s alpha. Therefore an overview of all the related constructs per paper is given, showing insights in the amount of survey items used, the source and most importantly, the Cronbach’s alpha. This is done in order to make sure the survey items with the highest available Cronbach’s alpha are used while considering the fit of the items in their context. This overview is represented in Appendix B. As stated earlier, the statistical conclusion validity has to prove whether the used items were eligible. These results of the reliability statistics are shown in table 5.1. This table shows that all the items are validated for this research (lowest value is 0,68 and thereby the only value below 0,7).

4.2 Operationalization

All the used survey items are shown in appendix C. Appendix C shows the original items per construct and their Cronbach’s alpha. Additionally, the adapted survey items per construct are shown with their resulting Cronbach’s alpha after conducting statistical analyses.

As mentioned in chapter 4.1, common method variance is an important threat to the internal validity of a survey. Therefore the items used are designed to reduce the common method variance that might occur. Item characteristics and context influence this common method variance as stated by (Podsakoff et al., 2003). Properties of common method variance that are influential by the choice of words and design are: ambiguous or complex items, format of the items describing the construct, choice of anchors, reverse coded items and item priming effects (Podsakoff et al., 2003). Therefore, all items measuring their constructs are measured by five point Likert scale. This is done in order to reduce confusion and increase consistency, since in other surveys some items were measured by a seven point Likert scale.

Power (3PL / Orchestrator) (PW) is operationalized using all three items that are adapted from Ke et al. (2009). These items describe the coercive, legitimate power that the 3PL or orchestrator has over the respondent organization. The items ask about influential behavior, obligation and possible compliance duty imposed by the 3PL or orchestrator. The original items were measured on a seven-

point Likert scale ranging from “strongly disagree” to “strongly agree”. The items used in the survey were measured on a five point Likert scale. Additionally, ‘dominant partner’ is substituted in each item with ‘3PL / Orchestrator’ to increase the consistency of the survey, thereby reducing confusion and risk of common method variance.

The reasoning for replacing words and adjusting the measurement scale is consistent and applicable to all the items described in this subchapter and is therefore not repeated.

Power (Your Company) PC is operationalized by using all three items that are adapted from Cheng et al. (2008). These items describe the coercive, legitimate power that the respondent organization has over the 3PL or orchestrator. The items ask about the influential behavior, obligation and threats imposed by the respondent organization. The original items were measured on a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’ and are therefore not adjusted. ‘Partner’ in each item is substituted with ‘3PL / Orchestrator’.

Behavior Uncertainty (BU) is operationalized using all three items that are adapted from Joshi & Stump, (1999). These items describe the behavior uncertainty of the 3PL or orchestrator as perceived by the respondent organization. The items ask about predictability, accuracy and adaptability of the 3PL / orchestrator. The original items were measured on a seven-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. The items used in this survey were measured on a five-point Likert scale. Additionally, ‘supplier’ in each item is substituted with ‘3PL / Orchestrator’.

Opportunistic Behavior (OB) is operationalized using all three items that are adapted from Cheng et al. (2008). These items describe the opportunistic behavior of the 3PL or orchestrator as perceived by the respondent organizations. The items ask about policies regarding information sharing restriction, not keeping promises and alternating facts. The original items were measured on a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’ and are therefore not adjusted. ‘Partner’ in each item is substituted with ‘3PL / Orchestrator’.

Relationship specific investment (RI) is operationalized using all the three items that are adapted from Tian et al. (2008). These items describe the investment the 3PL or orchestrator has done specifically in the relationship between respondent organization and the 3PL or orchestrator. The items ask about investments in related facilities, reengineering of business processes and employee training executed by the 3PL or orchestrator. The original items were measured on a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’ and are therefore not adjusted. ‘Major 3PL firm’ in each item is substituted with ‘3PL / Orchestrator’.

Participation (PA) is operationalized using all the three items that are adapted from Cheng et al., (2008). These items describe the level of participation and influence the respondent organization has related to the 3PL or orchestrator. The items ask about involvement, suggestions and decision making of the respondent organization in the commercial goals. The original items were measured on a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’ and are therefore not adjusted. ‘Partners’ in the first two items are substituted with ‘3PL / Orchestrator’.

Shared vision (SV) is operationalized using all the three items that are adapted from Li & Lin (2006). These items describe the vision and values the respondent organization and 3PL or orchestrator

have. The items ask about similar understandings about the aim, collaboration- and improvement importance of the supply chain between respondent organization and the 3PL or orchestrator. The original items were measured on a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' and are therefore not adjusted. 'Trading partners' in each item is substituted with '3PL / Orchestrator'.

Information Sharing (IS) is operationalized using all the four items that are adapted from Chu & Wang (2012). These items don't just describe information sharing in general; they specifically focus on the required information that is characteristic in a relationship an orchestrator. The items ask about the level of information exchanged in general, the level of information shared about shipments and whether the 3PL or orchestrator shares available service capacity or demand forecasts. The original items were measured on a seven-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. The items used in this survey were measured on a five-point Likert scale. Additionally, 'major 3PL' or '3PL' in the items are substituted with '3PL / Orchestrator'.

Information Quality (IQ) is operationalized using all the five items that are adapted from Li & Lin, (2006). As described in chapter 3.3, information quality is measured by five different characteristics. Therefor these adapted items describe exactly the five characteristics of information quality. The items ask if the information exchanged with the 3PL or orchestrator is timely, accurate, complete, adequate and reliable. The original items were measured on a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' and are therefore not adjusted. 'Trading partners' in each item is substituted with '3PL / Orchestrator'.

Benevolence trust (BT) is operationalized using all the five items that are adapted from Kwon & Suh, (2004). These items describe whether the respondent organization has the feeling it is taken care of by the 3PL or orchestrator they collaborate with. The items ask about sacrifices made the orchestrator, if it is concerned and if it is been on the same side as the respondent organization. The original items were measured on a seven-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. The items used in this survey were measured on a five-point Likert scale. Additionally, 'major 3PL' in the items is substituted with '3PL / Orchestrator'.

Capability trust (CT) is operationalized using all the five items that are adapted from Kwon & Suh, (2004). These items describe whether the respondent organization perceives that the 3PL or orchestrator can be trusted in its logistic capabilities. The items ask the respondent organization if it believes that the 3PL or orchestrator is capable of handling or managing their requests, problems and logistic service demand. The original items were measured on a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' and are therefore not adjusted. 'Major 3PL' in each item is substituted with '3PL / Orchestrator'.

Communication (CM) is operationalized using all the three items that are adapted from Cheng et al., (2008). These items describe the level of communication between respondent organization and its 3PL or orchestrator. The items ask if the respondent organization and its 3PL or orchestrator exchange opinions, information about developments and each other's expectations. The original items were measured on a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' and are therefore not adjusted. 'Partner' in each item is substituted with '3PL / Orchestrator'.

Relationship length (RL) is operationalized using the items that are adapted from Chu & Wang (2012) and Tian et al. (2008). They simply ask the relationship length in years between the respondent organization and its 3PL or orchestrator. Therefore the item representing relationship length is also measured in years.

Since the mentioned constructs are mostly referred to by their abbreviations from here on, a table is drawn to provide an overview to provide readability. The abbreviations are found in table 4.1.

Construct name	Abbreviation
Power (orchestrator)	PW
Power (respondent)	PC
Behavior uncertainty	BU
Opportunistic behavior	OB
Relationship specific investment	RI
Participation	PA
Shared Vision	SV
Information Sharing	IS
Information Quality	IQ
Benevolence Trust	BT
Capability Trust	CT
Communication	CM
Relationship length	RL

Table 4.1 Abbreviations used throughout the thesis per construct.

4.3 Conceptual validation

Based on the suggest procedure by (Moore & Benbasat, 1991) we performed a stage-conceptual validation procedure. Even though the items and their scales are pre-validated by other studies, we wanted to assess the construct validity by demonstrating the convergent validity and discriminant validity. Additionally, feedback is requested from professionals from CGI and the University of Twente in order to identify ambiguous words.

The procedure consisted of several steps. The first step was to build a survey consisted of existing items adapted from other studies. This first version of the survey consisted of an introduction text, an image to visualize the difference between a 3PL and an orchestrator with explanatory text, adopted survey items and definitions describing the items. As a second step we asked for feedback from the aforementioned professionals, in order to identify ambiguous worded questions and definitions. The third step consisted of a sorting round. With a sorting round we assess the construct validity. If the items are placed consistently in the desired category, we can demonstrate convergent validity with the related constructs and discriminant validity with the other constructs.

Different people were asked to help in the feedback round and the sorting round. For the feedback round we focused on professionals from CGI and the University of Twente. The group existed of thirteen persons; three with a PhD degree, seven with a Master's degree and three that are in the finishing stages of obtaining their Master's degree. All the persons in this group had affinity for supply chain management in the broadest way of the word. For the sorting group mostly Master students or Bachelor students were asked for help. Since the sample group used to fill in the questionnaire consists of a high variety of educational backgrounds, we decided to include bachelor students as well. The second group consisted of six persons; one with a PhD degree, two with a

Master's degree and three with a Bachelor's degree. The educational background of these people varied; psychology, business administration and econometrics are examples.

Pre-test

By receiving feedback from the first group of professionals from CGI and the University of Twente, a qualitative testing of the first draft version of the survey was performed. Ambiguously worded definitions and questions were identified. Additionally, the participants were asked to focus on evaluating the survey on an item-by-item basis; measuring if the participants perceive that the respective questions actually measure the given definitions. Feedback on the expected estimated time to complete the survey was also received.

After processing the received feedback, five participants of the group were asked for feedback once again. This means that the aforementioned process was repeated again. After the first feedback round several constructs and questions were dropped because of ambiguity (reputation and cultural fit, as mentioned in chapter 2). Additionally, it is decided to exclude the given definitions to prevent respondents of the survey from having a biased idea on what is to be measured. An approximate time between fifteen and twenty minutes to complete the survey was now measured. Additionally, all items scales are now measured by a five-point Likert scale and words as 'partner', 'major 3PL' and 'firm' were replaced with '3PL / orchestrator' in order to increase readability and consistency of the measuring survey items. Appendix D shows an overview of the original items obtained and their transformation to the items used in this research.

First sorting round

After finalizing the survey based on the aforementioned results from the literature research and the pre-test, a sorting round was organized to assess the construct validity. For this procedure, small paper cards were used. Firstly, all question items were separately printed on each card and handed out. All participants were asked to group these questions they felt were related. When done, the participants were asked to label the categories they created.

The results are shown in table 4.2. The results show an average of 76% hit with the respective categories. As shown, some items are placed extensively outside the targeted category. There are no specific scientific guidelines on how to interpret the items placed outside the targeted category. However, since removing the three construct placed outside of the category would increase the time to fill in the survey, we decided to exclude them out of the final model. As shown below, these constructs are satisfaction, supply chain dynamism and connectivity. It is emphasized that this method is only a qualitative method to assess construct validity. However, based on the percentage it can be concluded that the potential of the items will have good reliability coefficients (Podsakoff et al., 2003).

Participants found the questions on satisfaction ambiguous and thought the questions about connectivity didn't fit the construct. This feedback was also applicable for supply chain dynamism.

Construct name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Other	# Questions	Respective hit rate (%)
1. Opportunistic behavior	15		2												1	18	83
2. Relationship specific investment		16													2	18	89
3. Behavioral uncertainty	2		14												2	18	78
4. Power	2			28											6	36	78
5. Shared vision					13	2									1	18	72
6. Participation						6	12									18	33
7. Communication							17								1	18	94
8. Information quality								30								30	100
9. Connectivity									16						14	30	53
10. Supply chain dynamism			3							8					7	18	44
11. Top management support											22				2	24	92
12. Benevolence trust												22			8	30	73
13. Capability trust													24		6	30	80
14. Information sharing														22	2	24	92
Average																	76

Table 4.2. Results of the first sorting round.

Second sorting round

The second sorting round was conducted one week later with the same participants. It has to be noted the participants didn't receive any information about the results or about its implications from the first sorting round. In the second round, the participants were given the construct names and the same definitions as used at the pre-test. These were also printed on small paper cards. The results are shown in table 4.3. The hit-rate of this round is 93% and comparable with the hit-rate used by Moore & Benbasat (1991). As mentioned before, we used the guideline from Moore & Benbasat (1991) to use participants in the test group that are part of the target population of the survey. Since we reported an overall hit rate of 93% and because the same procedure is adopted with a very close result, we can assume that the scales of our items show good discriminant and convergent validity.

As shown in table 4.3, supply chain dynamism and satisfaction were sometimes misplaced which led to an additional confirmation that these items should be dropped in the final survey. Connectivity scored sufficient but based on the aforementioned results of the first sorting round, it is also dropped out of the final model.

Finally, top management support and commitment are excluded from the model. Top management is excluded because the aforementioned theory in chapter 2 only described a relationship with information sharing and not with trust as mentioned before. Also, this would reduce time for the participant to finalize the survey and now the final model focuses mainly on the aspects influencing both trust and information sharing. The same is applicable for commitment.

Construct name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Other	# Questions	Respective hit rate (%)
1. Opportunistic behavior	17		1													18	94
2. Relationship specific investment		18														18	100
3. Behavioral uncertainty	2		16													18	89
4. Power				36												36	100
5. Shared vision					14	4										18	78
7. Communication							18									18	100
8. Information quality								30								30	100
11. Top management support										24						24	100
12. Benevolence trust												24	6			30	80
13. Capability trust												6	24			30	80
14. Information sharing														24		24	100
Average																	93

Table 4.3. Results of the second sorting round.

4.4 Sampling

Organizations active throughout the Netherlands active in supply chain management were contacted in order to fill out the survey. The companies contacted are shipping and transporting organizations. Organizations are eligible to fill in the survey if they collaborate with a 3PL or with an orchestrator and if inter-organizational information is exchanged. This choice is made because organizations functioning as a network orchestrator are scarce and upcoming; it would most certainly yield to a low response rate. As mentioned before, they share similar characterizations so conclusions can be drawn carefully on both types of organizations.

Surveys were sent out to all the organizations registered on the website www.logistiek.nl categorizing logistic service provisioning. These are mostly shipping and transporting organizations. This website contains a list of 508 organizations and personal e-mails were requesting the organizations to fill in the survey. Additionally, several shipping organizations agreed to share their customer information database with us, resulting in an additional 248 eligible organizations to contact. At last, a topic on the forum from www.logistiek.nl was created requesting organizations to fill in the survey. From the 508 organizations found on the website from [logistiek.nl](http://www.logistiek.nl), 381 organizations were eligible and contained accurate contact information. From the 248 eligible organizations based on customer information databases, 188 organizations were eligible for participation. This means a total of 569 organizations were contacted and eligible for filling in the survey. Completed surveys were received from 50 members of all different organizations, resulting in a response rate of about 8.8%. These 50 filled out surveys are used for analyzing the results of the survey. The response rate isn't really high, but is acceptable and to be expected when requesting anonymous organizations to fill in a survey. When comparing the response rate with studies that are examined for the literature study, it is in line with the studies that also choose to anonymously

request response from organizations that are selected from a public list (Kwon & Suh, 2004; Li & Lin, 2006).

A bigger sample size would increase the chance significant relations are to be found. Since this study is performed in a limited timeframe, we chose to accept the 50 response rate and conduct several stepwise regression analyses. Because of the extensive pretests and precautions taken, significant results are to be expected. As described in the next chapter, these expectations are fulfilled; many significant relations are found. Additionally, in order to make sure the age, education level, organization size and the role of the evaluated company are not influential, these are taken into account as control variables. Chapter 5 describes and explains why no significant influence is found. The descriptive statistics of the group respondents is shown in the table below (table 4.4).

Age	N	Minimum	Maximum	Mean	Std. Deviation
	50	27	60	43,18	8,233

Sex	Frequency	Percent
Female	6	12
Male	44	88
Total	50	100

Education level	Frequency	Percent
High school graduate	6	12
College / Vocational	7	14
Associate degree	8	16
Bachelor's degree	19	38
Master's degree	10	20
Total	50	100

Organization size	Frequency	Percent
Small (<50 Employees)	15	30,0
Medium (<250 Employees)	15	30,0
Large (>250 Employees)	20	40,0
Total	50	100,0

Role of evaluated company	Frequency	Percent
3PL	32	64,0
Orchestrator	18	36,0
Total	50	100,0

Table 4.4 Sampling and population

4.5 Implementation of the survey

As mentioned before, 569 organizations were contacted and requested to fill out the survey. By sending out the survey via e-mail, we used guidelines described by Dillman (2000). The method named 'Tailored design method' has proven positive influence on survey response rates. Additionally, the method is applicable for this research because it is designed for mail surveys. It has to be noted that the method includes financial rewards for every respondent. Since this research is not receiving external funding we were not able to reward respondents with financial tokens; therefore the procedure is adapted to our context.

The 569 organizations were contacted in two different ways. The 381 organizations from logistiek.nl are contacted directly via e-mail with a request to fill in the survey. This e-mail started with a request for help to fill in the survey, reason why the e-mail was send, reasoning what the usefulness of the survey and research is, an introduction to the subject of the survey, an explanation how the results are treated confidentially, information that the recipient will remain anonymous and a link to the form where participants could fill in the survey. Additionally, it was noted that participants were given the option to receive a copy of the final thesis and were invited to join the round table session discussing the results. The mail concluded with a short thank you message and a show of willingness that the author was willing to respond to answer questions and provide additional information.

The 188 organizations from which the contact information obtained via several organizations are contacted differently. This because Dillman (2000) shows that contacting organizations via a pre-notice e-mail would improve the response rate with about 5 percent. Therefore we asked the contacts at the organizations we obtained the customer information database from to send an initial e-mail on behalf of us, noting that an e-mail would follow with a request to fill out the survey within the next five days. This e-mail included reasoning why the organization decided to help us and a request to fill out the survey that we would send five days later by e-mail. This mail send by us is about the same as the e-mail sent to the organizations obtained from logistiek.nl.

Two weeks after distributing the survey, a reminder was e-mailed by the author of this thesis, requesting response and reasoning why no response was given yet. This was repeated two additional times. If a response was received, the respondents were kindly thanked for responding and / or filling in the questionnaire. Two months after sending the initial mail, the form in which respondents could fill in the survey was closed and we started with the statistical analyzing process.

Contact information of all organizations were stored with Microsoft excel. This contained name, surname, organization name and e-mail address. Additionally, columns were added to keep track of responses; if additional information was requested, if the survey was filled out, if a reminder was send, if the respondent was not able to fill out the survey with reasoning and if the respondent was interested in receiving a copy of the results and / or was willing to participate in the round table session.

5. Data analysis and results

This chapter presents the results from the stepwise regression analysis, interview and the round table. It shortly describes the analysis technique and reasoning why it is used for this research. It describes in depth the steps undertaken to explain how each hypothesis is analyzed using stepwise regression. Finally, an overview is presented with the relationship values in the final research model.

5.1 Statistical technique

Since our research model focuses on measuring the influence of mostly independent variables on dependent variables, we chose to use a stepwise method in order to analyze the results (Hocking, 1976). Our model consists of ten independent variables and three dependent variables from which two are also hypothesized as mediating variables (benevolence and capability trust). Since the amount of independent variables extends the amount of dependent variables by a great extent, a relative small number of subsets have to be evaluated. For evaluating small number of subsets, Hocking (1976) state that stepwise methods are suiting. Since we obtained a data set with a survey, we subjected it specifically to stepwise regression in order to determine whether we can accept or reject our hypotheses.

Stepwise methods are proposed for evaluating small number of subsets by either adding or deleting variables one at a time, based on specific criteria. In this research we chose to use the forward selection method. The forward selection technique starts with no variables in the equation and adds stepwise a variable until all variables are in. Since we have a clear image of the relations we would like to analyze (and therefore don't have to set specific 'stop rules'), the forward selection approach is advised to use instead of the backward elimination method (Hocking, 1976). The approach used provides in-depth insights in the specific influences of each independent variable in combination with the control variables. For example, as is noted in the discussion chapter of this research, the control variable 'age' had a significant influence on benevolence trust until the last dependent variable participation was added.

With stepwise regression, we predict the values of dependent variables from independent variables. We assess the relation from each independent variable on one specific dependent variable. This means, as will be discussed later, five different regression analyses were performed. Additionally, based on the results from the analysis assessing the mediating influence of both dimension of trusts, an extra regression analysis was performed to test the direct influence of trust on information sharing additionally to the independent variables.

5.2 Measurement model

The first step in the stepwise method regression is to establish the reliability and the validity of items of the measurement model. In the stepwise method, we use the Cronbach's alpha to estimate the reliability of the model. As mentioned before, all values are found to be acceptable because they are higher than 0,6 (Dunn et al., 2013). Specifically, there is only one item with a Cronbach's alpha between 0,6 and 0,7. Chapter 4.2 and 4.3 already described how we assessed the different validities; in short; we performed an extensive literature study, used pre-tested and reliable item scales and performed several pre-tests and sorting rounds. Since participants could only hand in completed surveys, our data set doesn't contain incomplete cases. Also, no reversed scales were used so no additional changes to the data set had to be made. Additionally, all items were ranged on a five-

point Likert scale, so no rescaling of the item scales had to be performed, allowing stepwise regression to be performed by using the mean values of the item scales. Table 5.1 shows an overview of the descriptive statistics and the reliability. Table 5.2 shows the inter-correlation between all the constructs of the model. The overall fit of the structural model is acceptable, since all measures of fit reach an acceptable level (Hocking, 1976).

Table 5.1 Descriptive statistics and reliability (Cronbach's alpha)

Construct	# Items	Mean	Std. Dev	Range	Cronbach's alpha
Relationship length (RL)	n.a.	11,30	13,916	n.a.	n.a.
Power (orch) (PW)	3	8,36	3,14	1-5	0,82
Power (comp) (PC)	3	9,62	2,84	1-5	0,74
Behavior uncertainty (BU)	3	10,82	2,45	1-5	0,76
Opportunistic behavior (OB)	3	7,44	2,42	1-5	0,68
Relationship specific investment (RI)	3	10,32	2,77	1-5	0,82
Participation (PA)	3	10,76	2,55	1-5	0,74
Shared vision (SV)	3	11,38	2,66	1-5	0,94
Information sharing (IS)	4	14,00	3,89	1-5	0,86
Information quality (IQ)	5	18,56	4,29	1-5	0,92
Benevolence trust (BT)	5	17,42	4,75	1-5	0,94
Capability trust (CT)	5	19,42	3,52	1-5	0,90
Communication (CM)	3	10,44	2,943	1-5	0,91

Table 5.2 Construct correlations

	RL	PW	PC	BU	OB	RI	PA	SV	IS	IQ	BT	CT	CM
RL	1												
PW	.300	1											
PC	.193	.082	1										
BU	.242	.253	.184	1									
OB	-.082	-.134	-.055	-.356	1								
RI	.281	.336	.026	.481	-.502	1							
PA	.272	.276	.232	.424	-.267	.594	1						
SV	.152	.169	-.018	.555	-.505	.585	.704	1					
IS	.263	.319	.059	.491	-.387	.767	.718	.749	1				
IQ	.136	.144	.024	.626	-.512	.573	.583	.741	.662	1			
BT	.265	.329	.071	.528	-.487	.762	.694	.755	.754	.766	1		
CT	.236	.093	-.124	.426	-.604	.608	.543	.815	.739	.760	.716	1	
CM	.190	.338	-.021	.411	-.312	.685	.724	.777	.791	.657	.744	.706	1

5.3 Results

As mentioned before, five different stepwise regression analyses are performed to test the structural model. Additionally, a new model is added to assess the direct influence of both trust dimensions on information sharing. Splitting the final model in these five models is a necessary step when performing stepwise regression in SPSS. Appendix D shows the different models that are tested. By assessing these different models we were able to draw a total overview and determine whether our hypotheses are accepted or rejected. Figure 5.1 and table 5.2 depict these overviews in

figure and table form; they show an overview of the relationship strength of the significant relations. Stepwise regression only result significant relations (non-significant results can't be used to draw any conclusion so would only yield possible confusion), therefore these are only depicted here. Additionally, the regression analyses output used for figure 5.1 and table 5.2 is shown in Appendix D. Since no significant relation is found in which trust has a mediating effect on information sharing, an extra regression analysis is conducted. This model is also shown in Appendix E. The results of this regression analyses are shown in figure 5.3. and table 5.4.

Table 5.3 Stepwise regression results final model

Hypothesis	β	T	Significance
H2b Opportunistic behavior -> capability trust.	-.301	2.341	*
H3a Relationship specific investment -> benevolence trust	.677	4.281	***
H3c Relationship specific investment -> information sharing	.555	3.909	*
H4c Communication -> information sharing.	.391	2.268	*
H8b Shared vision -> capability trust.	.663	4.445	***
H8c Shared vision -> information sharing	.419	2.447	*
H9a Participation -> benevolence trust.	.397	2.292	*
H11a Information quality -> benevolence trust.	.417	4.008	***
H11b Information quality -> capability trust.	.232	2.493	*

Table 5.4 Stepwise regression results additional model

Hypothesis	β	T	Significance
Relationship specific investment -> information sharing	.449	3.173	**
Capability trust -> information sharing	.295	2.617	*
Participation -> information sharing	.340	2.152	*

The additional model as introduced in Appendix E (figure E.6), is only introduced to show that (capability) trust actually has an influence on information sharing, as to be expected and noted multiple times in reviewed literature. Additionally, we emphasize that the results of figure/table 5.1 and 5.2 can't be compared because a different model is used to perform stepwise regression analyses. It is merely to show in impression of the influence of trust (capability) on information sharing.

Hypotheses implications

We proposed positive mediating roles for the both dimensions of trust. As shown in table 5.3, no positive significant results were found to support hypothesis H1a and H1b. If a significant mediating role was found, the constructs BT or CT had to show up in the last step of the two stepwise regression analyses (Appendix D, image D.4 and D.5; communication, relationship specific investment and shared vision are the biggest predictors of information sharing, despite the levels of trust present in the relationship). Since this is not the case no conclusions can be drawn on H1a and H1b.

We proposed direct links between opportunistic behavior and benevolence trust (H2a), capability trust (H2b) and information sharing (H2c). All three paths were found negative, but only the link between opportunistic behavior and capability trust was significant ($\beta = -.30$ and $p < .05$). The path between relationship specific invest on benevolence trust (H3a) is shown to be strong significant ($\beta =$

.677 and $p < .001$). Additionally, relationship specific investment seems to have a positive path with capability trust (H3b), but is not significantly proven. On the other hand, relationship specific influence has a significant influence on information sharing ($\beta = .555$ and $p < .05$). Hypotheses 4a, b and c proposed the influence of communication on benevolence trust, capability trust and information sharing respectively. Data shows positive relations for all three paths, but only the influence of communication on information sharing (H4c) was strong enough to be significant ($\beta = .391$ and $p < .05$).

Hypotheses 5, 6 and 7 were not supported by the empirical data. The data indicates the negative influences of behavioral uncertainty on benevolence trust (H5a), capability trust (H5b) and information sharing (H5c), but is not significant enough. Additionally, positive influences of both types of power (PW and PC) were found on benevolence (H6a, H7a) and capability trust (H6b, H7b). Although the data is not significant enough, it is contradicting with our proposed hypotheses. The data does indicate positive paths from both types of power (PW and PC) to information sharing (H6c, H7c) but is also not significant.

We proposed a direct link between a shared vision of organizations and its influence of benevolence trust (H8a), capability trust (H8b) and information sharing (H8c). Our data shows doesn't show a significant path between shared vision and benevolence trust. However, it shows a strong significance of the path between shared vision and capability trust ($\beta = .663$ $p < .001$) and a less strong, but significant path between shared vision and information sharing ($\beta = .419$ and $p < .05$). These results are in line with our expectations.

Again, we proposed direct influences from an independent variable named Participation. The path between participation and the two dimensions of trust (H9a, H9b) and information sharing (H9c) was expected to be positive. Data indicates to confirm these hypotheses but only allows us to accept the influence of participation on benevolence trust ($\beta = .397$ and $p < .05$) because only that path is significant. Relationship length (H10) is also proposed to have a positive influence on the same three independent variables. Our data once again shows a positive path between the constructs, but doesn't allow us to accept the hypotheses since the data isn't significant enough.

Data shows a strong path between information quality and benevolence trust ($\beta = .417$ and $p < .001$) and a less strong, but significant path between information quality and capability trust ($\beta = .232$ and $p < .05$). This is in line with our proposed hypotheses (H11a, H11b). A significant path between the quality of information and information sharing isn't shown by the data.

Additional hypotheses implications

As aforementioned, we tested another model in SPSS because our data didn't show a significant mediating influence of benevolence trust and capability trust on information sharing. Since a lot of the reviewed literature proposed a positive relationship between trust (mostly defined with one dimension) and information sharing, we built an additional model to test the direct influence of the two dimensions of trust on information sharing. This model hypothesized benevolence trust and capability trust as direct influences on information sharing, contradictory with our original research model; this model hypothesized benevolence and capability trust as a mediating influence on information sharing. The last test results of appendix D depict this analysis. These results show that capability trust has a positive influence on information, as expected ($\beta = .340$ and $p < .05$). It is remarkable that shared vision as a predictor for information sharing is no longer significant

explanation for information sharing. Additionally, participation has a significant positive influence on information sharing ($\beta = .340$ and $p < .05$) when trust is hypothesized as a direct influence of information sharing instead of a mediating influence.

Interview

In addition to the survey, an interview was conducted with an organization assuming the role of a network orchestrator. In this interview we discussed the antecedents of trust and information sharing as depicted in the final model. The interview was held before insights in the results were gained. The interviewee noted relationship specific investment, information quality and communication as the most important antecedents of information sharing. Power was not recognized as a problem neither as a stimulator for information sharing. This because the organization interviewed assumes a neutral position in the logistic supply chain. Its business is to appoint freights to transporters and has insights in the information of the organization he is working with. These transporting organizations only have information about the profits and information from themselves, as explained by the interviewee. It stores all the data centrally and doesn't exchange all the information it possesses with anyone else. Additionally, all the information stored, is stored in one certain format. The orchestrator interviewed noted that they ask the collaboration organizations to exchange their information in the format the orchestrator uses. The interviewee explained that this is most often not the case, and in order to create trust, and stimulate the exchange of information, they build a small program (/write code), allowing the orchestrator to receive the data in the format they prefer. Additionally, this behavior is received by the collaborating organizations as relationship specific investment behavior. The interviewee emphasizes that initial trust is a must, but one of the organizations has to make the first step in order to stimulate the exchange of information. The interviewee thinks this role is reserved for the orchestrator. The quality of the information is of high importance because it creates transparency for the orchestrator, allowing him to communicate with all the collaborating organizations in a holistic way.

Round Table Session

During the round table session the results of the survey analyses were discussed with eleven external organizations active in supply chain management and six professionals from CGI. Additionally, participants were asked to fill in a short questionnaire about the results from the final model. Since this small questionnaire yielded fifteen responses, no statistical analyses are performed. The results are merely used as background information for the discussion and conclusions. Participants were asked to evaluate on a Likert scale from totally disagree (1) to totally agree (5) how much they agree with the nine significant results as shown in Table 5.3, based on their practical experience. Remarkable is to see that an average score of 4.53 is obtained on H2b about opportunistic behavior having a negative influence on capability trust (Table 5.3). Making appointments with collaborating organizations is noted as the most questionable influence on information sharing (in order to show that communication is more than just that). All at all high scores are obtained; the participants agreed with the results and particularly with H3a and H3b. Without knowing the results of the interview, participants agreed that one of the two organizations has to make the first step in the collaboration process. They have to take a 'leap of faith'. Relationship specific investments, shared vision and information quality are confirmed by the participants of the round table session as the most influential antecedents of information sharing.

Table 5.3 Average evaluation scores of participants of the results

Hypothesis	H2b	H3a	H3c	H4c	H8b	H8c	H9a	H11a	H11b
Avg. score	4.53	3.8	3.8	3.47	3.87	3.8	3.2	3.8	3.8

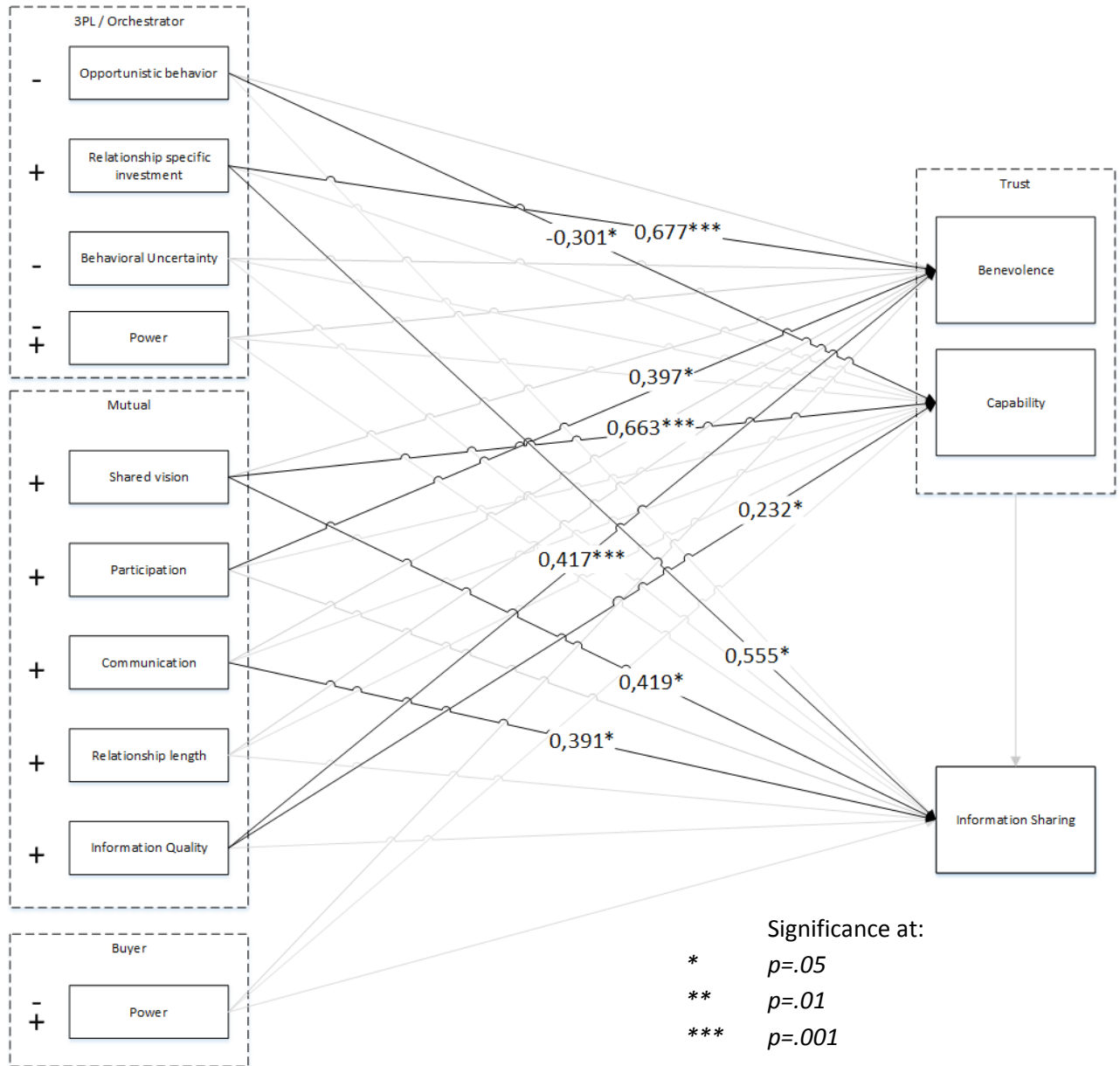


Figure 5.1 Stepwise regression results final model

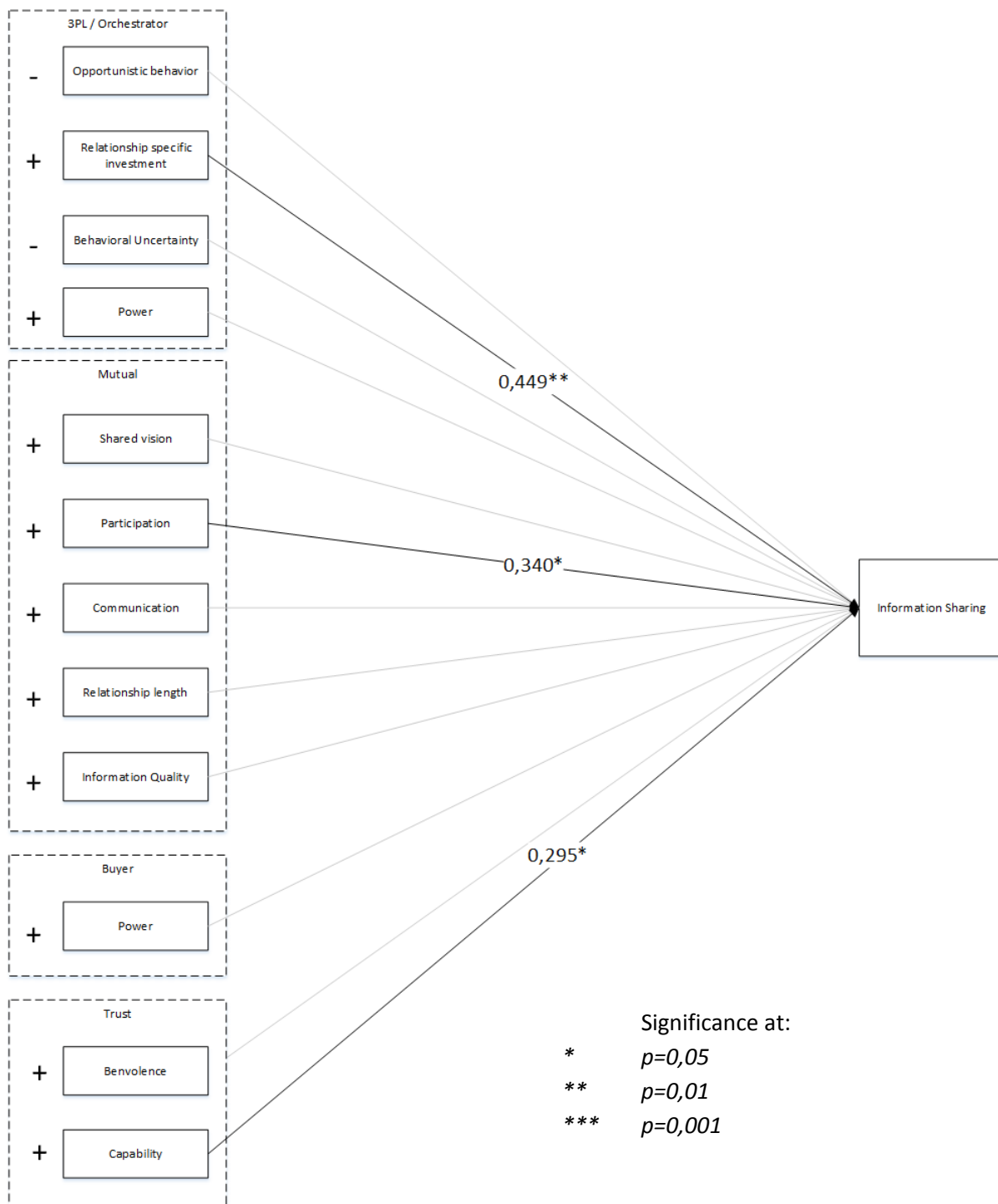


Figure 5.2 Stepwise regression results additional model

6. Discussion

This chapter describes the results and the conclusions of the analytical findings. Moreover, contribution to theory, practical implications and future research are discussed. The conclusion, discussion and implications are based on the analytical findings combined with the results from the round table session. A summarization of the discussed chapter is found at the last paragraph.

6.1 Conclusion

In chapter 1 we introduced several research questions. This chapter extensively discusses the conclusions based on these three research questions. At the end of this chapter we repeat the questions and shortly summarize the answers to them.

The first important conclusion is the impact of relationship specific investments towards trust and information sharing. We found significant direct relationships between relationship specific investment and both benevolence trust and information sharing. In our model, relationship specific investment has the biggest influence on benevolence trust and information sharing. This is in line with the findings from Kwon & Suh (2000) and Tian et al. (2008) although our research shows no influence on capability trust. As mentioned before, we split trust in capability trust and benevolence trust. Kwon & Suh (2004) and Tian et al. (2008) made no distinction in the two dimensions of trust. The results indicate that relationship specific investments don't increase the capability trust in the relationship, but only the benevolence trust. So specifically investing in a relationship increases the levels of inter-organizational benevolence trust, referring to the concerns and goodwill shown by the orchestrator, and information sharing. This could be explained by the fact that most often a certain level of trust already exists in a relationship in which an orchestrator is investing. It could also be explained by the fact that both organizations benefit from relationship specific investments because in most situations it generates a so called 'win-win' situation for both organizations. In that situation trust doesn't have to be highly present. This is shown in the additional model that was tested because benevolence trust doesn't have a significant influence on information sharing when evaluated as direct antecedent. In this model, the influence of relationship specific investments is once again emphasized. As mentioned before, in this model trust is included as a direct antecedent of information sharing. Results show that in this setting relationship specific investment has a positive significant influence on information sharing.

Aforementioned conclusion about the role of trust is extended by the fact that no significant mediating effect of trust on information sharing is found. Combining this result with the additional model that shows the importance of capability trust, there can be carefully concluded that benevolence trust is an important requirement only for the development of initial relationships. When organizations develop a relationship that lasts longer, capability trust becomes more important. However, the influence of relationship specific investments is the strongest. Additionally, organizations should have the feeling they have influence about the decision making done by the orchestrator. High levels of participations (or perceived by the organization that is to share information with the orchestrator) increase the willingness to share information. This is explained by the fact that organizations prefer to keep control over their data and prefer to have influence on the goals of the supply chain they operate in.

Remarkably, opportunistic behavior only has a significant direct negative influence on capability trust. This shows that organizations sharing information with an orchestrator prioritize the capability

of the orchestrator to handle their orders and their ability to answer questions over the fact if they can trust them as a caring organization. This is possibly explained by the fact that most organizations collaborate with a neutral orchestrator, and if not, opportunistic behavior would result in legal consequences for the orchestrator since collaboration often is based on strict non-closure agreements and contracts. This also explains the reasoning of no significant negative influence on information sharing. If an orchestrator shows opportunistic behavior the organization can undertake legal consequences, thereby reducing the orchestrator's power. Possibly, if an organization had shown opportunistic behavior in the past, the relationship might have ended already. Since we collected data from organizations with an existing relationship with a 3PL or orchestrator, we didn't examine those.

Furthermore, we found no support for hypothesis that behavioral uncertainty is related to the dimensions of trust or information sharing. It seems that knowing when next orders arrive or collaborating with an agile orchestrator in terms of handling requests does not make a noticeable difference to the intention of information sharing or increase of trust levels. This is contradicting with the expectations from Kwon & Suh (2004). This can be explained with the timing of this research and the sampling for the survey. Behavioral uncertainty measures the decision making uncertainty which is becoming more important for organizations due to the increasing uncertainty in the business environment in the post-modern world. The organizations evaluated possibly perceive less uncertain behavior with the increasing use of information systems to increase the levels of inter-organizational communication. As noted by Kwon & Suh (2004), two-way communication could possibly reduce uncertainty in supply chain partnerships.

Even though we assessed power in both directions, no significant results to support the hypotheses about power influencing trust or information sharing is found. This is contradicting with the findings from Cheng et al. (2008) and Ke et al. (2009), who found significant influences of power on trust and the willingness to share inter-organizational information. In order to explain the difference we use the aforementioned argumentation; the evaluated orchestrator or 3PL might have assumed a neutral place in the supply chain, both organizations benefit from the relationship equally or the usage of strict contracts and non-disclosure agreements prohibit organizations from using their power to stimulate to exchange of information. This is in line with the findings from the interview. As long as the relation evaluated is between shipper, transporter and 3PL, orchestrator (which is the scope of this research). This doesn't mean that power is not present in the evaluated relationships; it just shows that the other evaluated antecedents in the model are of more importance when determining the motivators or barriers for inter-organizational trust and information sharing.

Shared vision between the organization and the orchestrator increases the willingness to share information and the capability trust the organization has in the orchestrator. This in line with our expectations; organizations require a common 'world view' of supply chain management in order to increase information sharing. When a shared vision is lacking (this also includes the cultural aspects as discussed in the discussion chapter) more resistance will be received and negative behavior will be encouraged. This reduces the willingness to share information, but also the quality of information (Li & Lin, 2006). When organizations perceive they have a similarity of patterns of their shared values and beliefs with their orchestrator, their capability trust increases. A shared vision is also one of the most important factors for initiating a relationship as orchestrator.

We found partial significant support for our hypotheses about the influence of participation. Our results indicate that participation doesn't have a direct influence on benevolence trust and information sharing. Cheng et al. (2008) found a direct influence on trust, but didn't make a distinction in the dimensions of trust. This possibly explains why we found no significant results for benevolence trust. Capability trust defines the problem solving capabilities and knowledge in managing logistic activities of the orchestrator while benevolence trust shows the levels of compassion and concerns of the orchestrator. Participation is in line with capability trust since it provides insights and influences an organization has on the capabilities of the orchestrator. High levels of participation allows an organization to see how the orchestrator is operating, allowing him to gain a better view of the orchestrators capability. No significant results are found to support the impact of participation on information sharing. Contrary, when looking at the additional model, participation is shown up as a direct significant influence on information sharing. This is possibly explained by the fact that participation does have an influence on information sharing in the original model, but the other factors are just stronger (RI, SV and CM). Participation has a significant positive influence on capability trust in the original model and capability trust and participation are proven to be significant in the additional model. Therefore we carefully conclude that capability trust has a mediating effect on participation and information sharing. This means when an organization is involved in the set-up of commercial goals and performs an active role in the decision making; it is expected to share more information with the orchestrator when high levels of capability trust are present.

The results also provide evidence that communication plays a role in information sharing. This may sound like an open door, but of course, there are different levels of communication. In this research we investigated the role of opinion exchange, informing one another of new developments and discussing each other's expectations. When organizations frequently exchange aforementioned factors, they gain a clear vision of what the orchestrator wants and what its goals are. It is in line with participation as discussed earlier. Additionally, it is no surprise that communication has an importance influence on information sharing since after several cycles of communicating, a shared vision can be established. As mentioned earlier, shared vision is also a direct influence on information sharing. So the results are in line with the expectations. Contradicting, no evidence is provided to accept the hypotheses about the influence of communication on the two dimensions of trust. Cheng et al. (2008) for example, found a direct influence of communication on trust and state that communication is a major precursor of trust. The lack of a significant relationship might be explained by the fact that we used two dimensions to explain trust. As mentioned before, shared vision does have a significant influence with capability trust and information sharing. Since communication is linked with developing a shared vision, it might be an antecedent in developing a shared vision. The relationship length of the average relationship assessed is 11.3 years; most organizations already 'survived' the initial setup of goals and vision of the collaborating process. In these processes, as mentioned before, the role of trust is bigger than in the phases when organizations have a strong developed stable relationship. This is also shown in the additional model. When trust is considered as a direct influence of information sharing, communication is no longer significant, but participation is.

Relationship length of the evaluated relationship between shippers, transporters and the 3PL / orchestrator they collaborate with, seem to have no significant influence on the levels of trust or the willingness to share information. This is in line with Tian et al. (2008) who also didn't find a

significant influence but contradicting with the results from Chu & Wang (2012). Relationship length represents a specific investment in the relationship (Chu & Wang, 2012). Since we included a specific construct to measure the relationship specific investment of an organization, it is possible that that is the reason for relationship specific investment to be non-significant. Relationship specific investment, as mentioned earlier is shown to have a significant influence. Therefore we carefully conclude that the relationship specific investments aspect of the relationship length as measured by Chu & Wang (2012) are the aspects of relationship length causing it to have a significant influence on trust or information sharing.

Quality of the information shared has a significant influence on trusting the capabilities of the orchestrator and its good will and compassion to treat an organization well. This is in line with our expectations. We tested the quality of information exchange between an organization and its assessed 3PL / orchestrator both ways. This means the quality of the information that is shared by the orchestrator, but also by the organization itself. No results are found to confirm information quality as a positive direct influence on information sharing. This is contradicting with our expectations; when for example an orchestrator keeps sharing its information the wrong way, it might demotivate an organization to share their information. Literature shows us that it worked like a snowball effect. Our results show that this effect is applicable on the two dimensions of trust. On the other hand, low levels of information shared by an organization with an orchestrator might only cause problems for the orchestrator and has therefore no influence on the willingness to share information by the organization. Information quality playing an important role in determining the capability trust of the orchestrator is explained with the upcoming use of information systems in the supply chain. If orchestrators are not able to exchange information of high quality, organizations might think once or twice if they are capable of handling their demands and provide support during crucial aspects of logistic supply chain activities.

As stated before, summarized answers to the three research questions are given:

What are the antecedents of inter-organizational information sharing in a logistic outsourcing relationship?

The most cited antecedents found as a result of our literature study are: opportunistic behavior, relationship specific investment, behavioral uncertainty, power, shared vision, participation, communication, relationship length, information quality, connectivity and trust. The results of our data analyses show significant positive influences from relationship specific investment, shared vision, communication, participation and capability trust.

What are the antecedents of inter-organizational trust in a logistic outsourcing relationship?

The most cited antecedents found as a result of our literature study are: reputation, opportunistic behavior, relationship specific investment, behavior uncertainty, power, shared vision, participation, communication, relationship length, information quality and supply chain dynamism. The results of our data analyses show a significant negative influence from opportunistic behavior on capability trust, a significant positive influence from relationship specific investment on benevolence trust, a significant positive influence from shared vision on capability trust, a significant positive influence from participation on benevolence trust and a significant positive influence from information quality on both benevolence and capability trust.

What is the influence of trust on inter-organizational information sharing in a logistic outsourcing relationship?

The results of our data analyses show no significant mediating effect from benevolence and capability trust on information sharing. After evaluating an additional model whereby trust is included as a direct influence, our data shows a direct positive influence from capability trust on information sharing.

6.2 Contributions

This study makes several important contributions to the research stream of organizational knowledge sharing, its antecedents and the role of trust. First, we developed a framework of inter-organizational information sharing and its most recurring antecedents based on systematic review of prior research. Scoping the subject led to a focus on the antecedents influencing both trust and information sharing in logistic outsourcing relationships. In these relationships we focused on 3PLs and orchestrators assuming a neutral position in the logistic supply chains its active in. Our theoretically and empirically grounded framework can be used to analyze information sharing in the context of logistic outsourcing relationships using the falsifiable hypotheses that are provided in this research.

The model has been empirically tested in the Dutch logistic supply chain, evaluating relations between shippers, transporters and 3PLs or orchestrators. All the constructs were tested in different models to conclude a total overview as a single model. The research has been based on literature about inter-organizational information sharing with other carriers, transporters or 3PLs in order to determine the antecedents for inter-organizational information sharing with logistic network orchestrators.

Based on interview with supply chain experts and an extensive literature we concluded that trust is the most important factor influencing inter-organization information sharing. Several research also noted this and developed frameworks modeling the most important antecedents of trust or information sharing. Since our literature study showed that most of these (separately tested) antecedents of information sharing or trust are applicable to both trust and information sharing, a model has been developed to test whether trust has a mediating effect on information sharing. The antecedents tested are the most cited antecedents that were found significant in previous research.

Additionally, since Ganesan (1994) had proven that trust is a multi-dimensional construct, we adapted trust as a multi-dimensional construct in our research. Most of reviewed research didn't make this distinction. Benevolence trust and capability trust are the dimensions tested and are also separately hypothesized throughout the research.

The influence of several antecedents on the two dimensions of trust and information sharing are evaluated. Most of the proposed relationships were never empirically tested before since previous research didn't make a distinction in the dimensions of trust. Additionally, previous research mainly focused on simple carrier-transporter relationships while this research focuses on carrier/transporter – 3PL/orchestrator relationships. Since presences of logistic network orchestrators in the

Netherlands are scarce, we based our findings on the results from assessing relationships with both 3PLs and orchestrators.

Next to identifying factors that improve inter-organizational levels of trust and information sharing, we also identified factors that do not influence trust or the willingness to share information. These antecedents are the non-significant constructs in the final model. Careful explanation why these constructs have a non-significant influence on the two dimensions of trust or information sharing has been given. We emphasize the word 'careful', because although the model is carefully tested on its reliability and validity, the response rate was only 50 (8.8%); a higher response rate could possibly prove more significant relationships. Due to a limited timeframe we accepted this response rate. In order to extra validate our findings, we organized a round table session with 17 experts active in supply chain management. We presented our findings, discussed the results by introducing several statements and talked about implications for practice. This is done in order to add an extra validation step for our conclusions and gain additional insights relevant for practical implications. Key findings and implications are discussed in the next chapter.

In short, our research contributes to the investigation and explanation of the mediating effect of trust on information sharing in a logistic outsourcing relationship, whereby two dimensions of trust are taken into account (capability and benevolence trust). It investigates the antecedents of both trust and information sharing in relationships between shippers or transporters and 3PLs or neutral orchestrators. It aims to lay a foundation to the understanding of the motivators for organizations to share relevant and valuable information with a network orchestrator in order to create a more sustainable environment and a transparent logistic supply chain. Ideally, it should reduce transactional costs and increase profits for the collaborating organizations. Finally, table 6.1 compares the findings from the items adapted from previous research with ours. The table shows the relationships strengths where possible and its reference (if previous results were obtained with quantitative research). If not, it shows whether the relationship is expected to be positive or negative and its reference.

Table 6.1 Comparison of the results between previous findings and current findings

	Hypothesis	Previous results	Reference	Thesis results
1a	BT (M ⁺)-> IS	n.a.	n.a.	no med. effect
b	CT (M ⁺)-> IS CT (D ⁺)-> IS			no med. effect .295* (A)
2a	OB (D ⁻)-> BT	-.42**	(Cheng et al., 2008)	n.s.
b	OB (D ⁻)-> CT			-.301*
c	OB (D ⁻)-> IS	-.35**	(Cheng et al., 2008)	n.s.
3a	RI (D ⁺)-> BT	.367**	(Tian et al., 2008)	.677***
b	RI (D ⁺)-> CT			n.s.
c	RI (D ⁺)-> IS	+	(Handfield & Bechtel, 2002)	.555*
4a	CM (D ⁺)-> BT	.21*	(Cheng et al., 2008)	n.s.
b	CM (D ⁺)-> CT			n.s.
c	CM (D ⁺)-> IS	.15*	(Cheng et al., 2008)	.391*
5a	BU (D ⁻)-> BT	-.246**	(Kwon & Suh, 2004)	n.s.
b	BU (D ⁻)-> CT			n.s.
c	BU (D ⁻)-> IS	-	(Chen et al., 2011)	n.s.
6a	PW (D ⁻)-> BT	-.253**	(Ke et al., 2009)	n.s.
b	PW (D ⁻)-> CT			n.s.
c	PW (D ⁺)-> IS	+	(Hausman & Johnston, 2010)	n.s.
7a	PC (D ⁻)-> BT	-.20**	(Cheng et al., 2008)	n.s.
b	PC (D ⁻)-> CT			n.s.
c	PC (D ⁺)-> IS	+	(Hausman & Johnston, 2010)	n.s.
8a	SV (D ⁺)-> BT	+	(Zineldin & Jonsson, 2000)	n.s.
b	SV (D ⁺)-> CT			.663***
c	SV (D ⁺)-> IS	+	(Li & Lin, 2006)	.419*
9a	PA (D ⁺)-> BT	.22**	(Cheng et al., 2008)	.397*
b	PA (D ⁺)-> CT			n.s.
c	PA (D ⁺)-> IS	.16*	(Cheng et al., 2008)	.340* (A)
10a	RL (D ⁺)-> BT	+	(Tian et al., 2008)	n.s.
b	RL (D ⁺)-> CT			n.s.
c	RL (D ⁺)-> IS	+	(Prajogo & Olhager, 2012)	n.s.
11a	IQ (D ⁺)-> BT	+	(Chen et al., 2011)	.417***
b	IQ (D ⁺)-> CT			.232*
c	IQ (D ⁺)-> IS	+	(Kwon & Suh, 2004)	n.s.

M⁺= Mediating positive influence

M⁻= Mediating negative influence

D⁺= Direct positive influence

D⁻= Direct negative influence

A = Result based on the additional model whereby trust is evaluated as direct influence

n.a. = not applicable

n.s. = not significant

Significance at:

* $p=.05$

** $p=.01$

*** $p=.001$

6.3 Discussion and implications

As highlighted before, there are three crucial aspects network orchestrators have to take in mind when they want collaborating organizations to share important and relevant information with them (RI, SV and CM). As shown, relationship specific investments are of crucial importance for an orchestrator to get a relationship going. It creates both trust and stimulates the collaborating to share information. It has been explained by the fact that when doing so, an orchestrator takes a 'leap of faith' and shows trust in the organization it is willing to collaborate with. This creates high levels of trust by the perceived organization and puts the orchestrator in a weak position. There are different levels of relationship specific investments. For example, a big investment can be financially supporting the deployment of a warehouse where both organizations benefit from. A smaller investment could be rewriting programs or building software to allow the collaborating organization to share its information. In the latter situation the orchestrator invests time and money specifically for that relationship. If the receiving organization decides to back out, the investment of the orchestrator is lost.

Logistic network orchestrators should be careful when selecting organizations to collaborate with and who they ask to share their information. The highest chance of convincing organizations to share their information is to collaborate with organizations that have a similar vision about the aims, objectives, importance of information sharing and improvements in the logistic supply chain. As noted several times during the discussion, the experts emphasized the importance of a cultural fit between organizations. Cultural fit is partly embedded in the shared vision aspects, but most of it is explained in the top management support chapter. The right atmosphere has to be present in order to stimulate the organization to share its information. This can be stimulated by top management, but can also arise when collaborating organizations share the same cultural values. In order to reach for example an understanding of the goals, certain levels of communication have to be achieved. The orchestrator has to exchange its opinion with the collaborating organization, inform them about new forms of development and both organizations should exchange their expectations. Additionally, organizations are more willing to share information with an orchestrator once they perceive that they have influence in the goals of the collaborative logistic chain and that they perform an active role in the decision making.

A disadvantage of focusing on organization based on a shared vision might be the absence of innovative initiatives arising. This has been explained by the fact that collaboration based on a shared vision might lead to tunnel vision in the development of new ideas and thus innovation. When organizations don't struggle in finding a shared vision, they don't bump into different ideas than originally thought about and aren't forced to think outside the box and their own comfort zone. Creativity is created by using different people with different thoughts. Moreover, technology is taking over a leading role in innovation in the logistic supply chain. Perhaps organizations should base their common vision on what the technology has to offer; thereby allowing technology to become a crucial aspect in the goal of the logistic supply chain.

Results show no significant influence of power on levels of inter-organizational trust or information sharing. As mentioned before, this has been explained by the fact the assessed relationships evolve a neutral 3PL or orchestrator. This doesn't mean organizations with certain power can't influence the behavior (e.g. information sharing) of another organization, but our results show that orchestrators should assume a neutral role in the logistic supply chain. When for example a 3PL

evolves tries to involve into a network orchestrator, it isn't neutral. It still possesses own assets that it prefers to use of the assets of other organizations (trucks or products that need to be transported). Discussion showed that it is very hard to lose a biased image as 3PL when evolving to a network orchestrator. Other organizations still perceives the 3PL acts out of self-interest. The reputation as non-neutral organization you have will possible stay attached to your organization and is hard to get rid of. Selling all your assets as a 3PL in order to become a neutral network orchestrator seems like a possible solution. However, most 3PLs are specialized in certain aspect of the supply chain and used to gain competitive advantage by execution their core business. A network orchestrator on the other hand, requires a market-broad overview and not a specialized part of the logistic supply chain. Organizations have to reinvent them and this causes a lot of struggle. One of these struggles is gain sharing among the collaborating organizations. An organization that used to be a 3PL undoubtedly has several trading partners from the past it has good relationships with. In many situations he would prefer to use the assets of their 'friends' over those of the newly joining organizations in the supply chain. Therefore we conclude that it is essential that a network orchestrator has to be neutral. Its tasks are merely to function as a neutral accountant or police officer of the supply chain.

Another aspect that could aid in developing more network orchestrators is legislation. If legislation obliges organizations to share their information with each other, transparency of the supply chain can be achieved; leading to a 'perfect' synergy between the different transportation modalities. Without legislation total transparency possibly can't be achieved; organizations just have different goals in the supply chain and are therefore probably never going to share their information with full transparency. Possessing certain levels of information creates power for organizations which they are not willing to give up freely. On the other hand, legislation is also perceived as a bottleneck for innovation; with total information transparency in the supply chain, all organizations will be on the same level and there is less stimulation as an organization to distinguish itself. Therefore legislation should at least offer guidance for organizations. It should guide as a facilitator by for example defining the standards used by organizations that exchange information, or provide insights on how to secure the data stored or possibly even provide neutral data storage centers. Legislation should function as a facilitator rather than a leader to promote innovation and guidelines for organizations to exchange their information. One thing is certain; legislation has to start playing a role if the Dutch supply chain wants to play a leading role in the development of the international supply chain.

Another aspect discussed is the complexity and the role of information systems and information sharing in the future. An organization willing to assume the role of a network orchestrator should take into account that it information systems might make information sharing so easy, that certain organizations or systems get too much responsibilities for executing certain tasks. Information systems possibly disclose complexity and therefor shift the responsibility to a central place. Organizations that get hands on the right technologies first might take advantage of this and take a powerful monopolistic place in the supply chain.

The recommendations are summarized as follows:

As orchestrator:

- Expect to take a leap of faith by undertaking the initial investment, it creates trust by the receiving organization and promotes information sharing

- Look for organizations that share the same vision about the logistic supply chain and its goals
- Make sure you don't focus on certain aspect in this shared vision to prevent tunnel visioning in order to stay innovative
- Be neutral, make sure you don't own assets as trucks or warehouses
- Make sure you keep a total overview of the supply chain, don't stay specialized in certain operations or core business when evolving as a 3PL
- Don't avoid legislation but embrace it. It might help you to move forwards as long as it serves as an independent facilitator for standards
- Communication is key, exchange thoughts about developments, expectations and exchange opinions about the goals of the collaboration
- Make sure the collaborating organizations feel involved in the set-up of commercial goals, in the decision making and make sure you take their suggestions into account

6.4 Limitations and future research

The study has several limitations that need discussion. One of the limitations in the research is the response rate of 50. This response rate possibly limits us in finding additional significant results. Also, since we included relationships with both 3PLs and orchestrators instead of orchestrators only, we advise to investigate the impact of the discussed antecedents on orchestrators only. Even though our data shows that relationships with a 3PL instead of an orchestrator makes no significant influence on the results. Because we received a response rate of 50, possibly less significant relationships can be outspoken and we therefore advice to increase the response rate for future research. This is required because with a higher response rate we are able to increase the reliability of the sample. For instance, we now have an increased risk that a certain bias about the sample exists compared to when a bigger sample group is used; an increased chance of self-selection might be present and the chance is lower that a representative sample is used. Therefore we advise to use a bigger sample group. Additionally, these samples can be specified in certain groups; for example the impact of a network orchestrator in fast moving customer goods, or medic area, construction field etcetera.

In our research we focused on information sharing with neutral orchestrators; specifically in relationships between shipper/transporter and 3PL/orchestrator. Future research could investigate the influences of our antecedents on evolving 3PLs that strives to assume the role of a non-neutral orchestrator. Additionally, information sharing between shippers or transporters is not discussed. Perhaps power for example, has more influence in these relationships.

In our research we didn't focus on a distribution model for the profits or gains that have to be shared. As mentioned before, we focused on transporter – orchestrator relationships and not on transporter – transporter relationships. We focused on situations where an orchestrator divides certain workload among its connected transporting or shipper organizations. The transporter benefits because it optimizes its capacity and it pays a certain amount of the profits to the orchestrator for arranging the deal. This amount of profit to be shared with the orchestrator might differ per organization doing assignments for the orchestrator. However, when one organization

working for an orchestrator finds out that another organization has to share less of its profits, several reactions might occur. Future research can focus on the effect of these situations and design a model in order to equally share the profits (if possible).

Aforementioned influences of a gain sharing model towards information can be investigated. As discussed, our research scoped towards the influence of trust. Other influences that are potentially interested to investigate are shown in figure 3.1. Connectivity by means of ICT for example, as also partially discussed in discussion section, might get a growing influence in the way we distribute our goods but also our information. These limitations are potential research topics for future research. We also excluded several other influences when scoping on the antecedents influencing both information sharing and trust. For example, the impact of supply chain dynamism, or cultural fit on information sharing are not specifically investigated in this research. They partly embedded in our investigated antecedents (cultural fit in shared vision for example), but a total overview might result in different results.

Finally, the generalizability may thus be limited because we examined several different organizations in different logistic settings in one country (The Netherlands). Future research should for example test our framework on a Europe wide level and in different fields of practice. Once again, since this research was conducted in a limited time frame we had to make choices in the scoping of the research.

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Appendix A: Studies included in the review

Paper	Main results	Theory	Methodology	Context	Journal
(Cai et al., 2010)	"Government support and importance of guanxi significantly affect trust, which subsequently influences two elements of information integration, namely, information sharing and collaborative planning. Furthermore, the importance of guanxi has a direct, positive impact on information sharing, and government support has a direct, positive effect on both information sharing and collaborative planning."	Institutional theory, Transaction	-	SCM	Journal of Operations Management
(Carter & Jennings, 2002)	"Our findings suggest that PSR has a direct and positive impact on supplier performance, as well as an indirect, mediated effect through improved trust and cooperation."	Corporate Social Responsibility	-	SCR	Transportation Research Part E: Logistics and Transportation Review
(Chen et al., 2011)	"It was found that there is a positive relationship between the level of quality, and availability, and the level of trust; information sharing and commitment. Additionally, results revealed that country moderates the relationship between information sharing and trust."	-	Survey	SCR	Computer Standards & Interfaces
(Cheng et al., 2008)	"The findings of the paper provide useful insights into how supply chain members should reinforce their collaborative behaviors and activities that would enhance the trust-based relationships, in order to achieve the competitive advantage of knowledge sharing for the supply chain as a whole."	-	Survey	SCM	Supply Chain Management: An International Journal

(Chu & Wang, 2012)	"Using survey data from Mainland China, we found that 3PL importance, logistics performance, information sharing and legal contract are important drivers of relationship quality."	Transaction cost economics recourse dependence theory	Questionnaire and survey in China	SCR	Journal of Supply Chain Management
(Fawcett et al., 2007)	Two dimensions in information sharing, connectivity and willingness, found to have impact on operational performance and critical for the development of real information sharing capability	-	Survey and semi-structured interviews	SCM	Supply Chain Management: An International Journal
(Fawcett et al., 2008)	"Among the most prevalent barriers are inadequate information sharing, turf conflicts, and inconsistent metrics. These barriers inhibit both a company's willingness and ability to collaborate in meaningful ways. The result: most companies struggle to implement initiatives that lead to real and effective collaboration with SC partners."	Contingency theory, force field theory	In-depth interview	SCM	Journal of Business Logistics
(Handfield & Bechtel, 2002)	"Our model also suggests that buyer-dependence, supplier human asset investments, and trust are all positively associated with improved supply chain responsiveness, defined in this study as the supplier's ability to quickly respond to the buying party's needs."	Resource-dependence theory, marketing channel theory	Survey	SCM	Industrial marketing management
(Hausman & Johnston, 2010)	"Results suggest that coercive strategies are counterproductive in encouraging cooperation and compliance either directly or through relational intermediaries, while non-coercive influence produces positive outcomes and effects on intermediaries."	-	Survey	SCM	Industrial Marketing Management

(Hung et al., 2011)	"While a supply chain partner must share high-quality information to assist its supply chain partners' decision-making, it is also clear that a supply chain partner must rely on mutual adjustment and formalized inter-organizational processes to cope with demands."	Social exchange theory	Survey	SCM	International Journal of Logistics: Research and Applications
(Ke & Wei, 2008)	"Drawing on knowledge exchange and socio-political theories, we derive a model, in which trust towards the partner, in the form of competence and benevolence based trust, and the partner's power are positively relation with the firm's predisposition to share information and know-how."	Knowledge exchange theory, socio-political theories	-	SCC	Supply Chain Analysis
(Ke et al., 2009)	"We examine the confluence of institutional pressures, the focal firm's trust and the dominant firm's power."	dependence theory, socio-political and institutional theory	Survey	SCM	Decision Systems Support
(Kent & Mentzer, 2003)	"The research is unique in that it integrates both the behavioral constructs typically associated with channel relationships and the operational constructs typically associated with logistics research."	Communication Theory	Survey	SCM	Journal of business logistics
(Kwon & Suh, 2004)	"Trust is a critical factor fostering commitment among supply chain partners. The presence of trust improves measurably the chance of successful supply chain performance."	Social exchange theory	Survey	SCR	Journal of Supply Chain Management

(Lejeune & Yakova, 2005)	Four different types of trust influencing information sharing: Deterrence-based trust, Reliability trust, Competency trust and Goodwill trust. "Our typology of supply chain configurations encompasses four main types, the communicative, coordinated, collaborative, and co-opetitive configurations, called the 4 C's in supply chain management. The configurational typology provides researchers and decision makers with an integrative SCM framework, which can help them, clarify some current confusion in the SCM literature, and allow them to build on each other's insights."	Theory of relational forms	Literature review	SCM	Journal of Operations Management
(Li & Lin, 2006)	"It is found that both information sharing and information quality are influenced positively by trust in supply chain partners and shared vision between supply chain partners, but negatively by supplier uncertainty. Top management has a positive impact on information sharing but has no impact."	-	Survey	SCM	Decision support systems
(Marasco, 2008)	"Their findings suggest that trust and commitment are major distinguishing behavioral characteristics of logistics alliances."	agency theory	Literature Review	SCM	International Journal of Production Economics
(Moberg et al., 2002)	"The results indicate that information quality and relationship commitment are both significantly related to strategic information exchange. These findings are important because they reinforce the importance of building strong relationships with trading partners and making an effort to improve the accuracy, timeliness, and formatting of information that is exchanged within the supply chain."	-	Survey	SCM	International Journal of Physical Distribution & Logistics Management

(Müller & Gaudig, 2011a)	"Results of an empirical investigation based on a structural equation model confirm that monitoring measures and frequent meetings positively influence the exchange of information while explicit contracts have rather negative effects"	Principal-agent theory	Survey	SCM	International Journal of Production Research
(Nyaga et al., 2010)	I focused on the buyer perspective: "Results show that collaborative activities, such as information sharing, joint relationship effort, and dedicated investments lead to trust and commitment."	Social exchange theory	Survey	SCR	Journal of Operations Management
(Patnayakuni et al., 2006)	"Our results suggest that tangible and intangible resources invested in supply chain relationships enable the integration of information flows with supply chain partners. Specifically, formal and informal interaction routines that take time and effort to develop enable integration of informational flows across a firm's supply chain. Investments in relation specific assets and long-term orientation in relationships enable the development of these interaction routines."	Transaction Cost - Theory Resource-based theory		SCM/SCR	Journal of Management Information Systems
(Prajogo & Olhager, 2012)	"Information technology capabilities and information sharing both have significant effects on logistics integration."	Relational theory	Survey	SCI	International Journal of Production Economics
(Tian et al., 2006)	"The results indicate that the same factor has different effects on the three dimensions of trust. Here trust is decomposed into three dimensions: competence trust, goodwill trust, and integrity trust."	Trust Theory	Survey	SCO	Asia Pacific Decision Sciences Institute

(Tian et al., 2008)	"The findings indicate that logistics users' satisfaction with prior interactions with logistics providers, 3PL provider's relationship-specific investment, 3PL provider's information sharing, and 3PL provider's reputation are key determinants of logistics users' level of trust towards 3PL providers. Additionally, logistics users' trust may facilitate their loyalty behavior towards 3PL providers."	Survey	SCR	Industrial Management & Data Systems
(Zhou & Benton Jr, 2007)	"Supply chain dynamism has significant positive influence on effective information sharing as well as effective supply chain practice. Supply chain dynamism has more influence on information sharing than supply chain practice"	Pilot and formal Survey	SCM	Journal of Operations Management
(Zineldin & Jonsson, 2000)	"Companies trying to achieve high trust and commitment relationships, should create high satisfaction relationships, by decreasing their opportunistic behavior, adjusting to the needs of the other part, and developing shared values"	Survey	SCR	The TQM Magazine

Appendix B: Available survey items per paper

Paper	Items Construct	#Items	Used Source	Cronbach's alpha	Note
(Cai et al., 2010)	Trust	5	(Zaheer, McEvily, & Perrone, 1998)	0,7664	
	Information Sharing	5	(Heide & John, 1992)	Unclear	
(Carter & Jennings, 2002)	Trust	3	In paper	0,81 0,89 0,73	
	Commitment (on SRI)	3	In paper	0,94	
(Chen et al., 2011)	Information Sharing	11	(Li & Lin, 2006), (Kwon & Suh,		Not retested after combining items
	Information Quality	5	(Li & Lin, 2006)		
	Behavioral Uncertainty	4	(Kwon & Suh, 2004)		Part of all (more) questions
	Trust	5	(Kumar, Scheer, & Steenkamp,	Unclear	
	Commitment	3	(Kumar et al., 1995)	Unclear	
(Cheng et al., 2008)	Shared values	3	In paper	0,903	CR- green
	Participation	3	In paper	0,887	CR – green
	Communication	3	In paper	0,822	CR – green
	Opportunistic behavior	3	In paper	0,846	CR – green
	Power	3	In paper	0,923	CR – green
	Recourse fitness	3	In paper	0,929	CR - green
	Trust	3	In paper	0,913	CR - green
	Knowledge sharing	3	In paper	0,904	CR – green
(Chu & Wang, 2012)	Seller importance	4	In paper	0,890	
	Relationship length	1	In paper	n.a.	
	Information Sharing	4	In paper	0,826	
	Legal contract	1	In paper	n.a.	
	Benevolence trust	5	In paper	0,912	
	Capability trust	5	In paper	0,915	
	Commitment	6	In paper	0,919	
	Satisfaction	4	In paper	0,946	
(Fawcett et al., 2007)	Connectivity	5	In paper	0,86	
(Fawcett et al., 2008)	-	-	-	-	-

(Handfield & Bechtel, 2002)	Site-specific assets	3	In paper	0,78	More about materials
	Human-specific assets	5	In paper	0,76	Too specific
	Contracts	4	In paper	0,68	
	Trust	3	In paper	0,92	Vague items
(Hausman & Johnston,	Coercive	10	In paper	0,8800	EDI
	Non-coercive	5	In paper	0,8310	EDI
	Trust	3	In paper	0,9422	EDI
	Commitment	5	In paper	0,7534	
	Cooperation	4	In paper	0,862	1/4 about EDI
(Hung et al., 2011)	Trust	3	In paper	0,808	
	Commitment	3	In paper	0,779	
	Quality of information	4	In paper	0,777	
	Supply chain uncertainty	4	In paper	0,888	
(Ke & Wei, 2008)	Mediated power	3	(Brown, Lusch, & Nicholson, 1996)	~	Vague
	Non-mediated power	3	(Brown et al., 1996)	~	Vague
	Organizational trust	3	Can't access paper	-	-
(Ke et al., 2009)	-	-	-	-	-
(Kent & Mentzer, 2003)	Relationship trust	4	In paper	0,886	
	Buyer investment	4	In paper	0,939	
	Supplier investment	4	In paper	0,951	
	Relationship commitment	4	In paper	0,854	
	Long-term Relationship	3	In paper	0,887	
(Kwon & Suh, 2004)	Benevolence Trust,	10	In paper	0,94	Alpha for both the constructs
	Commitment	3	(Kumar et al., 1995)	Unclear	Reliability coefficient is 0,83
	Partner's asset specificity	3	(Joshi and Stump., 1999) and Heide	Unclear	Reliability coefficient is 0,67
	Respondent firm's asset	3	(Joshi and Stump., 1999) and Heide	Unclear	Reliability coefficient is 0,70
	Behavioral uncertainty	2	Noordewier et al. (1990), Zaheer	Unclear	Reliability coefficient is 0,67
	Information sharing	2	Research specific	Unclear	Reliability coefficient is 0,88
	Commitment	3	(Kumar et al., 1995)	Unclear	Reliability coefficient is 0,83
	Perceived satisfaction	3	(Kumar et al., 1993)	Unclear	Reliability coefficient is 0,87

	Partner's reputation	3	(Ganesan, 1994)	Unclear	Reliability coefficient is 0,81
(Lejeune & Yakova, 2005)	-	-	-	-	-
(Li & Lin, 2006)	Information sharing	3	In paper	0,72	
	Information quality	5	In paper	0,83	
	Supplier uncertainty	4	In paper	0,81	
	Top management support	4	In paper	0,90	
	Trust in trading partner	3	In paper	0,80	
	Commitment of trading	4	In paper	0,78	
	Shared vision	3	In paper	0,85	
(Marasco, 2008)	-	-	-	-	-
(Moberg et al., 2002)	Operational information	4	In paper	0,6367	
	Strategic information	5	In paper	0,6331	
	Information quality	3	In paper	0,8196	
	Trust	8	In paper	0,8914	
	Relationship commitment	5	In paper	0,8643	Maybe also IT + SCM commitment
(Müller & Gaudig, 2011a)	Reputation	3	In paper	Unclear	Mixing multi items
	Investment	3	In paper	Unclear	Mixing multi items
	Frequent meetings	3	In paper	Unclear	Mixing multi items
	Contract	4	In paper	Unclear	Mixing multi items
	Information exchange	4	In paper	Unclear	Mixing multi items
(Nyaga et al., 2010)	Information sharing	3	In paper	0,802	Supplier questions also
	Joint relationship effort	3	In paper	0,846	Supplier questions also
	Commitment	4	In paper	0,839	Supplier questions also
	Trust	3	In paper	0,903	Supplier questions also
	Satisfaction with	5	In paper	0,930	Supplier questions also
(Patnayakuni et al., 2006)	Long-term orientation	3	In paper	0,72	
	Relational asset specificity	3	In paper	Unclear for	
(Prajogo & Olhager, 2012)	Long term relationship	4	In paper	0,88	
	Information technology	6	In paper	0,87	
	Information sharing	5	In paper	0,84	
(Tian et al., 2006)	Reputation of TPL	?	-	0,729	

	Overall trust	?	-	0,817	
	Satisfaction of historical	?	-	0,762	
	Client's loyalty	?	-	0,710	
(Tian et al., 2008)	Reputation	2	In paper	0,729	
	Relationship-specific	3	In paper	0,805	
	Information sharing	3	In paper	0,710	
	Satisfaction	3	In paper	0,762	
	Relationship length	1	In paper	n.a.	
	Trust	3	In paper	0,817	
	Commitment	3	In paper	0,829	
	Loyalty behavior	3	In paper	0,846	
(Zhou & Benton Jr, 2007)	Information quality	9	In paper	0,89	* Interesting items
	Information support	8	In paper	0,86	Maybe?
	Supply chain dynamism	3	In paper	0,73	Maybe reject?
	Information sharing	4	In paper	0,70	
(Zineldin & Jonsson, 2000)	Trust	8	In paper	0,90	
	Commitment	7	In paper	0,72	
	Adaptations	5	In paper	0,90	
	Relationship bonds	5	In paper	0,62	
	Shared values	5	In paper	0,78	
	Communication	6	In paper	0,88	
	Opportunistic behavior	7	In paper	0,79	
	Satisfaction	3	In paper	0,83	
	Cooperation	4	In paper	0,80	

Appendix C: Survey instruments

Power (3PL / Orchestrator)

Power	(Ke et al., 2009)	CR=0,766	Seven-point Likert scale (Strongly disagree (1) to Strongly agree (7))
PW1	Due to its position, the dominant partner has the right to influence our behavior		
PW2	We are obliged to follow the dominant partner's suggestions		
PW3	It is our duty to comply with the dominant partner's request		

Used as:

Power		$\alpha=0,82$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
PW1	Due to its position, the 3PL / orchestrator has the right to influence our behavior		
PW2	We are obliged to follow the 3PL / orchestrator's suggestions		
PW3	It is our duty to comply with the 3PL / orchestrator's request		

Power (Your Company)

Power	(Cheng et al., 2008)	CR=0,923	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
PC1	You could have made things difficult for your partner		
PC2	You could threaten to refuse to renew your partner's contract		
PC3	You hinted that you would take certain actions that would reduce your partner's profits		

Used as:

Power		$\alpha=0,74$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
PC1	You could have made things difficult for your 3PL / orchestrator		
PC2	You could threaten to refuse to renew your 3PL's / orchestrator's contract		
PC3	You hinted that you would take certain actions that would reduce your 3PL / orchestrator's profits		

Behavior Uncertainty

Behavior Uncertainty	(Joshi & Stump, 1999) (via (Kwon & Suh, 2004))	$\alpha>0,80$	Seven-point Likert scale (Strongly disagree (1) to Strongly agree (7))
BU1	We can accurately predict the prices for the input component that will be charged by this supplier in our next procurement cycle		

BU2	We can accurately predict the delivery performance (% of on-time deliveries) of this supplier for our next procurement cycle
BU3	We know that this supplier will adapt quickly, should we have to change our order specifications at short notice

Used as:

Behavior Uncertainty		$\alpha=0,76$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
BU1	We can accurately predict the prices for the input component that will be charged by this 3PL / orchestrator in our next procurement cycle		
BU2	We can accurately predict the delivery performance (% of on-time deliveries) of this 3PL / orchestrator for our next procurement cycle		
BU3	We know that this 3PL / orchestrator will adapt quickly, should we have to change our order specifications at short notice		

Opportunistic behavior

Opportunistic behavior	(Cheng et al., 2008)	CR=0,846	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
OB1	Your partner has intentional policies to restrict the sharing of its knowledge		
OB2	To accomplish his own goals, sometimes your partner alters the facts slightly		
OB3	To accomplish his own goals, sometimes your partner promises to do things without actually doing them later		

Used as:

Opportunistic behavior		$\alpha=0,68$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
OB1	Your 3PL / orchestrator has intentional policies to restrict the sharing of its knowledge		
OB2	To accomplish his own goals, sometimes your 3PL / orchestrator alters the facts slightly		
OB3	To accomplish his own goals, sometimes your 3PL / orchestrator promises to do things without actually doing them later		

Relationship specific investment

Relationship-specific investment	(Tian et al., 2008)	$\alpha=0,805$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
RI1	The major 3PL firm has invested in related facility to better serve our needs		
RI2	The major 3PL firm has reengineered its relevant business processes to fit our specific requirements		
RI3	The major 3PL firm has had trained employee assigned to handle our relationship only		

Used as:

Relationship-specific investment		$\alpha=0,82$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
RI1	The 3PL / orchestrator has invested in related facility to better serve our needs		
RI2	The 3PL / orchestrator has reengineered its relevant business processes to fit our specific requirements		
RI3	The 3PL / orchestrator has had trained employee assigned to handle our relationship only		

Participation

Participation	(Cheng et al., 2008)	CR=0,887	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
PA1	You are involved in the set-up of the commercial goals with your partners		
PA2	Your partner takes into account your suggestions		
PA3	You perform an active role in the decision making		

Used as:

Participation		$\alpha=0,74$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
PA1	You are involved in the set-up of the commercial goals with your 3PL / orchestrator		
PA2	Your 3PL / orchestrator takes into account your suggestions		
PA3	You perform an active role in the decision making		

Shared vision

Shared vision	(Li & Lin, 2006)	$\alpha=0,85$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
SV1	We and our trading partners have a similar understanding about the aims and objectives of the supply chain		
SV2	We and our trading partners have a similar understanding about the importance of collaboration across the supply chain		
SV3	We and our trading partners have a similar understanding about the importance of improvements that benefit the supply chain as a whole		

Used as:

Shared vision		$\alpha=0,94$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
SV1	We and our 3PL/orchestrator have a similar understanding about the aims and objectives of the supply chain		
SV2	We and our 3PL/orchestrator have a similar understanding about the importance of collaboration across the supply chain		

SV3	We and our 3PL/orchestrator have a similar understanding about the importance of improvements that benefit the supply chain as a whole
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Information sharing

Information sharing	(Chu & Wang, 2012)	$\alpha=0,826$	Seven-point Likert scale (Strongly disagree (1) to Strongly agree (7))
IS1	There is a high level of information exchange with our major 3PL		
IS2	We share our 3PL's information to track our shipments		
IS3	Our major 3PL shares available service capacity with us		
IS4	We share our logistics service demand forecast with our major 3PL		

Used as:

Information sharing		$\alpha=0,86$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
IS1	There is a high level of information exchange with our 3PL / orchestrator		
IS2	We share our 3PL / orchestrator's information to track our shipments		
IS3	Our 3PL / orchestrator shares available service capacity with us		
IS4	We share our logistics service demand forecast with our 3PL / orchestrator		

Information Quality

Information quality	(Li & Lin, 2006)	$\alpha=0,85$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
IQ1	Information exchange between our trading partners and us is timely		
IQ2	Information exchange between our trading partners and us is accurate		
IQ3	Information exchange between our trading partners and us is complete		
IQ4	Information exchange between our trading partners and us is adequate		
IQ5	Information exchange between our trading partners and us is reliable		

Used as:

Information quality		$\alpha=0,92$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
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IQ1	Information exchange between our 3PL/ orchestrator and us is timely
IQ2	Information exchange between our 3PL/ orchestrator and us is accurate
IQ3	Information exchange between our 3PL/ orchestrator and us is complete
IQ4	Information exchange between our 3PL/ orchestrator and us is adequate
IQ5	Information exchange between our 3PL/ orchestrator and us is reliable

Benevolence trust

Benevolence trust	(Kwon & Suh, 2004)	$\alpha=0,912$	Seven-point Likert scale (Strongly disagree (1) to Strongly agree (7))
BT1	Our major 3PL cares for us		
BT2	Our major 3PL has made sacrifices for us in the past		
BT3	We feel our major 3PL has been on our side		
BT4	Our major 3PL is genuinely concerned about our success		
BT5	Our major 3PL considers our welfare as well as their own		

Used as:

Benevolence trust		$\alpha=0,94$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
BT1	Our 3PL / orchestrator cares for us		
BT2	Our 3PL / orchestrator has made sacrifices for us in the past		
BT3	We feel our 3PL / orchestrator has been on our side		
BT4	Our 3PL / orchestrator is genuinely concerned about our success		
BT5	Our 3PL / orchestrator considers our welfare as well as their own		

Capability trust

Capability trust	(Kwon & Suh, 2004)	$\alpha=0,915$	Seven-point Likert scale (Strongly disagree (1) to Strongly agree (7))
CT1	Our major 3PL has no problems answering our questions		
CT2	Our major 3PL is knowledgeable in managing logistic activities		
CT3	The advice our major 3PL gives us is helpful		
CT4	When we share our problems with our major 3PL, it can help us solve them		
CT5	Our major 3PL has the capability to satisfy our logistic service demand		

Used as:

Capability trust		$\alpha=0,90$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
CT1	Our 3PL / orchestrator has no problems answering our questions		
CT2	Our 3PL / orchestrator is knowledgeable in managing logistic activities		
CT3	The advice our 3PL / orchestrator gives us is helpful		
CT4	When we share our problems with our 3PL / orchestrator, it can help us solve them		
CT5	Our 3PL / orchestrator has the capability to satisfy our logistic service demand		

Communication

Communication	(Cheng et al., 2008)	CR=0,822	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
CM1	You and your partner frequently exchange each other's opinions		
CM2	Your partner frequently keeps you informed of new developments		
CM3	You and your partner frequently discuss each other's expectations		

Used as:

Communication		$\alpha=0,91$	Five-point Likert scale (Strongly disagree (1) to Strongly agree (5))
CM1	You and your 3PL / orchestrator frequently exchange each other's opinions		
CM2	Your 3PL / orchestrator frequently keeps you informed of new developments		
CM3	You and your 3PL / orchestrator frequently discuss each other's expectations		

Appendix D: Stepwise regression analyses in SPSS

In order to test the final research model, it is split up in five different models that are tested in SPSS. This appendix shows the five different models that are assessed. Since we couldn't accept the hypotheses about both dimensions of trust having a mediating influence on trust, we wanted to show the influence of trust on information sharing; therefore both constructs measuring these dimensions are included and tested in a new model. The last figure (E.6) in this appendix shows this model.

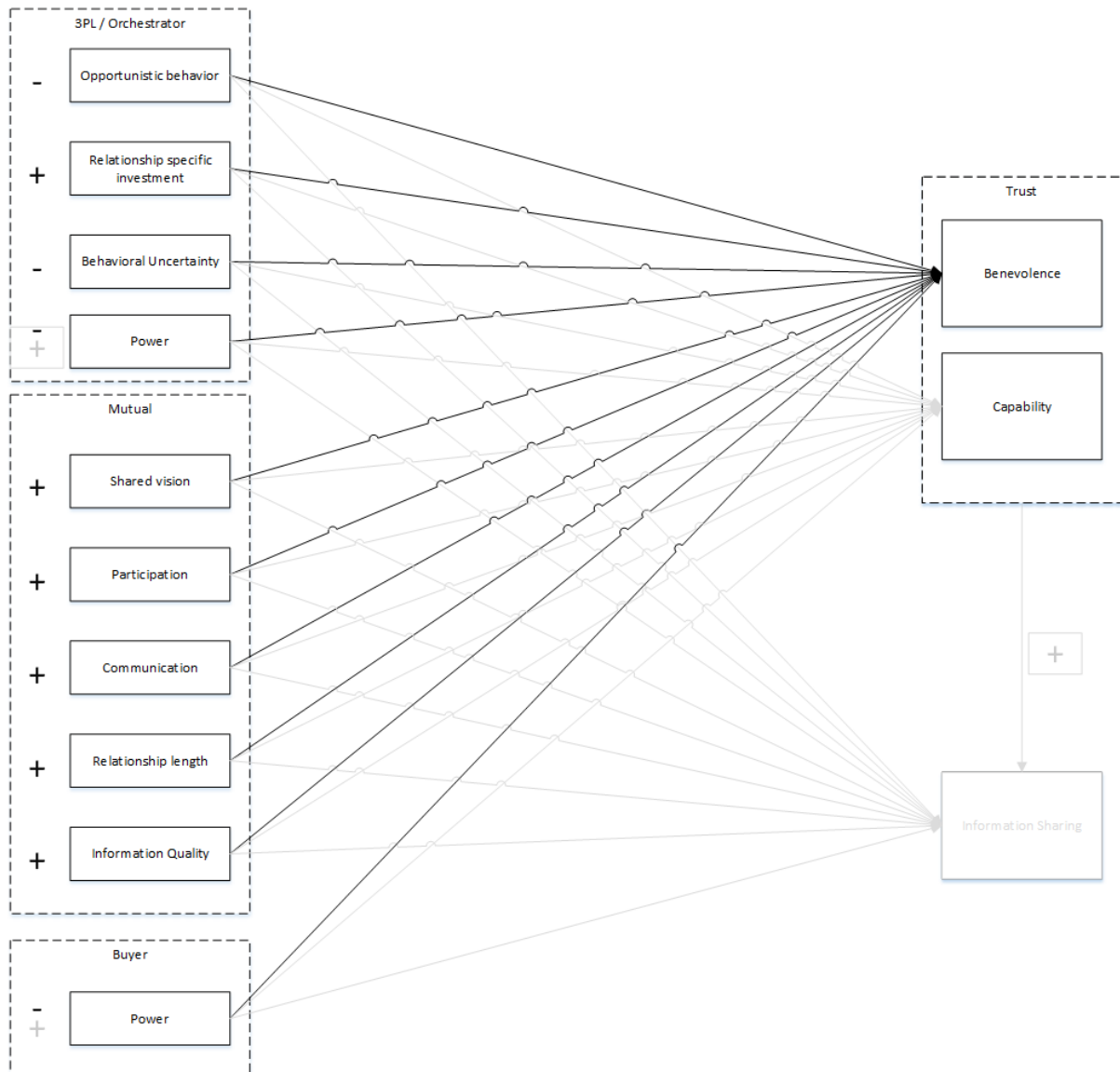


Figure D.1 Model used to assess the influence of the antecedents on benevolence trust

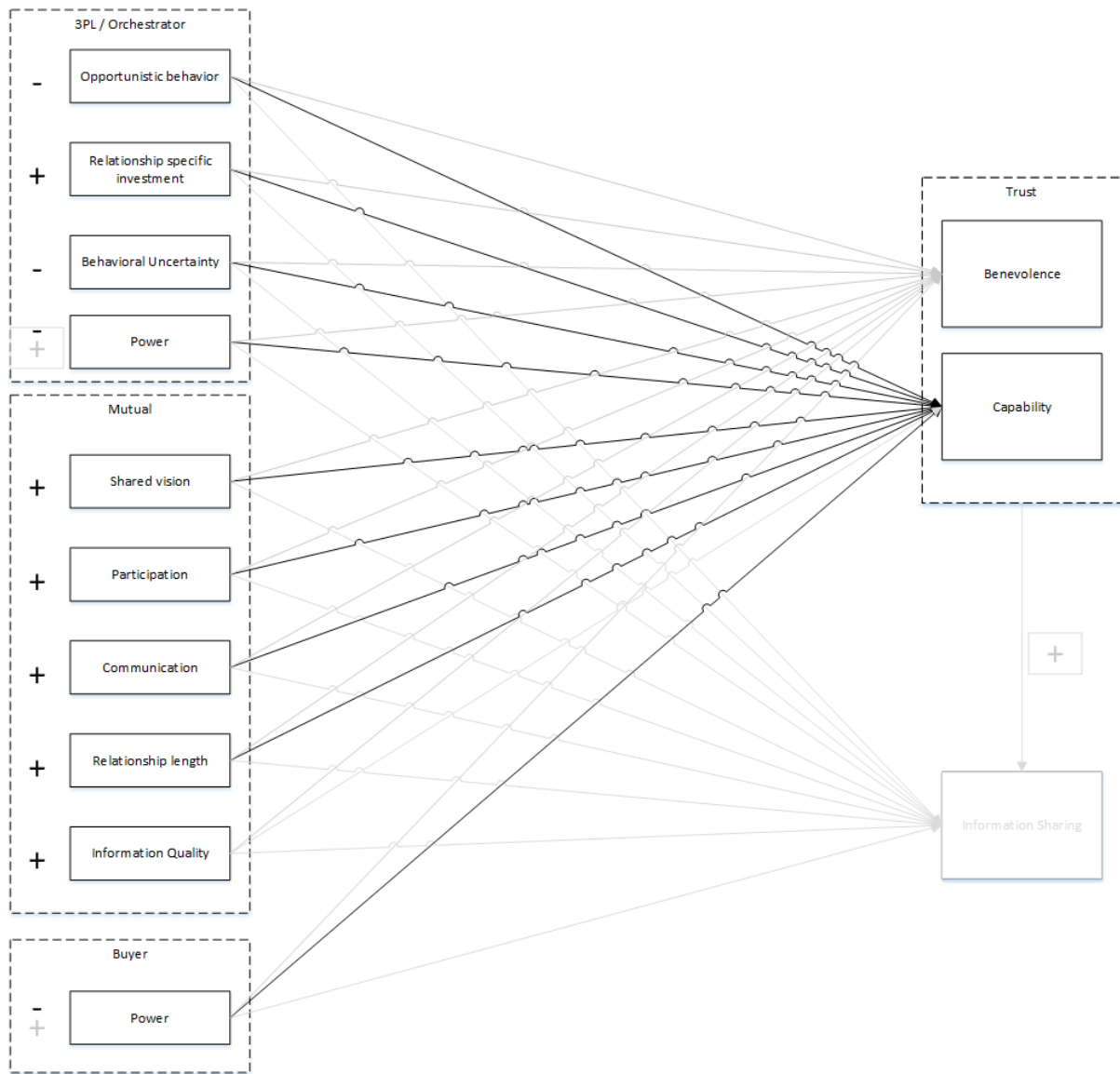


Figure D.2 Model used to assess the influence of the antecedents on capability trust

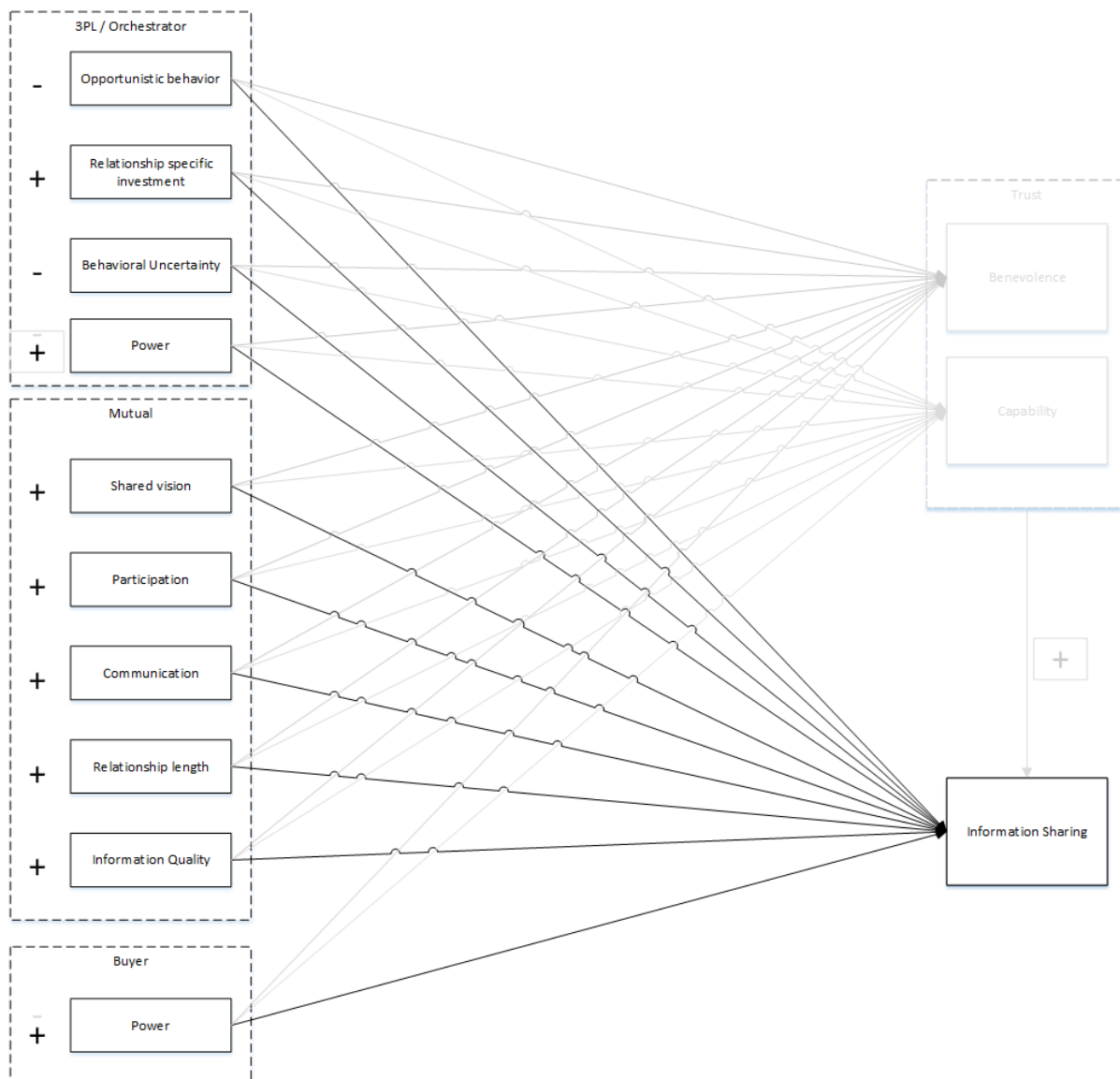


Figure D.3 Model used to assess the influence of the antecedents on information sharing

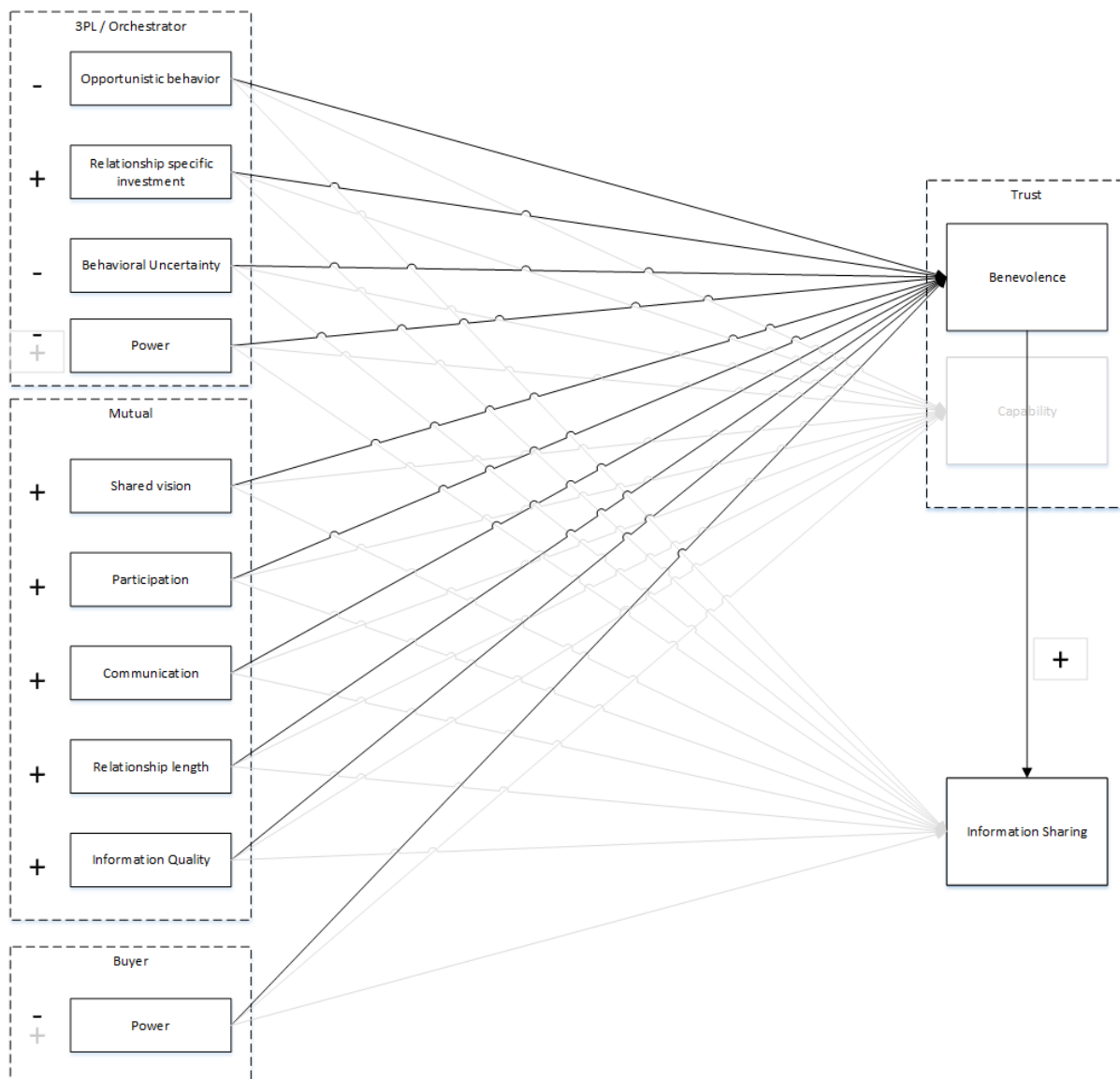


Figure D.4 Model used to assess the influence of benevolence trust as a mediating factor on information sharing

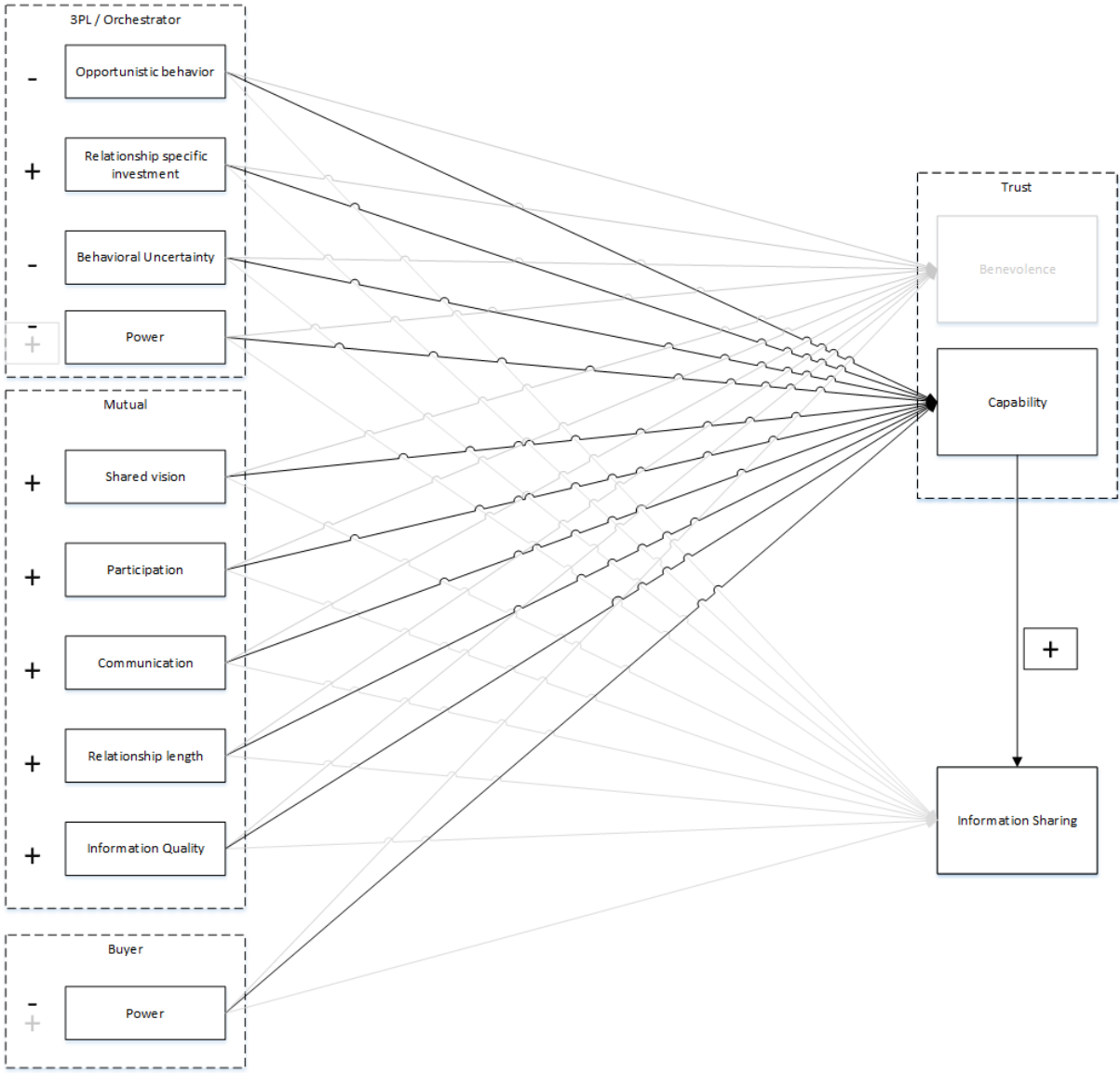


Figure D.5 Model used to assess the influence of capability trust as a mediating factor on information sharing

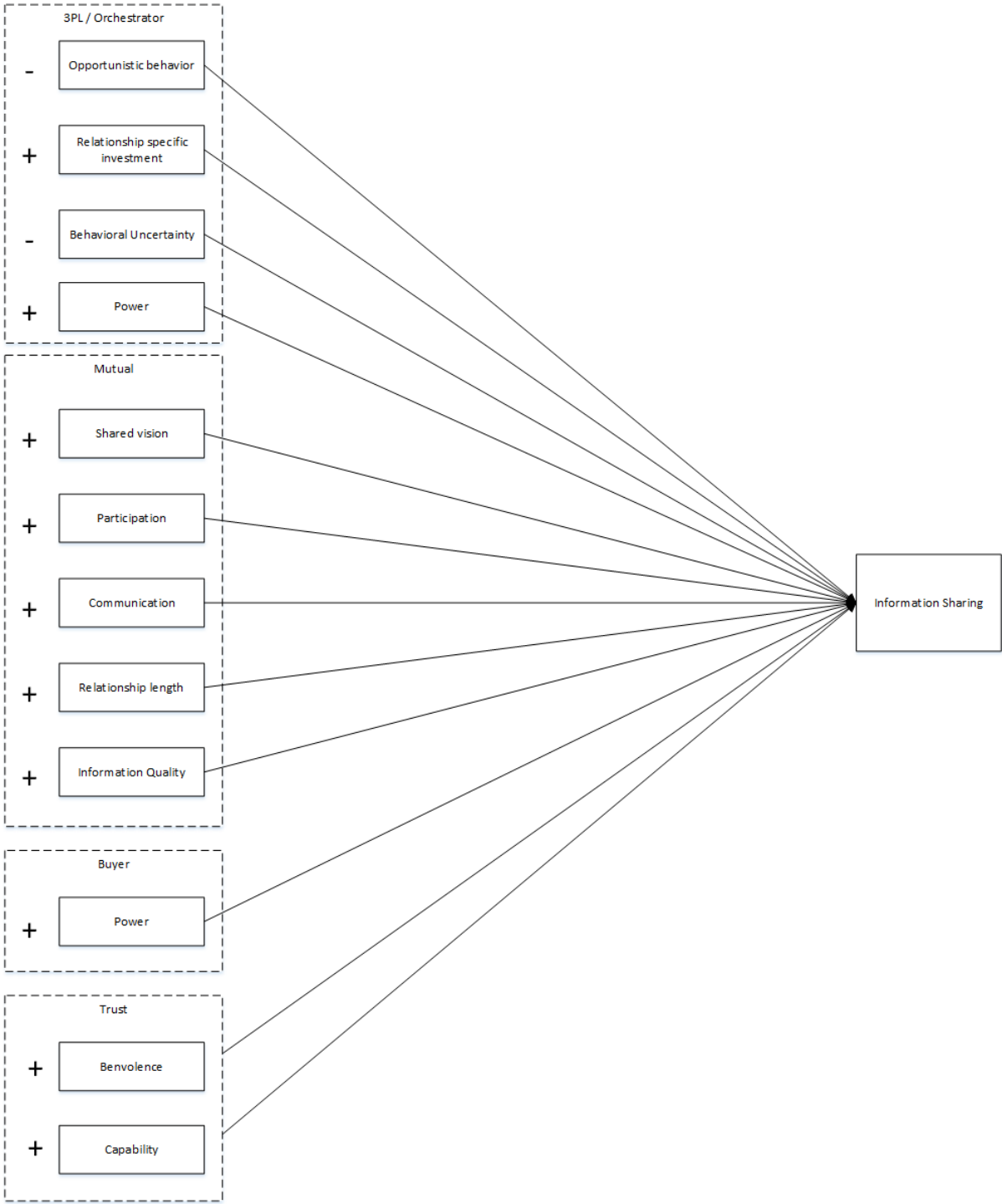


Figure D.6. Additional model used to assess the influence of the antecedents on information sharing, including trust