Supply chain transparency: An Analysis of the Motivations, Advantages and Disadvantages from an Innovation / Inventory Management Perspective

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ABSTRACT

This thesis investigates the main motivations, advantages, and disadvantages that come along with the implementation of transparency in the supply chain through semi-structured, qualitative interviews with experienced professionals working at various positions within the supply chain. The study aims to highlight the nature of transparency and its consequences on supply chain management practices. By interviewing experienced people working in the supply chain, the research explores and highlights the advantages that come with transparency, such as more fluent processes, automation, and shared innovation projects. Additionally, this thesis explores and highlights the potential disadvantages of the implementation of transparency as well, such as resistance to change, failing projects and costs that come along with up-to-date stock management. Based on an analysis of these interviews, it can be stated that there are more advantages than disadvantages that come along with the implementation of transparent initiatives in supply chain management practices. Three main stakeholders can be identified from this research. Information systems, which are an increasingly important moderator to implement transparency more easily. Mutual trust with buyers and suppliers first as an incentive, but after a while as a moderator of transparency initiatives as well. The main incentive of the implementation of transparency initiatives is an increase in efficiency, which saves resources and costs.

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Transparency, Innovation, Inventory Management, Efficiency, Relationship Management, Supply Chain Management

1. INTRODUCTION

Over the last few decades there has been a rapid increase in the availability and disclosure of supply chain information. Before, there was a considerable distance between a company and its stakeholders, but due to the rise of technology and communication mechanisms, people have become more aware of supply chain risks. In addition, supply chain risks have grown over time because nowadays, there are way more legal jurisdictions than before. Transparency has therefore become an essential component of supply chain management (Linich, 2014 ; Bateman and Bonanni, 2019). Supply chain transparency refers to the process of exposing supply chain information, such as supplier information, innovation, and production processes to all stakeholders (Morgan et. al, 2018 ; Lockhart, 2022). As literature emphasizes the increase of the importance of supply chain transparency, I am interested in finding out what the key advantages and disadvantages in a real-life Dutch business are. A lot of literature can be found about supply chain transparency, but some aspects seem to be left out more. To effectively cover the whole subject of supply chain management, I decided to choose two 'extremes' that have not been researched as sufficiently as other aspects of the supply chain (Gardner et. al, 2019). These two extremes will be transparency about innovation and inventory management. This research shifts from why supply chain transparency should be implemented and its key advantages and disadvantages, to the consequences that the implementation of supply chain transparency has had in real-life scenarios.

A lot of research in the purchasing and supply chain management field has been done on the consequences of the implementation of supply chain transparency. Gaining visibility by implementing supply chain transparency provides a clear overview internally, as supply chain information can easily be transferred and perceived across all tiers of a company (Montecchi et. al, 2021). Besides that, supply chain transparency provides an honest overview of the compliance with company goals and regulations, which increases trustworthiness. (Sodhi and Tang, 2019 ; Bateman and Bonanni, 2019). However, supply chain transparency also poses risks. Exposing supply chain information makes companies more vulnerable to external stakeholders, as companies are not able to keep supply chain information to themselves anymore if supply chain transparency is being implemented. Especially companies that have invested in labor improvement practices can lose their competitive advantage due to competitors taking over these practices because of labor exposure (Doorey, 2011). As stated before, a lot of information about the advantages and disadvantages of supply chain transparency can be found. However, some essential parts of the supply chain are not taken into consideration yet. Not much literature can be found about the effect of supply chain transparency on innovation projects shared within and outside a company. Besides that, little literature is available about the effect that supply chain transparency has on inventory management processes within a company. Therefore, this research will be focused on the advantages, disadvantages, and challenges of supply chain transparency from an innovation / inventory management perspective.

To address this issue, it is necessary to first find out how transparency initiatives regarding innovation and inventory practices are being organized. The purpose of this research is a qualitative-case study approach involving experienced individuals working in the field of supply chain which are willing to be interviewed. After designing a detailed framework based on an analysis of research gaps in scientific literature, a clear vision will be created of what questions should be asked during the interviews. Throughout semi-structured interviews during 30-60 minutes about situations where supply chain transparency played a major role, the key advantages or disadvantages that should be kept in mind on the aspect which will be focused on during the interviews will be found out. The objective is to obtain a clearer understanding of the advantages, disadvantages, and motivations of the implementation of supply chain transparency. By starting off discussing past experiences about supply chain transparency in general, the focus will gradually shift more to innovation and inventory management, and eventually the focus of transparency initiatives in the future. In general, the research question for this bachelor thesis is: What are the key advantages/disadvantages as well as motivations for engaging in supply chain transparency with regard to innovation and inventory management practices?

 Due to the unavailability of a company where this number of interviews could be conducted, the approach to interviews had to be slightly modified throughout the course of the research, resulting in less interviews in general, but interviews with individuals having different positions in the supply chain working in different sectors. This study concludes that the implementation of supply chain transparency contains more advantages than disadvantages. Additionally, information systems are identified as a key moderator for initiating various transparency initiatives within a company. The primary objective of transparency is to increase efficiency, and the establishment of mutual trust with both customers and suppliers is considered an objective, which would also serve as a moderator for further transparency initiatives in the long run.

2. LITERATURE

2.1 Transparency Implementation

As mentioned in the introduction, supply chain transparency refers to the process of exposing supply chain information to all stakeholders. It is being argued that one of the key motivations for engaging in supply chain transparency is compliance with government regulations. Hiding supply chain information gives the impression that regulations are being ignored and may lead to governmental concerns, which could result in low credibility and a bad reputation (Archila et. al, 2019). The implementation of supply chain transparency to mediate inventory management seems to pose a lot of benefits, as transparency saves unnecessary costs and time because of the information availability transparency initiatives such as information systems provide (Srinivasan et. al, 2017). It can be argued that information systems being used to share information about inventory levels throughout the entire firm is a means of supply chain transparency, as information systems improve efficiency through information sharing (Fernando et. al, 2020). Supply chain transparency has the same effect. It creates improved visibility into supply chain activities as well: there is a better overview about what supply chain processes seem inefficient and could be improved (Sodhi and Tang, 2019). New technologies and innovation practices ensure these improvements, make sure that competitive advantage is being maintained and efficiency increases over time (Handfield, 2016). The increasing need for innovation practices to keep up with the times and stay ahead of competition has also led many firms to consider implementing supply chain transparency. A big risk of supply chain transparency from an innovation perspective, is that crucial information could leak to competitors, who could use this information for themselves to replicate supply chain practices. Transparency in innovation projects with suppliers would be an even greater risk, as

confidential information could be leaked by the supplier to competitors as well (Park-Poaps and Rees, 2010). Besides that, the implementation of supply chain transparency could be expensive, as it takes time and money to track all supply chain information (Doorey, 2011). Supply chain transparency can only be achieved if the buyer and supplier agree to disclose information. It is therefore necessary to build and work on strong relationships (Brun et. al, 2020), to increase mutual trust and reduce the risk of spillage to competitors. Trust is a key factor to find a balance between a high degree of cooperation and achieving common objectives (Gardner et. al, 2019). However, trust should not just be built on transparency. Personal contact is important as well, as impersonal transparency initiatives negatively affect mutual dependency and have the potential to lead to a high sense of distrust (Shapiro, 1987). There seems to be a positive link between relationship management and innovation/inventory management, as mutual innovation projects do not only provide extra information about innovation but help improving social relations as well (McGrath et. al, 2021). In addition, good relationships between buyers and suppliers seem to have a positive effect on the delivery and allocation of resources (Gutierrez et. al, 2020).

## 2.2 Transparency's State of the Art

To clarify what will be examined and what is missing in the current literature, five recent papers with typical shortcomings, which occur more often in other articles, were analyzed. McGrath et. al (2021) have developed a control and relational orientation to create supply chain transparency, in which is being inferred that mutual use and development of technology and innovation helps to build and improve social relations, which is an essential factor in the implementation of supply chain transparency. The article sums up several disadvantages that come along with the implementation of relational supply chain transparency as well, such as the high costs that come with setting up and maintaining mutual transparency systems. However, in this article there is nothing to be found about the benefits regarding inventory management that typically come with increased transparency in a buyer/supplier relationship. Brun et. al (2020) conducted research on the effect of supply chain transparency on supply chain relationships through qualitative interviews as well. Based on this interview, a matrix was made with the consequences of high and low buyer/supplier collaboration and trust. From this research, it can be inferred that a high level of collaboration and trust between a buyer and a supplier leads to mutual innovation activities and better supply chain visibility, which positively affects supply chain transparency. Besides all the research conducted on buyer/supplier activities in the supply chain, this paper does not provide any information on the implications of the degree of collaboration and trust with regard to inventory management practices as well. There is a connection between research of Gutierrez et. al (2020) and this research as well, as this article thoroughly describes the advantages and disadvantages of innovation and inventory management practices in a buyer/supplier relational perspective. This article states that supplier-collaboration efforts often lack a clear governance structure, which would negatively affect mutual innovation and inventory management practices due to poor objective alignment. The main difference between said research and this research is that the research is being focused solely on the buyer/supplier relationship, whereas this research will be from a supply chain transparency perspective. Research by Ageron et. al (2013) provides a linkage between the use of innovation and inventory management as supply chain practices, as this paper infers that inventory management processes such as a central

logistics construction and a mutual supplier stock management system are being used as innovative supply chain practices in operational processes the most. However, the term 'transparency' is not being discussed in this article. Montecchi et. al (2021) developed an extensive cluster overview for different areas of supply chain transparency. This article infers that transparency strategies for integrating knowledge with suppliers and throughout a company as well improve decision quality and decreases perceived risks. But, despite all the different areas that are mentioned through this area, innovation and inventory management are not being acknowledged as supply chain aspects involved with transparency.

2.3 New Transparency Contributions

Most literature about supply chain transparency is focused more on sustainability (Schäfer, 2022 ; Gardner et. al, 2019), or supplier traceability (Morgan et. al, 2018 ; Doorey, 2011), but a lot of literature seems to leave out or insufficiently analyzes subjects such as innovation within a firm, even though the most transparent supply chains seem to be classified as 'innovators'(Bateman and Bonanni, 2019), as supply chain transparency provides a clearer overview about what supply chain could be improved (Sodhi and Tang, 2019). The same applies to inventory management. Literature about supply chain transparency does not mention inventory management very often, while it seems very clear that supply chain transparency and inventory management are related supply chain practices, as it is stated that visibility has a positive effect on the efficiency of inventory management practices (Bartlett, 2007). In addition, as supply chain transparency has a positive effect on maintaining relationships and contributes to innovation and inventory management, relationship management is serving as a connecting factor in the methodology (Wilhelm and Sydow, 2018). In the methodology, a plan was established to find out what are the main advantages and disadvantages that supply chain transparency poses, especially on innovation and inventory management. Based on a thorough literature review combined with an analysis of recent papers, a framework was created (see Figure 1) which would support all the subjects which will be approached in the methodology (Arksey and O'Malley, 2005). The arrows in this framework represent the effects that will be examined through qualitative interviews. The dotted lines from innovation management to the buyers and from inventory management to suppliers were added because these subjects will be discussed with them, but questions about those subjects could be answered more easily by the other two groups of interviewees.

Figure 1: Framework to identify advantages/disadvantages
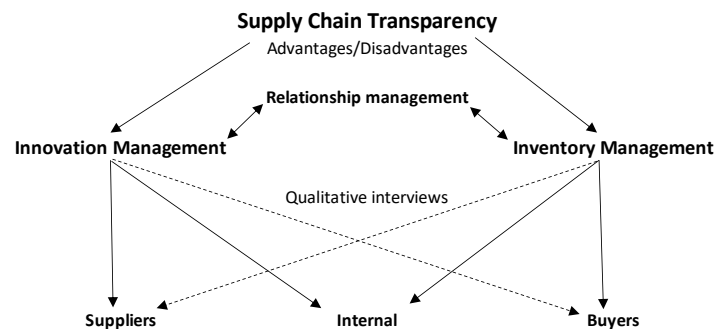
3. METHODOLOGY

3.1 Research Design

Most research in the field of transparency is often described theoretically rather than based on real-life experiences. Especially for aspects such as innovation and inventory management, the consequences have not been discussed well enough yet. This research aims to provide a comprehensive analysis of the advantages, disadvantages, and motivations associated with the implementation of supply chain transparency to potentially provide as many new insights as possible. Therefore, all interviews will be semi-structured: the interview protocol will be followed as a guideline to ultimately answer all questions as detailed as possible (Mashuri et. al, 2022). In this way, it is possible to keep discussing the main topics, but go as deeply as possible into real-life experiences regarding transparency. During these interviews, all topics mentioned in the framework (see figure 1) have been implemented to cover the entire subject of supply chain transparency. As these interviews were merely focused on past experiences, only qualitative data, thus information derived from talk and observation, was being used (Malterud, 2001). The unit of analysis here is a firm which is open to interviews about supply chain transparency and four of its suppliers and has shifted to people working at multiple roles across the supply chain. As this research builds on existing research which has not been studied sufficiently, a qualitative, deductive approach is being implemented. The deductive approach implies that the structure of the interview builds on previous knowledge (Elo and Kyngäs, 2007).

3.2 Case Selection

To conduct this research as accurate and effective as possible, the intention was to interview 4 buyers, 4 suppliers and 4 internal employees. For the interviews with internal employees, the intention was to conduct interviews with employees as far up the hierarchy as possible who are concerned with supply chain practices to obtain the best possible answers from the internal side. As mentioned in 5.4, this group has changed to 7 different people working across different positions in the supply chain. Throughout these interviews, the main interest was in past experiences of the interviewees, as these reflect the advantages and disadvantages of supply chain transparency in real-life scenarios the best possible way. This is why the interview gradually moved from a more general view, where the whole subject of supply chain transparency was covered, to the more concrete topics, which would be supply chain transparency regarding innovation and inventory management practices. By covering more general topics first, it was easier to engage in the interviewee's concrete experiences about supply chain transparency regarding innovation and inventory management. To successfully dig deeper into the interviewee's past experiences, questions were added about the buyer/supplier relationships, as the firm's relationships affect both innovation and inventory management practices, as can be seen in the framework in figure 1. After having discussed these subjects, questions about future plans regarding supply chain transparency have been asked at the end, as it is easier to reflect on past experiences if it just has been discussed. In figure 2, this approach is being visualized by using a funnel and in figure 3, it is being visualized what the focus of these questions were on the protocol and how this links to literature regarding transparency.

Figure 2 – Interview approach – from broad to specific characterized by funnel
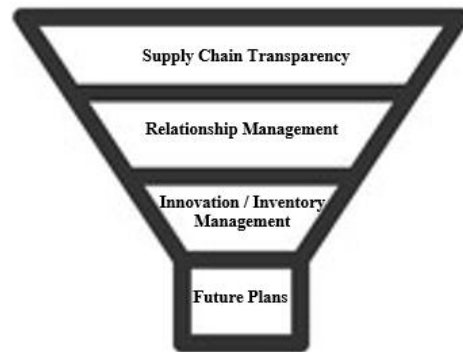

Figure 3 – Interview Protocol – Question Focus and Literature Link

Topic regarding Transparency	Questions Focus in Protocol	Literature Link with Transparency
General Understanding	General description of Role & Motivations	Definitions & Theoretical Discussions
Relationship Management	Relationship Approach with Buyers/Suppliers	Finding out the Importance of Relationships & Trust
Innovation management	Experiences & Perspective	Collaborative Projects – Risk of Disclosing Information
Inventory Management	Experiences & Perspective	Stock/Efficiency Management
Future Plans	What Transparency initiatives will be undertaken	Increase in initiatives / Long-term Strategies

3.3 Data Collection

The main source of the collected data were semi-structured interviews, which were supported by deeper engagement into past experiences. The interview protocol that was set up can be seen in Appendix A. The interview protocol was established following all the guidelines given above. Next to the interviews with buyers, suppliers, and internal employees, which lasted 15-20 minutes each, additional data was collected using scientific articles or internet reports. These were mainly found through Scopus, which is a database of scientific articles provided by the University of Twente. During the process, the number of interviews changed from 12 to 7, and the length of these interviews increased to 30-60 minutes, to successfully dig even deeper into past experiences including examples. This alternative method, which was not planned beforehand, may even provide a more comprehensive representation of the subject. By interviewing individuals with various roles within the supply chain across different industry sectors, the research creates a broader perspective. This approach overcomes the potential limitation of that the identified advantages and disadvantages just apply to one single company. A clearer overview of the interviewees' information is provided in figure 4.

Figure 4 – Interviewee Information

| Role	Company	Industry	Interview Length (minutes)
Sr. Supply Chain Manager	Dura Vermeer Bouw	Construction	33:53
Managing Director	Holland Pharma	Health Services	43:32
Purchaser	Delwi-Groenink	Metal Engineering	37:56
Marketing Manager	Tata Steel	Metal Production	39:42
Operations Manager	Esschert Design	(Garden) Commerce	32:44
General Manager Logistics	Jumbo Supermarkten Nederland	Commerce	61:37
Sr. ERP SCM Specialist	ETC Nederland	Professional (IT) Services	42:34

3.4 Data Analysis

To obtain a well conducted analysis of these qualitative interviews, every interview has been recorded, and transcribed afterwards. After that, unnecessary information was removed and all information which could be useful to bring up in the results section was highlighted. Mainly because of the past experiences and examples that have been brought up by the interviewees, these interviews provided a clear overview about the main issues, risks, advantages, and disadvantages of supply chain transparency, especially with regard to innovation and inventory management practices.

4. RESULTS

Based on the results collected from the interviews, it can be inferred that in general, there are more advantages to the implementation of transparency in the supply chain. The main purpose of all transparency initiatives is an efficiency increase, which enables a company to save as many resources and costs as possible. Many of these transparency initiatives are enabled through information systems. Mutual trust is an essential moderator, which unlocks and strengthens transparency initiatives with buyers and suppliers to be even more efficient. An overview of the results can be seen in Figure 5.

Figure 5 – Framework of Interview Results
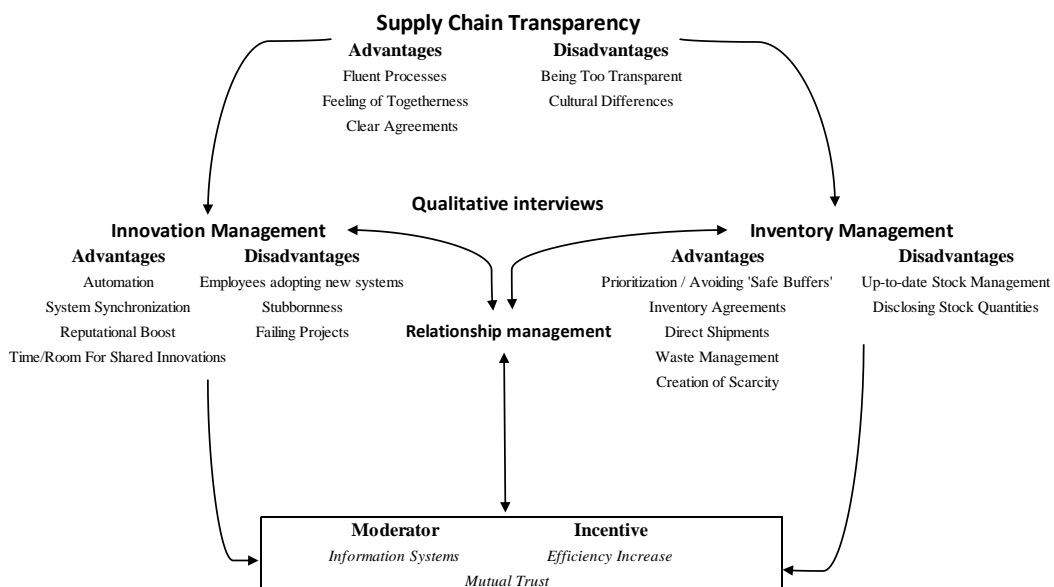
4.1 Advantages of Supply Chain Transparency

4.1.1 General Advantages

As mentioned in the methodology, the general subject of transparency in the supply chain was covered first before asking about the perspective of the interviewees on the effect of transparency on innovation and inventory management practices. These are the general advantages given and explained by the interviewees:

4.1.1.1 Fluent Processes

Clear communication throughout all parts of the supply chain results in a smoother operation, both internally and externally. Aligning all incoming data about delivery / operational data and making this data visible for all employees involved results in less disruptions: a stable chain. To make all this happen, it is necessary that employees fulfill these tasks and do what they are being asked to do. Achieving a transparent supply chain internally requires adequate leadership and guidance to ensure its realization. Operational alignment is one of the most essential aspects within a company to save a lot of manpower and costs. The interviewees found it just as important to communicate effectively with its buyers and suppliers and emphasized the importance of timely informing both its buyers and suppliers of any changes in their own production process or demand. This is often done through the sharing of a demand forecast, which is determined through past data and speculative predictions. It is being argued that early sharing of needed data and information externally ensures that more time is available to set additional targets and create a fluent process. This extra time also allows for quick reactions to unexpected disruptions in the supply chain. The logistic Manager of Jumbo Nederland provided an example of this by mentioning the war between Russia and Ukraine which suddenly started in 2022. Due to this war, there was less grain available, and Jumbo has a lot of products containing cereal. Due to Jumbo's ability to quickly assess the consequences and have a transparent insight to where the disruptions find place, the supermarket came with quick solutions. The supermarket decided for instance to temporarily move from the initial 20 types of pasta that the supermarket sold to just 6 types with a slightly larger range of products, so that Jumbo was still able to sell sufficiently. Due to clear and transparent communication with suppliers, the supermarket was able to make this possible in a short timeframe.

4.1.1.2 Feeling of Togetherness

Transparency throughout all departments of a company requires a lot of cooperation. The evolvement that typically occurs whilst implementing supply chain transparency is that instead of that employees work on a department-level, in which they only do what is needed from their department, a feeling of togetherness is being created with a fully transparent system in a company. Instead of working in their own 'corner', everyone within the company is aware of their worth and all data which their department processes is made available for the next step in the supply chain, and so the feeling of a common purpose is increasingly emerging. The incentive of suboptimization within departments, shifts gradually to a feeling of mutual optimization. The purchaser of Delwi-Groenink infers that the increase of shared information within departments of the company has not only been a great motivation to finish his work successfully, but he also calls it a considerable time saver. "Transparency within the company ensures that there are less disruptions internally. This makes the company's activities shift from 'reactive' to 'proactive', where we have fewer silly problems to fix, and we can focus more on our progress".

4.1.1.3 Clear Agreements

Another advantage of transparency with buyers but especially suppliers are the clear agreements that come from mutual transparency. A high degree of transparency in agreements can ensure that no party is taking advantage of the other. During the interviews, it was even argued that the certainty that comes from clear agreements is the biggest motivator to implement transparency in the supply chain. The Marketing Manager of Tata Steel provided an example of such a situation. With long-term clients, contracts are often drawn up for six months or a year with fixed prices. It can occur that the prices suddenly go up considerably, and customers start buying much more of a product because the contract price is still much lower. This could then be resold to other parties at the higher price. This phenomenon is also known as 'contract tourism'. To prevent contract tourism, it is important to take measures. Tata Steel often sets a maximum playing width in its contracts to set a cap on how much more or less can be purchased for a given period. It is thus important to be transparent about plausible scenarios as well, so that no party will be negatively affected. Clear agreements make a company aware of where it stands and what it is going to get, which decreases the possibility of any disruptions or misunderstandings. Besides that, such agreements cause an acceleration in the supply chain, which is often needed to keep up with competitors.

4.1.2 Advantages for Innovation Practices

4.1.2.1 Automation

As transparency provides improved visibility across the entire supply chain, increasingly more types of technology are being used to optimize operations. Optimization through technology ensures that certain tasks can be done automatically, rather than that these tasks need to be done manually, which saves time. Both online and physical checkout system are often linked to their ERP system, which enables companies to have a clear overview of what products are sold the most. Besides that, these systems are often able to send a notification when products need to be refilled as well. Jumbo's initiatives regarding automation are the most advanced, as the Dutch supermarket chain has a fully automized national distribution center in Nieuwegein, which needs far fewer employees than their other distribution centers. Right now, Jumbo is working on an expansion of this distribution center, which will go from 6.000 to 40.000 square meters.

4.1.2.2 Synchronization of Systems

Nowadays, dashboards are often built into ERP systems to introduce mutual systems. Transparency in collaboration processes with buyers and suppliers could facilitate the synchronization of systems. By sharing relevant data throughout their synchronized systems, operations are more effectively aligned. In this way, demand fluctuations can be processed easily, and a perfect overview is given. Delwi Groenink is working on a software package called DataWise, which converts purchase order data directly from their ERP system to the system of the supplier. Once this software package is properly implemented, orders no longer need to be filled in the system, as this will run fully automatically. This process would save a lot of time, as order confirmations still must be put into the system manually now.

4.1.2.3 Reputational Boost

Especially in the digital age that we are living in right now, it is necessary for companies to show they are moving with the times. Being transparent about innovation activities is a good way for companies to showcase themselves as a responsible and forward-thinking organization. Jumbo is very keen to share what innovative activities they are involved in, as this gives the company name a boost and these activities add something to the company what competitors do not have. For example, Jumbo is now more than happy to share that they are working on using electric trucks in the transport of their products, to reduce emission and be more-climate friendly. This is just an example of an innovation activity which gives the supermarket chain a reputational boost.

4.1.2.4 Time and Room for Shared Innovation

As mentioned above and being argued by all interviewees, transparency in the supply chain has the potential to save a lot of time, which could be spent otherwise. It is being argued that by having transparent relationships and clear agreements there is lesser need to discuss price and amount of ordered products. Instead, there is room to discuss the optimization of each other's supply chains and the future. Based on this, mutual innovation projects could be introduced more easily. Improved insights in data of buyers and suppliers enables innovative collaboration and the discovery of common purposes. As the Supply Chain Manager of Dura Vermeer says: "When companies know each other, the common purpose, and the optimization what can still be done, they are able to work continuously with regular parties and go one step further each time."

4.1.3 Advantages for Inventory Management

4.1.3.1 Prioritization and Avoiding 'Safe Buffers'

Transparency measures are often being used in the warehouse to facilitate inventory management. A fully transparent supply chain works with less inventory, as a transparent supply chain is built on clear agreements and communication on incoming and outgoing inventory. A less transparent supply chain, on the other hand, works with more 'safe buffers'. Because it is not clear enough what inventory will be going in and out in a less transparent supply chain, these buffers are kept making sure that the inventory will always suffice. The Marketing Manager of Tata Steel provided an example of one of their implemented systems: To be as transparent as possible about the availability and importance of incoming parts in the warehouse of TATA steel, a 'traffic light' system is being used. In this system, black means a black-out, in which the part is not available. Red indicates a critical situation; orange indicates alertness and green indicates no problems This system improves the decision-making process and keeps employees informed about incoming parts, enabling better inventory management. Besides that, such transparency initiatives ensure optimal use of space and low inventory requirements.

4.1.3.2 Inventory Agreements

By openly sharing information such as inventory levels, demand forecasts, and production plans, companies and suppliers can work together to address inventory management challenges. Transparent cooperation strengthens relationships and encourages buyers and suppliers to help each other out if needed. The Operations Manager of Esschert Design provided an example concerning breeding tables. Esschert had a lot of

purchase orders open with a supplier for these breeding tables, and these had also been produced already. It only later became known that not as many breeding tables would be sold as before, which meant that Esschert was going to be left with a lot of (unsold) stock, while they did not have much space left to store this. Because this company was transparent about this situation, and both the supplier and Esschert consider each other as partners, they were able to come to an agreement where these breeding tables could be left at the supplier first, before Esschert sold these articles.

4.1.3.3 Direct shipments

Clear communication combined with a transparently shared production process could even enable companies to skip the warehouse. Especially concerning bigger deliveries with close customers, companies are willing to prioritize such orders and ship deliveries directly from the factory to avoid inventory costs. This does not only require very close coordination of the timing of shipments, but it requires close communication with clients as well. The Operations Manager of Esschert mentions that he often takes care of these operations.

4.1.3.4 Waste Management

By having a transparent overview of what waste is created during the production process or within the company, it is easier to organize waste management processes, such as recycling. Such a transparent overview ensures that there is an insight into how much waste is created, and so it can be determined and arranged more quickly where this waste goes. Jumbo is very transparent in their recycling processes. The supermarket knows exactly what waste is left over and processes this waste through recycling arrangements. A good example are the orange peels left over after people tap fresh orange juice in the supermarket. These peels are collected at all Jumbo's branches and are brought to a processor, who manages to make shampoo from these peels.

4.1.3.5 Creation of Scarcity

Transparency in inventory management can also be leveraged strategically to create a sense of scarcity and drive customer demand. By consciously maintaining low stock levels and transparently communicating this scarcity, companies can stimulate customer interest and encourage purchasing behavior. General Manager of Holland Pharma mentioned that this company sometimes maintained low stock levels on the website, so people are more likely to buy these products.

4.2 Disadvantages of Supply Chain Transparency

4.2.1 General Disadvantages

4.2.1.1 Being Too Transparent

Sharing too much information can have negative consequences as well. Especially for companies that offer a big range of products, it often occurs that too much data of an article is being disclosed, which for example eventually helps competitors find out where the article comes from. It is essential to make a distinctive in what information to share and what not. Especially the further details regarding innovation projects and supplier information should be withheld publicly, to maintain uniqueness. In markets with lots of competition and narrow profit margins, it cannot be afforded for others to run with confidential ideas or know under what conditions deals are

being made. The Supply Chain Manager of Dura Vermeer always sticks to a rule of thumb regarding transparency: "It is important to not forget to disclose any details of a delivery your company will fulfill but keep all information regarding purchase prices and your own supplier data to yourself. So, disclose operational data, but keep commercial and financial data to yourself".

4.2.1.2 Cultural Differences

In some regions, supply chain processes seem to be (mainly digitally) way less advanced compared to Western companies. Companies operating in regions such as South-Eastern Europe and Asia do not possess the facilities to be transparent about their data. Information from these companies is not only difficult to obtain, but this information also takes a long time to obtain because none of these processes run automatically. In some cultures, the concept and usefulness of transparency has not even been introduced yet. Because of the difference between these cultures, transparency is often more difficult to implement.

4.2.2 Disadvantages for Innovation Practices

4.2.2.1 First Walk, Then Run

Whilst implementing new innovations into a company's information systems, all stakeholders must be considered in a sense that this innovation is understandable and useful for the people who need to use it to avoid disruptions and optimize the innovation's utility. Do not make things too complicated, as if often happens that especially the less schooled / technical employees have difficulties adopting the newly needed skills. If needed, it is important to teach new functions and technicalities to employees in a correct time frame. It often happens that more transparent methods of working are being introduced in a company, but people continue working the traditional way because they do not know how to use this innovation. The ERP Specialist from ETC Nederland emphasizes the importance of possessing these skills before implementing transparency initiatives: "First walk, then run".

4.2.2.2 Stubbornness

Another reason that innovations sometimes fail or are not accepted within a company is simple stubbornness of employees. People often do not want to change their way of working within a company, because they feel like it works better for them to do it in their own traditional way. Mainly because the increasing willingness to link departments together within the supply chain, task descriptions change, and sometimes enlarge. The ERP Specialist argues that it is sometimes true that the traditional way of working is more efficient for an employees' own role, but the new way of working contributes in a better way to the entire supply chain.

4.2.2.3 Failing Projects

In the field of developments regarding information systems, companies sometimes want things that cannot be realized yet. Forward-looking ideas do not only lead to progress, but they could also lead to unrealistic expectations. this can cause projects that have already cost time and money to be stopped. Jumbo wanted trucks that loaded containers with a long arm just like a garbage truck. After recruiting an external party and drafting an entire plan, Jumbo still pulled the plug because it was too unreliable technically. It is important to be transparent about the risks involved in innovative projects, and consider these, so that it can be found out early enough whether the

project can be realized or not. This would eventually save a lot of time and costs which can be invested in other innovation ideas.

4.2.3 Disadvantages for Inventory Management

4.2.3.1 Up-to-date Stock Management

Keeping track of stock levels can pose a lot of challenges and disadvantages. It can easily happen that stock data is entered incorrectly by an employee, or a few products are put in a different place. Tracking stock quantities as an essential part of a transparent supply chain, as a false visualization could lead to many disruptions in the supply chain. Especially in chains with multiple branches, it is a big challenge to keep track of stock levels. However, if this is not done, companies must be attentive that the right amount is available. It is being argued that this problem would make companies more reactive again instead of proactive. To counter this problem, checks such as cycle counts are done regularly. It seems that transparency regarding inventory management sometimes is more of a challenge than an advantage.

4.2.3.2 Disclosing Stock Quantities

In section 4.1.3.4, the advantages of consciously maintaining low stock levels to stimulate consumer interest were already mentioned. This phenomenon can backfire easily as well, as these products will quickly run out of stock, leaving no supply for a while. While products with low stock quantities may look stimulate customer interest, this could work the other way around with products with high stock quantities. All in all, it is being argued that it is better not to disclose any stock quantities.

4.3 Main Purpose and Moderators

Based on all the information gathered through the interviews; three big stakeholders regarding transparency in the supply chain could be identified. Information Systems are more of a moderator to enable transparency, and the Efficiency Increase is the main purpose of transparency. However, Mutual Trust can be seen as both a purpose and a moderator.

4.3.1 Information Systems

The importance of information systems in transparency initiatives for both innovation and inventory management initiatives has been stated many times. All interviewees argued that all their supply chain information is shared throughout their companies, which makes it easier for them to share this information with other companies as well. Information systems allow many steps in the supply chain to be skipped as they are automated. Delwi-Groenink implemented internal memos in their ERP system, to add additional info which is useful to facilitate agreements regarding orders or deliveries throughout the entire company. In this sense, information systems improve transparency internally. Tata Steel has created personalized dashboards for several regular customers, in which they can enter their usage themselves. This ensures maximum transparency with close customers in a single system, which makes inventory management easier. As this is easy to see, suppliers can work more flexibly and customers and deal better with changes in supply and demand. In this sense, information systems improve transparency externally. Information systems give a good insight into the placement of the inventory as well. And, as mentioned before, the quantities of the inventory are also being maintained by information systems. Most of the innovation projects named by the interviewees were related to information systems as well. Information systems are also being

used on a bigger level. Jumbo keeps a close eye on their stock through information systems as well, to extract sales data about the 687 supermarkets the company has in the Netherlands. Because of this transparency, they know exactly which products are sold a lot at which times, and they can respond fantastically to this from a marketing and stock perspective.

4.3.2 Mutual Trust

From the interviews, it can be argued that mutual trust between customer and supplier is not only considered as a moderating variable, but as an incentive to eventually build on as well. Transparency initiatives enable relationships to trust each other more, and this mutual trust which is being created by transparency initiatives enables an increase of transparency in a buyer/supplier relationship. So, when mutual trust is achieved, transparency activities are strengthened and increase.

Trust has a positive effect on the transparency of relationships. In a trustful relationship, by sharing vulnerable information, a sense of trust, mutual commitment and a favorable position are being generated. It is essential to make yourself vulnerable as a company as well. As stated by the Supply Chain Manager of Dura Vermeer: "If you hold the cards to yourself, you will lose very often". Being transparent in the first place, creates a sense of trust in relationships, as no important information is being withheld. The ERP specialist emphasizes the increasing importance of transparent communication to generate trust as well. He argues that "Sharing is the new having", indicating that by establishing transparent relationships and close connections, companies can acquire the necessary information for success.

An example that demonstrates the advantage of transparency is the implementation of a two-bin system with a close relationship at Delwi. The supplier takes care of replenishing the inventory of Delwi's nuts and bolts, relying on trust. Although this approach potentially involves higher costs, the efficiency gains outweigh the disadvantages. In this example, trust enables skipping intermediate steps and achieving cost savings through efficient operations.

4.3.3 Efficiency Increase

The one main purpose which came back in nearly every transparency initiative named in the interviews: increasing efficiency. Whilst asking the interviewees about their interpretation of supply chain transparency, all answers were related to an increase in efficiency as well. There has not been an interview where the interviewee argued that efficiency or an aspect of efficiency is not the main purpose of transparency initiatives. Companies are always on the lookout for ways to increase their efficiency to keep up with the times and their competitors, and transparency has grown as a means to increase efficiency.

5. DISCUSSION AND IMPLICATIONS OF RESULTS

This research on the advantages / disadvantages as well as motivations for engaging in supply chain transparency with regard to innovation and inventory management provides valuable insights by implementing real-life scenarios through interviews. The key results of this research are found on what advantages, disadvantages and main moderators / purposes come along with the implementation of transparency in the supply chain. First, by interviewing about the advantages, such as fluentness, automation and cooperation, this research

highlights the potential benefits of transparency. In total, 12 key advantages were found on this subject. Furthermore, by interviewing about the disadvantages, such as being too transparent, stubbornness, and failing projects, possible complexities of transparent practices are being highlighted. In total, 7 disadvantages were found on this subject. Besides that, information systems have been found to be a moderator to successfully implement transparency, an efficiency increase has been found to be the ultimate purpose, and mutual trust is found to be both a purpose, and later on, a moderator of supply chain transparency. This qualitative analysis provides a deeper understanding of the considerations of implementing supply chain transparency into the supply chain. This study's consideration of innovation and inventory management provides a unique perspective, which has not been researched sufficiently yet. Overall, this research offers an engaging analysis of a critical upcoming component in the field of supply chain management, which makes it a valuable contribution to this respective field.

5.1 Discussion of results

Based on the results of the interviews, it can be concluded that supply chain transparency generally contains more advantages than disadvantages. Transparency fosters smoother operations internally and externally. This enables a better visualization of data, reduces disruptions, and allows for more time to react to unexpected events. It fosters a sense of togetherness among employees and facilitates clearer agreements between companies as well. However, being too transparent, thus sharing too much information such as commercial and financial data can aid competitors. Besides that, cultural differences can complicate transparency initiatives.

Information systems enable the use of transparency and innovation practices to automate tasks and improve efficiency. This transparency facilitates data sharing between systems, which leads to improved collaboration and alignment of operations. These transparent initiatives save time, enabling room for optimization and innovation projects. Besides that, showcasing innovative activities helps companies position themselves as forward-thinking, boosting their reputation. On the other hand, implementing innovations requires an understanding and usability for al stakeholders. Employees may struggle to adopt certain innovation changes. Resistance to change among employees, especially when an innovation replaces a traditional way of working, can hinder the adoption of innovations as well. These struggles and stubbornness can be countered by introducing innovations gradually and providing necessary training and support. Innovation ideas can sometimes lead to unrealistic expectations as well, which would waste time and resources.

Transparency in inventory management allows for better prioritization of inventory and reduces the need for excessive safety stock. Being transparent about these lower stock levels can even create a sense of scarcity, which could boost customer interest. Openly sharing inventory information fosters collaboration between companies and suppliers, helping to address inventory management challenges. This could result in further efficiency activities such as direct shipments from the factory directly to the customer. However, keeping accurate track of stock levels can be challenging, and could entail potential errors in data entry or misplaced products. Especially for bigger companies, it may be costly and difficult to constantly keep track of these quantities. While maintaining low stock levels can stimulate customer interest, it can backfire if products quickly run out of stock, leading to supply shortages.

5.2 Implications for Literature

5.2.1 Contribution of Advantages

It can be argued that this thesis serves as an exploration into a topic that will continue to be closely associated with supply chain transparency in the future: information systems. Srinivasan et al. (2017) developed a model that clearly demonstrates how information systems can contribute to a fully transparent process. Yet, there still is limited existing literature that effectively connects these two concepts. This thesis provides a clear indication of how information systems could enable innovation initiatives in numerous ways.

Brun et al. (2020) and Gardner et al. (2019) have already highlighted the importance of establishing and maintaining strong relationships to foster transparent collaborations. However, existing literature often fails to demonstrate the full potential and possibilities that arise from such relationships. This thesis, utilizing information systems as well, clearly illustrates the initiatives that can be undertaken between buyers and suppliers to improve the overall efficiency of the process, such as sharing forecasts or synchronizing systems.

As already mentioned in section 2.3, most literature on supply chain transparency leaves out inventory management practices, making it difficult to find relevant literature about transparency regarding inventory management practices. However, through interviews conducted for this study, it became evident that many interviewees provided valuable insights on how they applied transparency initiatives and identified potential opportunities regarding inventory management. While studies like Ageron et al. (2013) and Gutierrez et al. (2020) briefly mention transparency initiatives that improve logistics within organizations, there is not a lot of research that highlight the specific impact of transparency on inventory management activities. In contrast, this research highlights many ways in which transparent initiatives can improve inventory management systems. Some of these improvements can be implemented internally, and some can foster transparency and trust with both customers and suppliers. Transparent utilization of information systems thus enables even more possibilities in inventory management practices.

5.2.2 Contribution of Disadvantages

Literature regarding supply chain transparency often leaves out the effect that transparency initiatives have on employees. However, considerable research already exists on how employees may react unfavorably to organizational changes. For example, Rehman et al. (2021) conducted extensive research, highlighting the significance and underestimation of resistance to change. Similarly, this study highlights the disadvantages that can arise due to resistance to change, but with a specific focus on the implementation of transparency initiatives. This research on transparency, especially for situations where the use of information systems assists transparency initiatives, is more of an examination of the uncertainties, resistance to change, and skepticism regarding new "transparent" systems, as employees often struggle with understanding and adapting to these systems.

In literature regarding transparency, the costs associated with implementing transparent activities are often named as a disadvantage. There is an emphasis on the requirements and achievements necessary for successful transparency projects. However, there is little to no mention of how excessive enthusiasm and overly ambitious ideas can sometimes hinder

realization. This thesis sheds light on and provides examples of situations where transparency initiatives may initially appear promising but ultimately fail, resulting in a loss of money.

As mentioned above, the known advantages of transparency initiatives are often left out in literature. On the contrary, the disadvantages of transparency in inventory management mentioned in literature are already named during the interviews. Doorey (2011) acknowledges the difficulties regarding time and financial investments required to maintain accurate inventory levels, which is argued during the interviews as well.

Furthermore, this research provides a unique perspective by incorporating insights from experienced professionals within the supply chain. While many studies conceptualize and explain the disadvantages, this study extends beyond by also providing real-life examples of transparency projects that ultimately failed due to mentioned disadvantages.

5.3 Implications for Practice

To start with, it has been argued that transparency and any optimization initiatives can only be implemented correctly in supply chain practices if the supply chain is considered stable. It does not make any sense to make any analysis or optimization reports if there is no foundation. The importance of a state-of-the-art IT system should not be forgotten, as transparency initiatives cannot be implemented correctly without these IT systems. Once this foundation is introduced, there are more aspects to consider:

5.3.1 Accurate Implementation

Moving on from the foundation, the implementation must be right down to the last detail. It is being inferred that a system that operates poorly or inadequately can be worse than having no system at all. While analyses and optimization reports are valuable, they will not be effective if the foundational aspects are not in order. Regarding transparency initiatives with partner companies, constant communication should never be forgotten. Evaluation discussions and clear agreements are vital. Regular communication and evaluation help ensure transparency initiatives progress smoothly and deliver the desired outcomes.

5.3.2 Managing Support

The shift from suboptimization to optimization, so the shift from incentives within departments to mutual incentives within the entire company, requires sufficient leadership and guidance to ensure successful implementation. Clear direction and management support are necessary to achieve the desired results. Employees should be considered heavily in the implementation of transparency initiatives. Gradually introducing transparency into the supply chain allows for a smoother transition and reduces the likelihood of oversight. It is important to ensure employees are ready and prepared for planned transparency initiatives. Complexity should be minimized to prevent demotivation or lack of trust in new systems. Providing training and support can help employees adapt to the changes.

5.3.3 Collaboration and Building Trust

As stated in 4.3.2, trust is a critical aspect of transparency. It is important to establish trust both internally and externally. Building trust requires upfront investment, as it can easily be broken if transparency is compromised. But, while occasional trust issues may arise, lack of transparency creates greater mistrust. Openly and honestly engaging with customers and

suppliers fosters a transparent relationship, leading to mutual engagement and trust. It is important to be honest, even in situations if something promised in advance cannot be fulfilled. Competitors should not be avoided in collaboration initiatives but should not obtain confidential information either. Organizations may be cautious about sharing information but can still work together with competitors to achieve mutual improvements. Collaboration should focus on areas where there is a shared interest in optimization and improvements.

5.3.4 Strategic Transparency

As mentioned in 4.2.1.1, it must be considered what aspects of a business would benefit from transparency. Operational data, such as orders and deliveries, can be shared openly, while commercial and financial data may be kept confidential. Finding the right balance between transparency and confidentiality is crucial.

5.4 Limitations and Future Research

During the review of the research process and results, some challenges and important discoveries shaped the direction of this study. Initially, the plan was to conduct this research within a single company and delve deeper into their activities regarding transparency. However, difficulties finding a company to conduct this research came along the way. Mainly because a company possesses the valuable information but nothing substantial can be given in return, this could not be realized. This led to the decision to adjust the focus of this research. And thus, the scope of this research was broadened. To do this successfully, various aspects of the supply chain have been approached. Through LinkedIn and assistance from a recruiter, people holding different roles within the supply chain were connected. By leveraging their experiences and insights, stories from multiple perspectives within the supply chain have been told and declared.

Based on the analysis of the literature on transparency in the supply chain, the anticipation was that a transparent supply chain would offer more benefits than drawbacks. The findings of this research aligned with this expectation. Additionally, it was expected that transparency would be closely related to customer-supplier relationships, and this hypothesis proved to be true as well.

One aspect which not initially considered but found to be crucial in the implementation and use of transparency in the supply chain was the extensive use of information systems. Most of the innovation projects mentioned by the interviewees highlighted the role of information systems, such as ERP systems, in providing transparent visibility of inventory management throughout the entire organization. In retrospect, the importance of this moderator and its impact on the research should have been recognized. As a result, an interview with an ERP specialist was arranged, to gain further insights into this aspect.

It was initially planned to conduct interviews within a single company. Three different interview protocols have been prepared for this: one for purchasers, one for external suppliers, and one for internal employees. However, as the focus of this research shifted towards interviewing individuals with diverse roles in the supply chain, the decision was made to streamline the process and utilize a single standardized protocol. This protocol included all the covered topics, allowing it to go deeper into the interviewees' experiences in relation to transparency. While this adjustment enabled it to gather valuable insights from a wider range of perspectives, it also presented a limitation in terms of professional consistency. Each interviewee possessed different levels of knowledge and expertise, some more familiar with specific aspects than others. So, the uniform protocol might have resulted in a less precise exploration of certain topics, as individuals were not equally equipped to provide in-depth information on every aspect. This limitation should be acknowledged within the context of this research, as it may have influenced the breadth and depth of the data collected. Despite this constraint, all interviewees were able to their experiences and perspectives professionally in every aspect, providing a comprehensive view of the subject matter within the constraints of the revised research approach. The interview protocol that was used for all the interviewees is the last protocol in the appendixes, introduced with 'General'.

During the interviews, it became evident that future plans regarding transparency are focused on advanced visibility and tracking capabilities. For example, Delwi-Groenink expressed their desire for a system that allows live location tracking of orders. Companies also expressed the need for transparent collaboration systems with customers and suppliers to streamline processes. Tata Steel is working on personalized dashboards for key customers, incorporating all available data, while Esschert Design aims to develop a system that provides suppliers with precise insights into their purchasing and selling activities. The ERP specialist highlighted the increasing need to integrate various systems, enabling collaborative work between companies, by saying he had to synchronize a lot of systems for multiple companies together lately.

Based on these findings, I would recommend further research into transparency through an analysis of information systems, with an emphasis on synchronized processes and maximum visibility within the systems, as these were mentioned in the future plans regarding transparency of all interviewees. Overall, this research journey involved adapting to challenges, uncovering new insights, and recognizing the significance of information systems in achieving transparency in the supply chain.

Appendix A

The Interview Protocol

Purchaser

Introductory Questions

- What is your position within the purchasing department?
- Are you familiar with the term 'Supply Chain Transparency'? (If not, explain)

Questions about Supply Chain Transparency

- How would you describe the actions that the firm you work for undertakes regarding supply chain transparency (perhaps in the department you work in)? Some examples as well?
- Could you explain the main motivations for implementing supply chain transparency within the firm you work for?
- Based on past experiences, could you name the main advantages of supply chain transparency for the firm you work for? Why / Explain?
- On the other hand, could you name the main disadvantages or challenges which you have experienced regarding supply chain transparency for the firm you work for? Why / Explain?

Questions about relationships with different suppliers

- As a purchaser, how do you maintain your relationships and agreements regarding purchases with suppliers?
- How would you classify this firm regarding transparency towards suppliers?
- How would you classify this firm regarding transparency towards suppliers?

Questions about innovation management

- How do you approach innovation within your department? To what degree are you involved in collaborative innovation projects with suppliers? Perhaps personalized products / working on improvement together.
- Could you describe any advantages / challenges your organization or department has faced regarding transparency in innovation practices?

Questions about inventory management

- How is the inventory management system being set up in your firm?
- Could you describe any advantages / challenges your organization has faced regarding transparency in inventory management practices?

Future plans

- Could you describe the plans within your firm for future engagement in supply chain transparency if there are any? And how do you see these plans evolve?
- Are there any examples of what you wish the firm you work for or your department had done differently regarding supply chain transparency?

Supplier (preferably account managers)

Introductory Questions

- What is your role in the supplying firm?
- Can you tell me something about the relationship the firm you work for has with (…)?
- Are you familiar with the term 'Supply Chain Transparency'? (If not, explain)

Questions about supply chain transparency

- How would you describe the actions that the firm you work for undertakes regarding supply chain transparency (perhaps in the department you work in)? Some examples as well?
- Could you explain the main motivations for implementing supply chain transparency within the firm?
- Based on past experiences, could you name the main advantages of supply chain transparency for the firm you work for? Why / Explain?
- On the other hand, could you name the main disadvantages or challenges which you have experienced regarding supply chain transparency for the firm you work for? Why / Explain?

Questions about the relationship of buying firm (…) and the supplier

- How long have you been the supplier of (…)?
- Would you classify your relationship with (…) as strong or weak and why? What aspects are the main factors for this?
- How transparent does (…) appear to you? Does this have positive or negative consequences for your relationship and in what sense?

Questions about innovation management

- How do you approach innovation within your company? And in doing so, how do you involve customers such as (…) in these processes? Maybe even collaborative processes?
- Could you describe any advantages / challenges your organization has faced regarding transparency in innovation practices?

Questions about inventory management

- How is the inventory management system being set up between your firm and (…)?
- Could you describe any advantages / challenges your organization has faced regarding transparency in inventory management practices?

Future plans

- Could you describe the plans within your firm for future engagement in supply chain transparency if there are any? And how do you see these plans evolve?
- Are there any examples of what you wish the firm you work for had done differently regarding supply chain transparency? And how do you make sure this will never happen again in the future?

General

Introductory Questions

- Can you tell me something about your current position within this firm?
- Are you familiar with the term 'Supply Chain Transparency'? (If not, explain)

Questions about supply chain transparency

- How would you describe the actions undertaken by your firm regarding supply chain transparency? Do you have any examples?
- What influence does your role in the firm have on supply chain transparency practices within the firm?
- Could you explain the main motivations for implementing supply chain transparency within the firm?
- Based on past experiences, could you name the main advantages of supply chain transparency for the firm you work for? Why / Explain?
- On the other hand, could you name the main disadvantages regarding supply chain transparency which may have caused challenges as buyer or supplier for your firm? Why / Explain?
- How would you classify this firm regarding transparency initiatives? What could be done more perhaps?

Questions about buyer/supplier relationships

- What approaches does your firm normally use to build and maintain buyer/supplier relationships? (Lot of contact / Regular visits / agreements etc.)
- How would you classify this firm regarding transparency towards suppliers?
- What are the main benefits or difficulties you have experienced whilst maintaining buyer/supplier relationships? Examples?

Questions about innovation management

- How do you approach innovation within this firm?
- In what sense is this firm disclosing information about innovational practices
- Do you have any examples of collaborative innovation projects with suppliers this firm is involved in? Perhaps personalized products / working on improvement together.
- Could you describe any advantages / disadvantages or challenges your organization has faced regarding transparency in innovational practices?

Questions about inventory management

- How is the inventory management system being organized in the firm that you are working for? Which departments are concerned with inventory management and is it visible throughout the entire firm?
- How do you, as a firm, make your suppliers aware that you have low stock and need replenishment?
- Could you describe any advantages / challenges your organization has faced regarding transparency in inventory management practices?

Future plans

- Could you describe the plans within your firm for future engagement in supply chain transparency if there are any? And how do you see these plans evolve?
- Are there any examples of what you wish the firm had done differently regarding supply chain transparency? And how do you make sure this will never happen again in the future?

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