The first step towards supply chain collaboration: sharing information between the manufacturer and wholesaler

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Abstract

Frymaster & Co. is a food manufacturing company that struggles with low forecast accuracy on frozen products for their sales towards wholesalers. Due to its low forecast accuracy and its rise in customer demand, it has been struggling with its capacity: 26.5% of customer demand could not be met. This only occurs when their customers are wholesalers, but surprisingly does not when their customers are retailers; wholesalers had a 14.3 per cent point lower forecast accuracy compared to retailers. The main difference found is that retailers are sharing a lot of information and wholesalers are not, which leads to believe that the lack of information sharing is the cause of the low forecast accuracy with wholesalers. So, to improve the demand planning practices of Frymaster & Co., this research will answer the following question: "What are the first steps for a food manufacturer to improve demand planning by gaining information and insights from their wholesalers?". To answer this question, a literature study found two main aspects related to sharing information: the availability of information and the willingness to share this information. Several enablers and restrictors were found for both these aspects such as historical sales data, POS data for the former and the lack of trust and incentives for the latter.

To understand why wholesalers are not sharing information, descriptive, qualitative research was done through semi-structured interviews which were held with demand planners of five of the top largest wholesalers in The Netherlands. The interviews showed that the main barrier to sharing information was the lack of IT capabilities to efficiently and effectively do so. Also, incentives were perceived as the main enabler to share information, even though no information was shared. This led to the first step of improving the demand planning practices by sharing information to be invested and building an IT infrastructure with its main partners so information can easily be shared among the supply chain. To do this, partners need to design the infrastructure together to ensure alignment of the data available and management needs to be convinced of the return on investing in IT capabilities by highlighting the benefits of sharing information (such as increased performance KPIs). This, together with a general focus on trust and reciprocity, will ensure Frymaster &Co. can optimize its demand planning process by sharing information.

Although the external validity of this research is narrow, it showed that five of the largest wholesalers in The Netherlands do not have sufficient IT capabilities for their demand planning practices in place that would allow them to efficiently share information within the supply chain. This has not been in line with studies done over the past years, which showed an increase in supply chain collaboration by sharing information. It is therefore advisable to conduct more research on the (lack) of sharing information upstream of the supply chain.

All in all, this study shows that supply chains first need to invest in effective IT systems that take away the barriers to sharing information, because only then supply chain collaboration by sharing information can efficiently and effectively take form between food manufacturers and wholesalers which would allow food manufacturers such as Frymaster &Co. to optimize its demand planning process by using more accurate data to improve their forecast accuracy.

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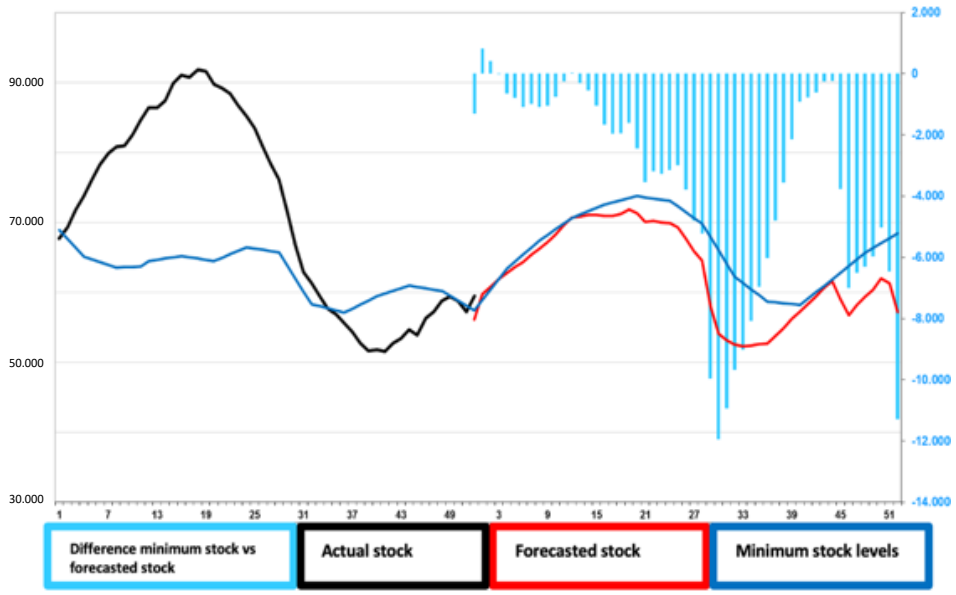
I. Introduction

Since its introduction in the late 1990s, demand planning can no longer be ignored in organizations. It is fundamental for making good predictions of the future which is important because it ensures that the right products are at the right place at the right time to allow for the best use of capacity which then contributes to the key performance indicators ("KPIs") such as flexibility, cost, delivery, and quality performance to meet customer demands and maintain a competitive advantage (Petropoulos & Carver, 2019; Wook Kim, 2006). In attempts to foresee future demands as accurately as possible, ensure these high-scoring KPIs, and ultimately serve the customer as well as possible, this demand must be planned before it is known for certainty. That is why, the demand planning process includes statistical forecasting based mainly on historical data and subjective input from demand planners and it includes the concurrence between marketing, sales and operations and adjustments made after such internal meetings (also called: "S&OP") (Kilger & Wagner, 2008). This results in a demand forecast, which allows organizations for several time ranges (long-term, middle-long-term, and short-term) to predict future demand so they can plan their production schedule, ensure enough materials, determine safety stocks, and make (future) capacity plans. However, rising customer demands for shorter lead times, constant availability of products and a wider variety of types and flavours of products make the predictability of future demand more complicated.

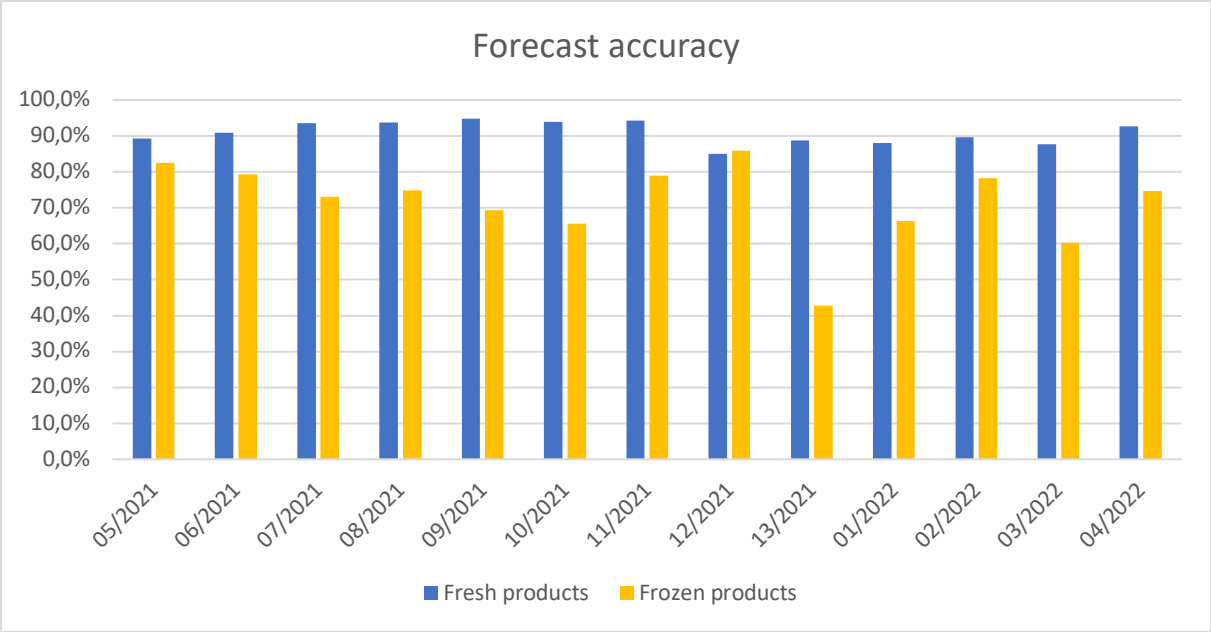
This increasing difficulty for accurate demand planning is also felt by a food manufacturer in The Netherlands, which from now on will be called Frymaster &Co. for anonymity reasons. Frymaster &Co, with a current annual turnover of approximately 900 million euros is experiencing low levels of forecasting accuracy. This is currently problematic for the company, as a sudden rise in customer demand in the last year caused a capacity shortage, as is shown in Graph 1 where the blue bars indicate the shortage of required stock (i.e.: forecasted stock minus minimum stock levels) caused by the capacity shortage. The low forecasting accuracy is in this case problematic because Frymaster &Co has three product types with hundreds of different Stock Keeping Units ("SKUs") and as raw materials and capacity are scarce, a high forecast accuracy allows the purchasing department to effectively procure all the right materials in time to ensure the feasibility of the production. Lastly, as Frymaster &Co is a food manufacturer in various multi-tier supply chains, the shelf life of its products is also limited, wherefore inventory levels need to be optimized in line with future demand to minimize waste and reduce costs.



Graph 1. Shortage on stock of Frymaster &Co

As a result of this sudden increase in demand, the capacity constraints, and the scarcity of raw materials; the service level towards its customers was declining and Frymaster &Co was unable to deliver all its requested customer demand; about 26,5% of its demand could not be delivered to its customers. To go into detail on this, Frymaster &Co is mainly experiencing this low forecasting accuracy for one product type, the "Frozen Products", as the forecast accuracy of another product type, the "Fresh Products"[1], remained relatively high and this remained high. This might be attributed to the low shelf-life of the Fresh Products because customers are not able to maintain high levels of inventory for these products due to the low shelf life and thus cannot hoard products, because they want to avoid waste, which ensures that regular smaller inbound flows of Fresh Products are requested. A more accurate overview of the discrepancies in forecasting accuracy between these two product types is shown in Graph 2 which shows that Fresh Products have on average a 19.3 percentage points higher forecast accuracy. All this raises the question as to how the forecast accuracy can be improved for the Frozen Products, to raise the service levels again and ensure the fulfilment of all customer demand.

[1] As mentioned before, Frymaster &Co has three product types, but the last product type is not considered for the rest of this research as this product type is outside the strategic scope of the operating company of Frymaster &Co in The Netherlands and therefore not within the scope of this research.

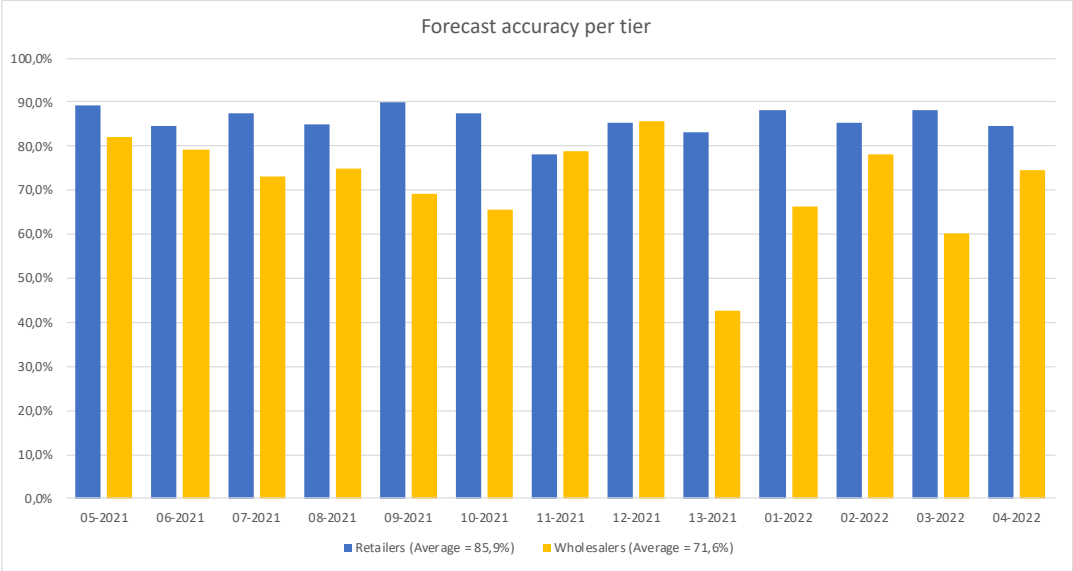


Graph 2. Forecast accuracy of product types "Fresh" and "Frozen"

Now, something interesting is happening inside the company. As mentioned before, Frymaster &Co. operates with their Frozen products in two multi-tier supply chains (as shown in Figure 1) but only in one of them, does the low forecast accuracy of the Frozen Products occur – only in the first presented supply chain, with its food service wholesalers (hereinafter referred to as "wholesalers") in the link. These discrepancies between the forecast accuracy levels of retailers and wholesalers are shown in Graph 3. Here it shows that the average difference in forecast accuracy between retailers and wholesalers is 14.3 percentage points. This difference might be due to several reasons. First, retailers have more end-user data available which they can share with Frymaster &Co which decreases possible bullwhip effects (Chen et al., 2000; Fransoo & Wouters, 2000; Paik & Bagchi, 2007). Second, retailers often have sophisticated requirements to meet consumer demands, such as "Efficient Consumer Response" planning and a high focus on minimal out-of-stock levels (Corsten & Gruen, 2016; Hübner et al., 2013). Lastly, the retailers directly serve the consumer while wholesalers sell their products to various kinds of end-users such as catering, accommodations, and (fast-food) restaurants. So, with retailers selling directly to consumers, it subducts one tier out of the supply chain (see: Figure 1). Retailers on the other hand only have one kind of end-user (the customer) so this simplifies the supply chain. So, since wholesalers sell their products to various kinds of end-users, predicting demand might become more difficult as all these end-user segments have different needs, behaviour, and different seasonal demands. In addition, wholesalers are also currently not sharing information on future promotions and stock levels, while retailers are doing so. This leads to sudden peaks in demand in the wholesaler supply chain which Frymaster &Co was not made aware of beforehand and thus not prepared for as there are already capacity constraints.

All this shows that there are several bottlenecks in the demand planning process with wholesalers that might be attributed to the lower forecast accuracy for the frozen products sold to wholesalers. The difference seems to be the amount of shared information between retailers and wholesalers, yet it is unclear why wholesalers are currently not sharing information with Frymaster &Co. and its wholesalers.

Figure 1. Supply chain overview Frymaster &Co



Graph 3. Forecast accuracy of retailers and wholesalers

So, for Frymaster & Co. to improve its forecast accuracy, more information is needed on from wholesalers. Based on this, it is likely the overarching discrepancy between the wholesalers' supply chain and retailers' supply chain that causes the dissimilarity in the forecast accuracy is the level of information shared upstream in the supply chain. So, sharing information within the supply chain might be a reason for optimizing the demand planning process, and with that the forecast accuracy, and thus the production plan, which might make sure again that all customer demand is fulfilled, that the customer service levels will be improved, and that the company is more prepared to fulfil customer demand. Furthermore, food manufacturers in general might draw from this research on the types of information that are needed to successfully implement supply chain collaboration and evaluate whether some of the biggest wholesalers are willing to share information with them. They can then make efforts to obtain the same kind of information from their wholesalers as this improves their resources, output, flexibility, and other performances (Yigitbasioglu, 2010).

To sustain this, over the past few years, academics have found that through supply chain collaboration, more information is shared which has positive effects on all other kinds of performance KPIs (Arzu Akyuz & Erman Erkan, 2010; Costantino et al., 2014; Flynn et al., 2010; Trapero et al., 2012; Wook Kim, 2006). The effects of supply chain collaboration range from minimizing costs, improving customer service levels, increasing sustainability and higher customer satisfaction. That is why, sharing information through supply chain

collaboration can create improved demand planning practices as better indications of future demand can be made (Fransoo & Wouters, 2000; Rai et al., 2006).

However, this supply chain collaboration through sharing information within the supply chain of Frymaster &Co. and its wholesalers has not been realized yet. Research has shown that this was (or might still be) a common struggle in Europe as often supply chain collaboration is a more academic phenomenon rather than a reality (Bagchi et al., 2005). Thus Frymaster &Co, and many other organizations, struggle to create, implement and sustain supply chain collaboration wherefore demand planning processes may fall behind.

So, considering that Frymaster &Co wants to optimize its demand planning process for frozen Products within the multi-tier supply chain including the wholesalers to tackle its capacity constraints and optimize its customer service level, more information needs to be gathered on its end-users from its wholesalers. However, current academic literature has until now mainly focused on the positive effects of supply chain collaboration when it is already in place. Furthermore, multiple studies show that supply chain collaboration is not common practice (yet) within most organizations (Bagchi et al., 2005; Childerhouse & Towill, 2011). As for Frymaster &Co., it is unclear to which extent wholesalers have data available that can be shared and if the data is available, why wholesalers currently are not sharing it. The former might be due to distrust as this is a restriction of sharing information (Zaheer & Trkman, 2017). However, this does not specify the type of information a wholesaler might be reluctant to share, since some types of information might be valuable to a food manufacturer but do not involve privacy risks or sensitive information of the wholesaler (Eurich et al., 2010). Therefore, the implications of this research on the availability of information and willingness to share information might contribute to the academic relevance of the achievability of supply chain collaboration.

The goal of this research is to make the first steps for Frymaster &Co. towards supply chain collaboration through sharing information between Frymaster &Co. and its wholesalers. As this form of supply chain collaboration is not currently in place for Frymaster &Co. the first steps need to be made to identify possible enablers or drawbacks of supply chain collaboration. These first steps will include will two main building blocks of information sharing: the availability of, and willingness to share information. Based on this, the following research question arises:

What are the first steps for a food manufacturer to improve demand planning by gaining information and insights from their wholesalers?

To answer this question, this research will first focus on two building blocks of sharing information namely, the availability of information to optimize the demand planning and the willingness to share this information because as shown by Bagchi et al. (2005), organizations are cautious when it comes to sharing information with other tiers in the supply chain. Furthermore, Vereecke et al. (2018) showed in their research that even organizations with a high demand planning maturity often lack sharing information with suppliers.
Based on this, interviews will be held with wholesalers to detect whether they have this information available and whether they are willing to share the information. Based on these interviews, recommendations will be made for Frymaster &Co. on how they can optimize

their demand planning process by using this information. A visual overview of the research outline is given in Figure 2.

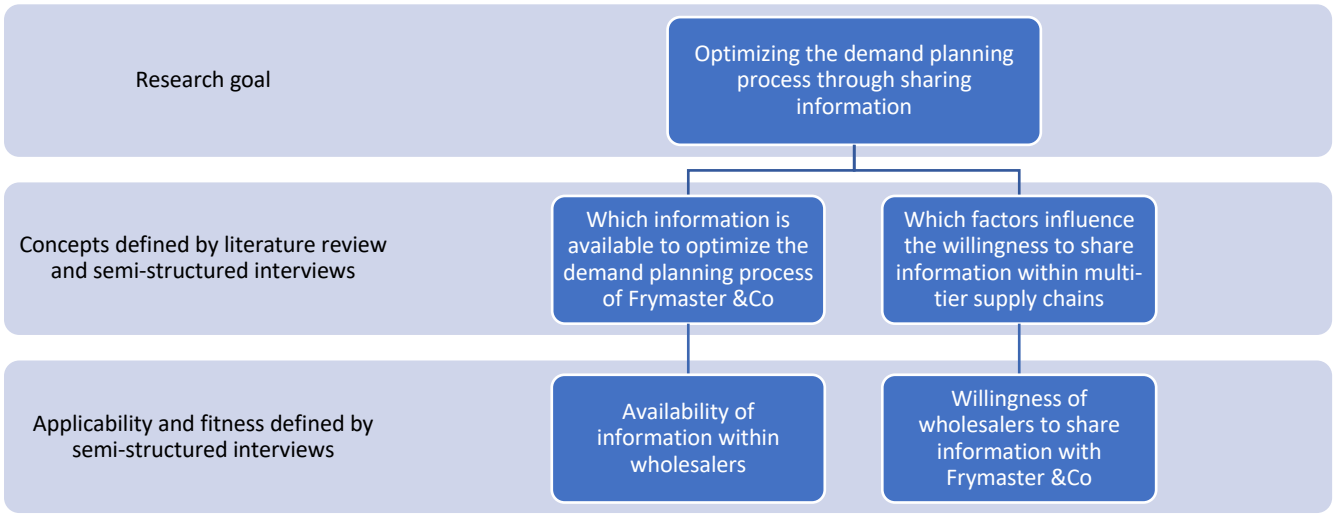


Figure 2. Outline research

II. Theoretical framework

For Frymaster &Co to optimize its demand planning process, this research will investigate supply chain collaboration where there will be a focus on information sharing as the driver of this which will be explained below. It will also be shown that the availability of information and willingness to share information are two important aspects related to information sharing which both have their enablers and restrictors. A visual overview of this is given in Figure 3, and a detailed explanation of these aspects is given in the rest of this chapter.

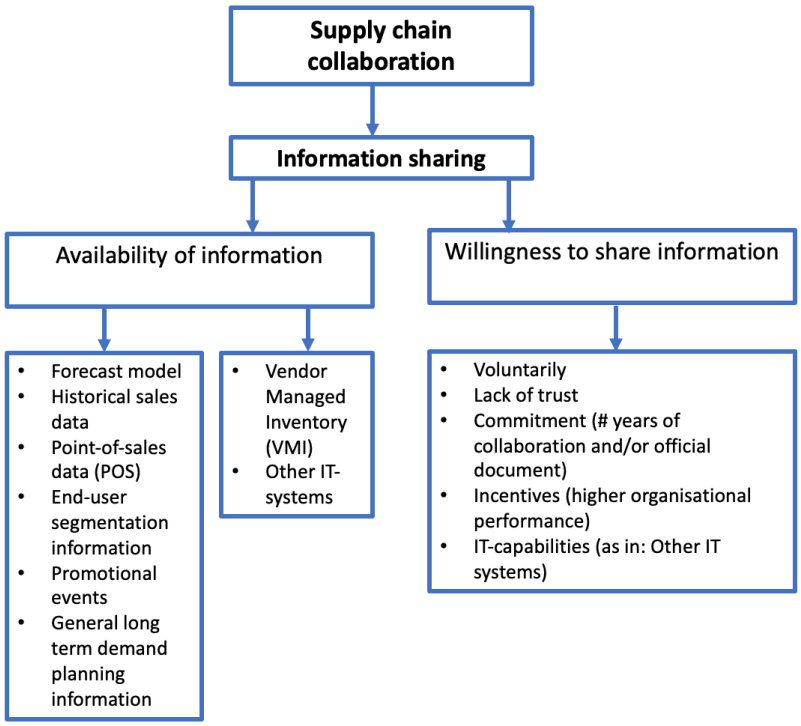


Figure 3. Thematic framework 'supply chain collaboration'.

1. Supply chain collaboration

The need for actors in the supply chains to collaborate is frequently pointed out in academic literature over the past years as supply chains experience higher customer demands, greater competitiveness, and more globalization (Fawcett et al., 2009). Especially the need to meet the high customer demands to keep a competitive advantage is an important factor for tiers in the supply chain to collaborate. A study by Nimmy et al. (2019) showed that collaborative supply chain management throughout the years has resulted in synchronized collaboration, which can be described as sharing information on sales data, forecasts, and demand satisfaction strategies. They explain that all these supply chain collaboration practices have information sharing as their backbone. Studies by Simatupang and Sridharan (2004) and Matopoulos et al. (2007) confirm this by showing that **information sharing** is one of the most important aspects of designing, establishing, and maintaining supply chain collaboration.

Yet, some may argue that extensive supply chain collaboration increases the complexity of supply chains as there are many items purchased which might result in a lot of

data and information which needs to be analysed in order to get relevant insights to improve the demand planning process. However, a study by De Leeuw et al. (2013) showed that collaboration in the supply chain and sharing of information decreases the complexity in supply chains, instead of the other way around. All in all, for these reasons, sharing information between wholesalers and manufacturers is an important pillar in supply chain collaboration which can have a significant positive impact on organizational performance. Besides these reasons for supply chain collaboration through information sharing, there are several other enablers which make supply chain collaboration salient, namely, tighter relationships between the supply chain tiers over the last few years, the need for better information, and new information technologies which enable organizations to use and safeguard data and information to relevant insights which helps them better their demand planning practices (Fawcett et al., 2009). That is why information sharing is a critical practice in multi-tier supply chains and might greatly benefit the tiers in the supply chain.

2. Sharing information

As mentioned before, sharing information within the supply chain can have a significant impact on the performance of the tiers in the supply chain that collaborate and thus share information. For manufacturers, information from wholesalers regarding demand has specifically a positive impact on the profit of the manufacturer (Cavusoglu et al., 2012; Kulp et al., 2004). For wholesalers, as they are the ones sharing most information about their demand, a study by De Leeuw et al. (2013) shows that wholesalers experience high levels of uncertainty in the supply chain due to the low delivery reliability of their suppliers, thus the manufacturers. That is why sharing information is an asset to decrease this uncertainty as it enables manufacturers to better their demand planning practices, which decreases the bullwhip effect as sudden distortions in the demand are understood and minimized, leading to a more reliable demand forecast and thus resulting in better performance for both parties (Costantino et al., 2014; Geary et al., 2006). However, the higher profits for manufacturers obtained by sharing information between manufacturers and wholesalers have more underlying benefits for both parties. From the perspective of both parties, sharing information results also in smaller batch sizes, reduced inventory levels, faster new product design, improved promotional events, less waste, increased (customer) service levels, customer satisfaction, and overall improved coordination in the supply chain activities combined with improved firms' performances. From just the manufacturer's perspective, sharing information also leads to shorter order fulfilment cycles, improved purchasing activities, the ability to adjust wholesale prices based on demand, and faster delivery (De Leeuw et al., 2013; Fawcett et al., 2009; Kulp et al., 2004; Li & Zhang, 2015; Matopoulos et al., 2007). Also, a better prediction of future demand allows the manufacturer to run more cost-effective practices which reduce the costs and thus directly affect the profits (Kulp et al., 2004). As just from a wholesaler's perspective sharing information also leads to shorter lead times, and improved customer service levels (Fawcett et al., 2009; Li & Zhang, 2015).

Although there are many benefits to sharing information, lots of supply chains have not implemented such forms of supply chain collaboration yet (Bagchi et al., 2005). This might be attributed to several reasons. First, current literature has given some types of information that can improve demand planning practices for manufacturers, however, it is yet unidentified which information is **available** to wholesalers that improve demand planning processes of food manufacturers (Fawcett et al., 2009). Secondly, an important aspect of sharing information pointed out in academic literature, besides the availability of

this information, is the **willingness to share** this information. Although a longitudinal study by Fawcett et al. (2009) showed that the willingness among supply chain actors has improved, another study by Fawcett et al. (2008) showed that one big barrier to sharing information is the willingness to share this information. Furthermore, since any form of information sharing is not yet in place in the supply chain of Frymaster &Co. it is important to research which aspects related to this willingness withhold wholesalers to share information with the food manufacturer, even though the information is available, to ensure that the new insights of this research can be practically implemented. That is why the concept of willingness is another important aspect to ensure the implementation of information sharing to improve demand planning practices (Simatupang & Sridharan, 2004).

3. Availability of information

Although information sharing is important to sustain supply chain collaboration, as previously explained, it is yet unsure which data wholesalers have available in an accessible manner to share with their manufacturers. Although it may seem that wholesalers have lots of customer data available, this does not necessarily mean that all data is usable and thus analysed enough to gain relevant insights from a manufacturer's perspective. Thus, now the most important types of information will be discussed which can improve demand planning processes, and in addition, some extra types of information might be added based on interviews within Frymaster &Co. which allow for synchronized collaboration as it explains the specific organisational information needs of the food manufacturer (Nimmy et al., 2019; Simatupang & Sridharan, 2004). This together will give an overview of the information needed to gain relevant insights to improve the demand planning process for food manufacturers.

- **Forecast model**

To begin with, the academic literature suggests that the first types of information that are important to share are the forecast methods on the products of the manufacturer (i.e.: the sales data of the specific products) of wholesalers as this significantly decreases the bullwhip effect in the upstream supply chain and significantly improves the forecast reliability of manufacturers (Byrne & Heavey, 2006; Chen et al., 2000; Costantino et al., 2014; Cui et al., 2015; Elofson & Robinson, 2007; Lin et al., 2019; Shaban et al., 2019; Trapero et al., 2012; Van Belle et al., 2021; Yigitbasioglu, 2010). So, wholesalers can discuss with their food manufacturer which type of forecast model they use, the parameters included and in which time horizon they plan their demand for the products, to ensure alignment between the two tiers. In addition to that, they can also share their sales data with the food manufacturers so the manufacturer can forecast based on the historical sales data of the wholesaler instead of the historical order data of the wholesaler which will decrease the bullwhip effect and thus increase the forecast reliability. This might be every month or can be done weekly for the best impact, although this might be very time-consuming (Trapero et al., 2012). This is coherent and in line with the desired information from Frymaster &Co (Bastiaansen, 2022).

- **Historical Sales Data, Point-of-Sales Data & End-User Segments**

Secondly, one step further than the type of forecasting method and the historical sales data of wholesalers is the point-of-sales data (hereafter: POS) that the wholesaler can share with the manufacturer. The POS consists of all information related to the sale of the

product such as the type of product, the renewed inventory levels, the number of sales, and the types of customers. This has a highly significant, positive impact on forecast reliability and demand planning (Costantino et al., 2014; Hartzel & Wood, 2017; Hosoda et al., 2008; Kaipia & Hartiala, 2006; Narayanan et al., 2019; Van Belle et al., 2021). Yet, it does not improve the order-fulfilment planning (Narayanan et al., 2019). However, based on internal interviews within Frymaster &Co., types of customers in an aggregated form can be a useful tool to improve the forecast. To sustain this, research shows that in-depth end-user information can increase agility (Collin & Lorenzin, 2006). So, this could mean that sharing information on end-users and other demand indicators might increase the forecast accuracy of Frymaster &Co. within the supply chain that involves a wholesaler as well. Therefore, aggregated customer information of wholesalers in a way that they are divided into end-user segments is a good alternative to the type of customer data within the POS data (Bastiaansen, 2022; Leusen, 2022).

- **Vendor Managed Inventory**

Next, also as part of POS data, information on stock and replenishment is researched to have significant positive effects on forecast reliability. A good way to ensure adequate inventory levels for the wholesalers might be to implement a Vendor Managed Inventory system (hereafter: VMI), this is because, VMI can have a positive direct effect on the profit margins as it allows a manufacturer to implement cost-effective resource planning (Elofson & Robinson, 2007; Holweg et al., 2005; Kaipia & Hartiala, 2006; Kulp et al., 2004). Furthermore, research from De Leeuw et al. (2013) shows that VMI can also decrease the complexity of the supply chain.

- **Promotional Events**

Furthermore, information on promotional events is a desired type of information by Frymaster &Co (Bastiaansen, 2022). As currently there is no information on promotional events of wholesalers, sometimes a sudden increase in demand of these wholesalers cannot be met with enough products, as the demand of wholesalers is higher than the capacity of the food manufacturer. For this reason, information on promotional events is another type of important information. This is sustained by the research of Kulp et al. (2004) that shows that sharing information on promotional events leads to fewer stock-outs and thus increases the effectiveness of the promotion. Iyer and Ye (2000) even say that promotional events can sometimes be harmful to manufacturers as without the information on them, they cannot plan cost-effective resources and inventory in time, however, sharing information on the promotions makes it profitable. Thus, information on promotional events is important to improve the effectiveness and profitability of the promotions.

- **Long-term Demand Planning**

Lastly, long-term demand planning information such as new customers, loss of customers, big upcoming events and disruptions, overstock information, and macroeconomic variables such as future expectations and inventory constraints can improve the demand planning practices of the manufacturer (Cheikhrouhou et al., 2011; Fildes et al., 2009; Novitasari & Diah Damayanti, 2018; Sagaert et al., 2018; Yigitbasioglu, 2010). This might be very useful as collaborative planning on long-term bigger events might decrease small adjustments over time. This is desired given that most of the time, small adjustments decrease the forecast reliability instead of improving it, and ensures that the manufacturer

and wholesaler together are able only to adjust bigger adjustments based on sporadic events which most of the time increase the forecast reliability (Fildes et al., 2009).

So, the types of information that are hoped to be available to wholesalers are **forecast models**, **historical sales data**, **POS** (using information on inventory levels, and replenishment practices), **end-user segmentation**, **promotional events**, and **general long-term demand planning information**. However, as previously also mentioned, information technologies such as a VMI system can increase forecast reliability and thus improve the demand planning process. Also, research by Fawcett et al. (2009), Matopoulos et al. (2007), and Culot et al. (2020) mention that the right IT systems need to be in place to make sharing information possible, sustainable and cost-effective. That is why, besides the six types of information, the availability of **VMI** or **other IT systems** will be researched to determine if adequate information is available to sustain information sharing between food manufacturers and wholesalers.

4. Willingness to share information

Although availability is an important aspect of sharing information, the availability of information does not improve the demand planning practices if this information is not in reality shared with the wholesalers' manufacturers. So, to make sure that the relevant information is shared among the tiers in the supply chain, the wholesalers need to be willing to share this information. A longitudinal study by Fawcett et al. (2009) shows that the willingness to share information has increased over the past years within the supply chain, yet, progress is still very slow due to a lack of understanding of the specific information-sharing practices. However, the types of information that are needed to improve demand planning processes are already established. That is why now the items related to the willingness to share information will be elaborated upon based upon the researched constructs by Zaheer and Trkman (2017) that showed to be significant antecedents of the willingness to share information.

- **(Lack of) trust**

To begin with, one of the main factors why wholesalers do not want to share customer data with their manufacturers is the lack of trust. Even though sharing information has lots of positive impacts on organizational performance, wholesalers are often afraid the information shared will not be kept within the manufacturers' walls and that their competitors might get access to this information or that the power balance might shift not in favour of the party sharing the information (Byrne & Heavey, 2006; Eurich et al., 2010; Fawcett et al., 2008; Flynn et al., 2010; Matopoulos et al., 2007; Nimmy et al., 2019; Nyaga et al., 2010; Zaheer & Trkman, 2017). Yet, Nyaga et al. (2010) explain that after a while of sharing information whereupon the organizational performance improved, more trust is created between the supply chain tiers. Nevertheless, to start sharing information within the supply chain, some levels of trust need to be established between the wholesaler and manufacturer.

- **Commitment**

Another aspect that influences the willingness to share information is the level of commitment the tiers in the supply chain have towards each other (Zaheer & Trkman, 2017). This commitment can be explained from different perspectives. First commitment can be

achieved through long-term relationships, but secondly, it can also be achieved through contracts or other official documents stating the terms of the joint relationship (Du et al., 2012). That is why commitment will be controlled by the objective measure of the relationship (by measuring the number of years the manufacturer and wholesaler work together) and it will be checked if the willingness might increase if it would be documented in some sort of contract or another official document.

- **Incentives**

Next is the level of incentives given to those who will share information that might increase the level of willingness to share information (Cavusoglu et al., 2012). However, based on an internal interview within Frymaster &Co, the organization is currently not in a position to grant additional incentives, wherefore this might lead to wrong impressions towards the wholesalers if asked upon (Leusen, 2022). That is why the only incentive considered for this research will be improved organisational performance such as increased service levels and delivery reliability.

- **IT capabilities**

Finally, the last aspect that influences the willingness to share information, is the capability to do so. Research by Nimmy et al. (2019) explains that high investments in certain IT systems and technologies might be the reason not to share information within the supply chain, as these IT capabilities are not in place. To substantiate this, Zaheer and Trkman (2017) found that when wholesalers have IT capabilities in place to share information, the willingness is also higher as they want to gain back on their investments by increasing their organisational performance through information sharing. That is why the IT capabilities to share information is the last factor that will be accounted for to determine the willingness to share the information which is in line with IT systems that provide the availability of information.

So, several factors influence the willingness of wholesalers to share information with their food manufacturers. However, although there are several reasons for wholesalers to (not) be willing to share information, it cannot be assumed that there is no voluntary willingness to share the types of information as beforementioned. That is why also a **voluntary willingness** to share information will be considered.

To conclude, supply chain collaboration has significant positive impacts on organisational performance, as well as for the manufacturer and the wholesaler. To establish this supply chain collaboration, information needs to be shared upstream in the supply chain, from wholesalers to food manufacturers. However, not all information gives relevant insights that will improve demand planning processes for the food manufacturer, so specific types of information need to be obtained from wholesalers. Nevertheless, the wholesalers also need to be willing to share this information with their food manufacturers as well and they need to have IT capabilities in place to share such information. That is why this research is going to focus on both the availability of information and the willingness to share this information and related enablers and restrictors (see Figure 3), to make the first steps towards supply chain collaboration which will improve the demand planning process of food manufacturers and their KPIs.

III. Methodology

1. Research design and approach

To answer the question: “How can a food manufacturer optimize its demand planning processes by making the first steps towards supply chain collaboration with its wholesalers by sharing information and insights?”, qualitative empirical research was conducted to gain a deeper understanding of how supplier collaboration can be created between tiers in the supply chain by information sharing.

As shown in the theoretical framework, sharing information within the supply chain has a lot of potential upsides, for as well the manufacturer as the customer, in this case, the wholesaler. However, currently, wholesalers are not sharing any information with Frymaster &Co. as opposed to retailers who are doing so. The longitudinal study by Fawcett et al. (2009) showed that the willingness to share information had improved already several years ago, and together with all studies done after theirs on the benefits of supply chain collaboration, one might believe this trend would continue. Nevertheless, wholesalers still do not share information with Frymaster &Co., so to gain a deeper understanding of the underlying reasons for this, it is imperative to first understand the reasons; might it be the availability, or the willingness, perhaps both, or neither.

So, to gain a deeper understanding of why wholesalers are currently not sharing information; descriptive, qualitative, and exploratory research was conducted as this allows for the identification of the mismatch between literature and the current situation and allows for identifying possible themes that have not yet been studied in the literature.

The descriptive nature of this research was to gain an accurate profile of the current situation and gain a deeper understanding of the predetermined issues that cause non-information sharing within the supply chain as this could not be clearly defined by Frymaster &Co., nor explained by the current literature as this has shown a positive trend in supply chain collaboration.

The exploratory form of this research was to determine the underlying motivations of non-information sharing and to clarify the unforeseen issue(s) with sharing information building further on the theoretical framework. This interpretive approach allowed building further on current existing literature by exploring wholesalers' perspectives and thoughts on reasons why (not) to share information and insights and by exploring if the themes of the theoretical framework based on the literature were complete by checking for any themes not previously mentioned in the literature. Thus, it highlighted (more) themes that are related to the current mismatch between the advantages of sharing information; the literature, and the reluctance to share this information; the current business practices.

Thus, for the descriptive, exploratory research, primary data was gathered: semi-structured interviews were held with wholesalers to gain a deeper understanding of the relationship between the current setting of not sharing information and the enablers and restrictors, as described in Figure 3, were investigated.

2. Case selection

For the semi-structured interviews, five participants were interviewed. These five participants were chosen as a sample based on non-probability sampling through self-selection. An overview of these five participants is shown in Table 1. Since this research focussed on a business case and reaching participants was difficult, self-selecting

participants made it possible to seek practical relevance for Frymaster &Co. because all (willing) participants were invited to explain their perspectives on the current problem. Furthermore, this research sought to gain a deeper understanding of the current problem and its related enablers and restrictors, thus being mainly exploratory, there was no definite case size. Yet, to increase the reliability and validity a homogeneous group was interviewed (Saunders et al., 2019a) . The criteria met for the homogeneous group were that all participants were (at least in part) responsible for the demand planning of the fresh and frozen products within one of the top 10 wholesale companies in The Netherlands, some represented even the top 5 (Schreijen, 2021; Smits, 2019). So, the interviewees represented the biggest wholesalers of not only Frymaster & Co. but of the whole Netherlands. Yet, saturation was not found based on this case selection, and thus the outcome and themes of this research need to be further explored to generalise the outcomes. However, as all the participants represent a number of the largest wholesalers, other food manufacturers might use the outcomes as a guideline to explore any difficulties they have with their supply chain collaboration.

Transcript	Function	Interview Length
1	Demand Planner	42:51
2	Demand Planner	44:16
3	General Manager	36:13
4	Senior Buyer	25:42
5	Manager Demand Planning	39:36

Table 1. Overview participants

3. Research protocol

As mentioned, the participants were self-selected. After consultation with the sales managers at Frymaster & Co., these wholesalers are most important to the business as they represent the biggest part of the turnover and thus impact in large the demand planning. Of the 39 participants who were asked to be interviewed, only five responded and agreed to participate. The one-to-one semi-structured interviews were held online, through Microsoft Teams, to ensure that participants were in a familiar environment as this contributed to the trust and openness of the participants and due to the time frame of the research (Bowen, 2015). As the semi-structured interviews were meant to explore underlying themes for the reluctance to share information with Frymaster and Co., the themes from the thematic framework were first operationalised to ensure the questions would lead to obtaining the relevant set of information on the availability and willingness to share information from the participants on which themes are currently hindering sharing information. These were specifically asked to have a direct impact on the availability and willingness to share information. The operationalisation of the theoretical framework is found below in Table 2.

Theme	Operationalisation
Trust	Trusting the other party will keep the information confidential
Commitment	Number of years you have been doing business
Incentives	Gain better service performance, and stock levels if you share information

IT capabilities	Easy ways to share information through any kind of IT systems
Historical sales data	Number of historical sales and types of customers
End-user segmentation	Aggregated customer information in a way that they are divided into end-user segments (e.g.: type of business/market)
Forecast models	Which parameters are included and which time horizon
POS data	Inventory levels and replenishment practices
Promotional events	Information on future promotional events that might increase output
Long term demand planning information	New customers, loss of customers, big upcoming events and disruptions, overstock information, and macroeconomic variables such as future expectations and inventory constraints
Vendor Managed Inventory (VMI)	System that allows the supplier to manage the inventory levels.

Table 2. Operationalisation of thematic framework

In the first half of the interview, open questions were asked to avoid steering the participants in predetermined directions by the interviewee and to explore deeper their insights and perspectives on the current level of information sharing and any, yet undetermined, underlying reasons for not sharing information. In the second half of the interview, the themes from the thematic interview were checked to see whether these influenced the current business practices.

The general outline of the semi-structured interview was therefore as follows (full overview of semi-structured interview questions is found in Appendix 2. Semi-structured interview questions):

1. Introduction of the participant;
2. General current demand planning practices;
3. Current situation on sharing information;
4. In-depth questions on the themes of availably of information to share;
5. In-depth questions on the themes of willingness to share information;
6. In-depth questions on IT systems available to share information;
7. Additional topics or points of improvement for demand planning and sharing information.

After the interviews were conducted, they were first transcribed. After completing the transcriptions, all were sent to the participants for validation to ensure the participants would still agree with their answers and that no mistakes were made in the transcriptions. When the transcriptions were validated, the transcriptions were summarized so the principal themes from the thematic framework that emerged were easily identified into shorter statements. This so, the transcription summary allowed in an exploratory way for checking common patterns, topics and participants' views on the predefined themes and constructs and even for new themes not previously mentioned in the thematic framework (Saunders et al., 2019b). All themes that emerged were summated to see which themes were most often mentioned and most prominent in the decision-making on whether (or not) to share information with Frymaster &Co. Based on the most common and occurring themes, the main barriers, misalignments, and opportunities were included into the results as to see why there is currently no information shared between Frymaster &Co. and its wholesalers. Based on this, the first steps that need to be taken were detected together with the themes that

need to be further explained to sustain supply chain collaboration by sharing information between Frymaster &Co. and its wholesalers.

Although this research allowed for identifying themes that hinder supply chain collaboration by sharing information, the validity of this research was under pressure because as this research focused on the situation between Frymaster &Co and its wholesalers, the generalizability is low, and the outcomes are not conclusive. However, as this research was interpretative and it explored the themes that hinder sharing information within the supply chain, the themes that emerged from the interviews gave an indication of important enablers and restrictors that further need to be researched to generalize these themes within more supply chain settings where information is not shared and there is a wish to set up supply chain collaboration. Besides, although interpretative, the reliability and external validity of this research were ensured by interviewing a homogenous group of all relevant wholesalers for food manufacturers in the Netherlands, therefore, the predefined themes and the outcomes of this research might be found again if replicated.

IV. Results

1. Key findings from semi-structured interviews

All interviewees were responsible for the demand planning of fresh and frozen food products at one of the top ten biggest wholesalers in The Netherlands. When asked about the themes that were related to their demand planning practices (as set in Figure 3), the interviewees explained which information they have available to predict accurately their demand and what influences the willingness to share forecasts with suppliers. They were also able to add additional information about their demand planning which resulted in the emergence of other themes. An overview of the themes that emerged from the interviews is given in Table 3.

Theme	**Interviewee**	**1**	**2**	**3**	**4**	**5**
Availability						
	Statistical Forecast Model	X	X		X	X
	Historical sales data	X	X	X	X	X
	POS	X			X	X
	End-user segmentation				X	
	Promotional events				X	X
	General long term demand planning				X	
	IT systems					
Willingness to share						
	Voluntarily		X*	*X***		
	Lack of trust				X	
	Commitment				X	
	Incentives	X	X	*X***		X
	IT capabilities					
Other themes						
	Seasonality	X	X			X
	Manual sales input	X				X
	ABC/XYZ	X	X			X
	Macro-economic situation	X				
	EDI connection (customers)				X	
	Share forecast against payment	X			X	

**= only if demand variation is >15%*
*** = "if" scenario*
Table 3. Summary interview responses

Availability

Almost all respondents had an established statistical forecast method within their organization. They all used and based their statistical forecast method on historical sales data to determine what their future demand would be. Only the third interviewee mentioned they did not have any time statistical forecast method in place, mainly because it is a very costly investment and in the current tight labour market, they do not have enough

manpower to sustain and effectively run a demand planning department. Besides, the wholesaler did not have the right IT capabilities in place to set up a forecasting tool.

Only three of the 5 respondents had POS data available. Wherefrom two did not use these to determine their forecast.

Yet, none of the respondents had IT systems in place that made the forecast accessible for third parties, neither in a manual nor automated way. While four out of five respondents had statistical forecasting tools, if shared, they all did so via (manually distributed) Excel files. One respondent noticed that the lack of IT capabilities limits the amount of information that is shared because sharing and requesting information in Excel is very time-consuming. When asked about a particular IT system; the Vendor Managed Inventory System (VIM-system), none of the respondents had this in place. The second interviewee said: "I do not believe a Vendor Managed Inventory-system is the future of demand planning, given that we have a lot of information available about our customers, something that our suppliers would never be able to do. Besides, we have so many suppliers that they cannot see our cross- and upselling patterns. As a supplier, you stand too far away from reality in this sense to accurately manage stock levels." In addition to this, the respondents rarely received forecasts from their customers, which did not allow them to alter their forecasts or share these forecasts with their suppliers. Only the fifth interviewee sometimes receives forecasts from its customers, but notices: "Although we really appreciate the forecasts we receive from our customers, it is too time-consuming to implement these in our forecast tool as a lot of them use different formats. As everyone has a different forecasting- and different ERP systems a lot of times, we do not even have the option of implementing a customer's forecast as it takes too much time to manually enter this information in our system."

End-user segmentation and promotions were also added manually. The fourth interviewee was the only one that had its customers divided into end-user segments, however, these were mainly used for general long-term demand planning to see which areas were growing or shrinking. The promotions were for both the fourth and fifth interviewees added manually based on discussions with the sales and marketing department.

Willingness

Of all the respondents, only the second and third interviewees, of which the latter did not have a forecasting method nor demand planning department in place, said he/she would be willing to share the forecast voluntarily. The second interviewee mentioned that they currently share the forecast voluntarily with their suppliers but only if the forecasted output deviates more than 15% compared to the usual output on specific products: "We do this to help our suppliers. Given that the order for a specific item drastically decreases or increases, we want to inform them so they can alter their production planning based on this. To be honest, this is also done to ensure that we secure the right amount of capacity from our suppliers, so we do not run out of stock."

The fourth interviewee only shared information based on trust and commitment: "If data is shared, it is because we trust our partners and believe we can make better margins on their products and if we do not share any data, it is mainly because we either do not trust them, or it will not generate any higher profit margins. As a wholesaler we have so many suppliers, it does not make sense to share with all of them." As well the first interviewee mentioned that added value and commitment of a supplier are very important, "if the management does not see the added value of a supplier, we are not allowed to share any forecasting information with them voluntarily". The added value in this case is mainly based

on the total purchase volume at a supplier. So, it seems that as long as there is trust between the tiers in the supply chain, the wholesalers are voluntarily willing to share information. Yet, the added value of sharing this information needs to be visible, as it is time-consuming to share information as no IT capabilities are in place to do so, which resulted in a barrier to sharing it with all the wholesalers' suppliers as it seems the potential incentives did not outweigh the time-consuming effort to share the forecasts, wherefore almost none of them were willing to share regular forecasts with (all of) their suppliers.

Other themes

In addition to the Thematic framework 'supply chain collaboration'., more themes emerged during the semi-structured interviews. The main themes that came forward during the interviews, were seasonality and ABC/XYZ analysis. These played an important role in three out of five respondents' demand planning practices. Regarding the latter, the fifth interviewee mentioned: "We ask ourselves the question if we even need to forecast products that are categorized as CY or CZ as they are so unpredictable that it is not worth the effort to try and predict their future demand. For this, we just generate higher safety stock levels if the shelf life allows this, or we take the risk of being out of stock". For seasonality, as part of the statistical forecasting method, the respondent believed that AI (i.e.: Artificial Intelligence) could play a big role on seasonality in the future: "Right now, lots of holidays like Ramadan are not considered in the forecast in an automated way, as these are celebrated each year on a different day. Besides the holidays also weather plays an important role in the seasonality of the products, and AI could make a difference to both as it recognizes more advanced patterns. So even although there is seasonality, we often need to manually adjust this which would not be necessary with AI".

In addition, as opposed to voluntarily sharing forecasts, two respondents mentioned that they only shared information if the supplier paid for it. They noted that information is so valuable, and their departments put so much effort into obtaining the information that they are only willing to share it with their suppliers against payment. "If [the management] does not see the added value of sharing information with a supplier, it is only shared against a certain amount of money."

To determine future demand, manual sales input was also seen as an important factor by two of the respondents. Also, the macro-economic situation, such as war, pandemic, or financial crisis was only considered in the forecast by one of the respondents. Yet, although the macro-economic situation was only by a few of the respondents considered in the forecast, three interviewees mentioned that COVID-19 had still a significant impact on their forecast as the historical data was not considered accurate due downfall in sales because of the pandemic.

Lastly, one of the respondents mentioned that they prefer setting up EDI connections as opposed to implementing a demand planning department with the relevant forecasting systems as the latter is very time-consuming and a relatively big investment. "We believe we gain more from an EDI connection with our customers as this allows us for operational efficiency and therefore has a faster return on investment".

To summarize all the above, all the participants have historical sales data available and almost all of them have POS data available. However, there are seven more different types of available information of which the availability is scattered across the different participants. This prevents the alignment between Frymaster & Co. and its wholesalers.

More notably, none of the participants, even the ones who have a lot of information available, have sufficient IT systems in place to share information. Just one participant has an EDI connection with its supplier, but this EDI connection does not allow for easy information sharing as it is mainly focused on optimizing the purchase-to-pay process.

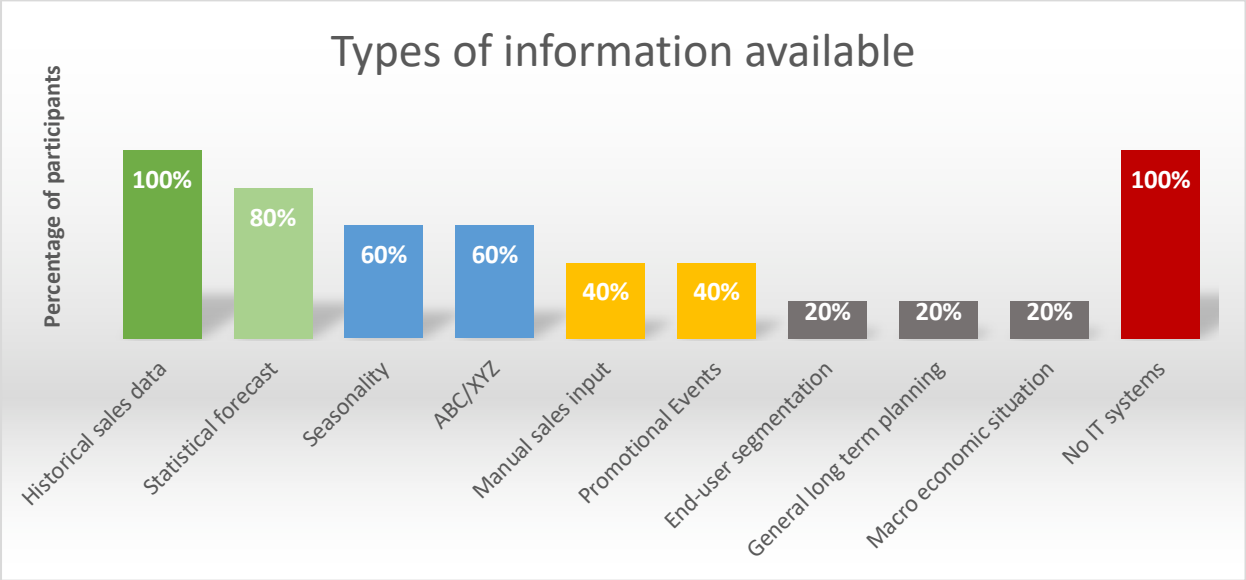


Figure 4. Summary of Information Availability

As for the willingness to share information, the interviews showed several reasons for whether or not to share information. The most frequently mentioned reason to share information is incentives. This shows it is generally known within demand planning and purchase departments that sharing information generates better supplier performance. Besides the increased performance, participants either are voluntarily willing or share only information against payment. Notable here is that one participant who had a lot of data available, only shared its data against payment, which makes it seem as if the investment in generating a lot of information cannot just be earned back by increasing supplier performance but needs an additional payment. Yet, again, no IT capabilities were in place to share information easily which was a big constraint on the willingness to share information as it is very time-consuming and asks for a lot of labour capacity for the wholesalers.

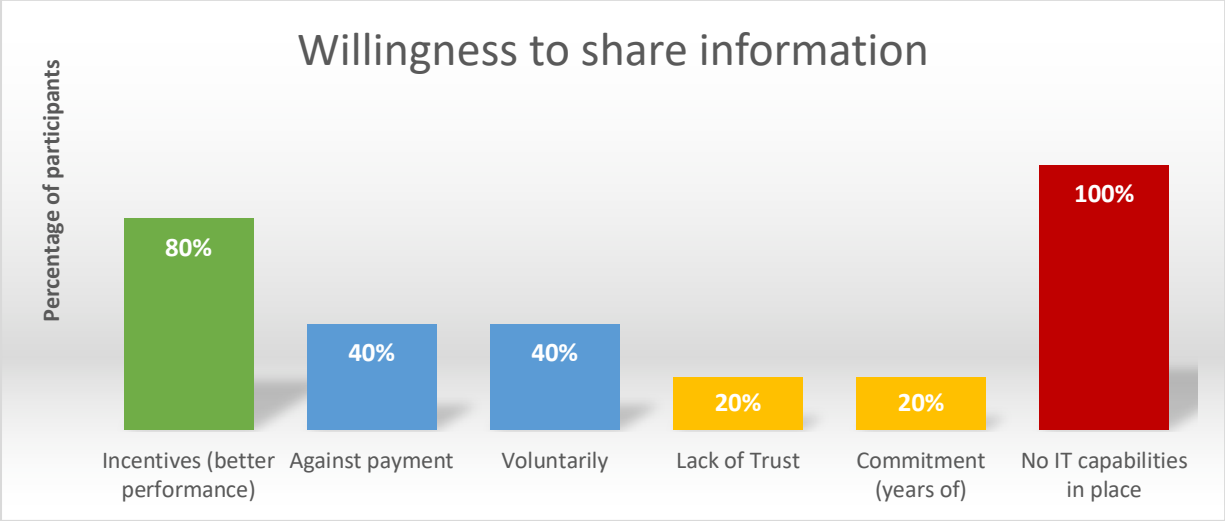


Figure 5. Summary of Willingness to share information

2. Proposed first steps to improve demand planning by sharing information

As shown in the section above, the main barrier to not sharing information for both the availability and willingness is the lack of IT capabilities to efficiently and effectively do so. Therefore, the first step to improve the demand planning process of Frymaster &Co. would be to build an IT infrastructure with its partners that would allow this. Research by Purwanto et al. (2024) has shown that IT systems have a significant and positive contribution to sharing information. It also makes the relationship more effective as the communication paired with this leads to better forecasting and thus optimizes the demand planning process (Purwanto et al., 2024). For Frymaster &Co. to initiate this, several actions emerge to set this up: [1] Frymaster &Co. should select specific partners to start the IT systems with as the design of the IT infrastructure should be aligned between the partners with mutually agreed-upon targets and desired incentives (Panahifar et al., 2015; Wu et al., 2014). As this is time-consuming and takes effort for both Frymaster and Co. as well as the wholesaler, Frymaster &Co. might start with just one wholesaler which has the biggest impact on their demand planning process (likely the one with the highest turnover) to find consensus with them on which system to use and which ways of communicating. This would in turn minimise the misalignment for the availability of information as both parties have all needed information available or will make available (Wu et al., 2014). After the selection of the wholesale partner to initiate this with, [2] the management of both companies should be convinced. This is because often senior managers might not see the return on investment for IT systems to optimize demand planning (Nguyen et al., 2022). This might be because is it often unclear what benefits sharing information in general has on the performances and costs of organizations (Nguyen et al., 2022; Nimmy et al., 2019). This can be overcome by showing that implementing IT systems that sustain proper demand planning by sharing information leads to significant cost reductions and improved performances such as delivery performance and reduced inventory costs for wholesalers; and improved forecast accuracy and less waste for food manufacturers (Nguyen et al., 2022; Nimmy et al., 2019; Ramanathan & Gunasekaran, 2014). In addition, based on the interviews, it was shown that incentives are the main enabler which positively contributes to the willingness to share information, so it is important to properly communicate and show the benefits of sharing information to convince building the IT infrastructure between Frymaster &Co. and its wholesaler. Then, after convincing management to invest in the IT infrastructure that enables the sharing of information between the supply chain partners, [3] it is important to also set up a communication structure between the manufacturer and the wholesaler as research by Lauer and Franke (2020) showed that analogue communication significantly improved the demand planning processes as the expertise and the experience of the demand planners led to better decision making. Therefore, the collaborative approach in sharing information is imperative to accurately interpret demand predictions and changes, not just the IT capabilities itself. The aligned IT systems and communication structure will therefore positively contribute to sharing information efficiently and effectively between Frymaster &Co. and its wholesaler.

Another, more general long-term step to take by Frymaster &Co. to optimize its demand planning by sharing information is by building an increased sense of trust with their wholesalers and focussing on reciprocity. This should already be considered while selecting a partner for the implementation of the IT infrastructure (step 1) but continues with other

possible partners as well when Frymaster &Co. wants to implement this with more wholesalers. This is because study shows that trust is key to supply chain collaboration which in turn helps to share information between actors in the supply chain (Panahifar et al., 2015; Wu et al., 2014). Trust, taken together with reciprocity, has a significant positive impact on the amount of information shared between tiers in the supply chain as studies show (Wölfel & Grosse-Ruyken, 2020; Wu et al., 2014). This might ensure wholesalers will share more information with Frymaster &Co., especially the 40% of the participants that would be voluntarily willing to do so but currently do not share information. A specific measure for this could be Frymaster &Co. being the first to start sharing information with its wholesalers, which would show the wholesalers that Frymaster &Co. trust them with the information and both this trust as well as the effort to share the information likely might be returned by the wholesalers as we know from the social exchange theory on reciprocity. Although this is a more long-term view of the supplier-customer (i.e.: wholesaler) relationship, it can be worthwhile for Frymaster &Co. to implement this strategy in their demand planning practices as this in turn will likely increase the amount of information shared between Frymaster &Co and its wholesalers and might make the process of selecting partners to initiate an IT infrastructure with easier.

Both the abovementioned steps should, in the short and long term, increase and facilitate the amount of information shared between Frymaster &Co. and its wholesalers, which in turn would lead to better demand planning practices.

V. Conclusion and discussion

For Frymaster & Co., as for many (food) manufacturers, demand planning is a vital department within the company to accurately plan future demand to optimize the production runs and utilize its capacity as best as possible. The need for more accurate demand planning was especially felt by Frymaster &Co. in their supply chain with its wholesalers which could be explained by the lack of information shared between Frymaster &Co. and their wholesalers as the latter are currently not doing so. Also, the literature showed that supply chain collaboration by sharing information is key to developing more accurate demand planning practices, but it is not always common practice within organisations. As there is a need for Frymaster &Co. to improve its demand planning practices, the following research questions emerged: "What are the first steps for a food manufacturer to improve demand planning by gaining information and insights from their wholesalers?"

To have this question answered, this research has focussed on the two building blocks of sharing information namely, the availability of-, and the willingness to share information. Extensive literature research has been done based on these two building blocks to understand the underlying themes of these. This resulted for example in the former including point-of-sales data and promotional events, and the latter including lack of trust and incentives. Then, based on this theoretical framework, descriptive and exploratory qualitative research was conducted through semi-structured interviews which were held with five of the biggest wholesalers in The Netherlands.

From these interviews, several main themes have arisen which caused the lack of availability of information and willingness to share information which impedes supply chain collaboration. The most important and prevalent themes that arose for availability were the actual lack of availability of information on promotional events, general long-term demand planning, end-user segmentation and the lack of IT systems. Two or less of the interviewees had one of these in place. This means that out of seven themes on availability, only statistical forecast model, historical sales data and POS were relatively common practices to have available for demand planning.

Having looked at the willingness to share, it was notable that none of the participants had IT capabilities in place to easily share information with their manufacturers. This hindered sharing information as it takes up too much time and resources to do so. It has been also notable that voluntarily sharing information has been very limited among the participants. Incentives seem to be the best motivator to share information.

Furthermore, the results of the interviews have shown that there were also themes that have not yet been identified (often) in literature nor by Frymaster & Co. as important such as seasonality and ABC/XYZ data. This shows there is a discrepancy between the types of data available to wholesalers and the input wanted by manufacturers.

All this considered has led to the conclusion that most organizations do not have sufficient data available that is useful to share, nor does it satisfy the needs of manufacturers to optimize their demand planning process. And even if sufficient data has been available to wholesalers, the willingness to share this data has been so limited that it does not allow for dexterous supply chain collaboration. Therefore, the first steps for a food manufacturer, in

particular Frymaster &Co. to initiate sharing information with their wholesalers would be [1] to set up IT systems with some of their wholesale partners that would efficiently and effectively align and share data across the supply chain. An IT infrastructure designed and built by the two partners ensures a steady flow of information shared that positively contributes to the demand planning practices of the food manufacturer. Another long-term step is to ensure a focus on trust and reciprocity between Frymaster &Co. and its wholesalers within the demand planning strategy as this in time leads to more willingness to share information by the wholesalers. Nevertheless, again sufficient IT capabilities should be in place so the right data is available, and the information can be shared in an accessible way.

Limitations

Even though this research extensively interviewed participants and uncovered underlying themes to the unwillingness to share information and the lack of data to share, the sample size is limited to just five of the biggest wholesalers in The Netherlands. This means that the external validity of this research is narrow. Therefore, an additional study must be done on a greater scale to determine whether this problem gives the same results for different types of organizations and is also applicable in a wider area. However, although just five food wholesalers have been interviewed, they represent over half of the turnover produced by food wholesalers in The Netherlands, so it is likely that smaller food wholesalers in The Netherlands will have the same limitations in sharing information.

As to the internal validity of this research, and thus the possibility of a causal relationship, this research is exploratory so there still must be done an explanatory study to determine whether this relationship between the thematic framework and concepts is an actual causal relationship.

Looking at the reliability of this research, the reproducibility is limited as it is qualitative research with semi-structured interviews. Yet, given the semi-structured interviews contributed to the thematic framework, this framework will be a good foundation for further, quantitative research, that can be done to determine whether these themes from the thematic framework correlate to and cause the unwillingness to share information and thus hinder supply chain collaboration.

Implications and recommendations

Over the past years, multiple studies have already been done regarding supply chain collaboration, some even focusing on just small and medium-sized enterprises (Palomero & Chalmeta, 2012). They stated that for SMEs the main obstacles were a lack of employees, lack of availability of computer applications, and an overall lack of resources for communicating information to establish supplier collaboration. Ten years later, this research shows that the obstacles identified then, have still not been conquered; not even by larger enterprises. As shown in this research, even though the importance of supplier collaboration by sharing information is apparent, practice shows that companies still have trouble overcoming obstacles and restrictions in actually doing so. It is clear now that the uncertainty of demand planning increases when no information is shared. Frymaster &Co. sees a significant decrease in forecast accuracy and an increase in capacity restraints when information is not shared with wholesalers, compared to retailers. This is in line with the study by De Leeuw et al. (2013) which stated that uncertainty increases with no information sharing within the supply chain.

As for the availability of sharing information, most studies agreed on the importance of historical sales data and POS data. The results show that these types of data are indeed most frequently available at the wholesalers. Nevertheless, the other, perhaps less studied, types of data available to generate an accurate demand plan such as data on end users and general long-term planning were hardly available at the wholesalers. Just historical sales data is for Frymaster &Co. not sufficient to build their demand planning, which shows that more research needs to be done on the most efficient types of information available and the alignment between the supply chain of these.

The willingness to share this information seems to have not improved over the years. This is not in line with the positive trend of increasing supply chain collaboration founded over 10 years ago, so another longitudinal study should be done to determine whether this effect of staggering supply chain collaboration can be found elsewhere (Fawcett et al., 2009). Yet, the biggest enabler of the willingness to share information is incentives, which is in line with research by Cavusoglu et al. (2012), but when there are no IT capabilities in place to share the information it makes it very time-consuming, so hardly any information is shared. To place this next to the research by Nimmy et al. (2019) which showed IT capabilities are one of the biggest restrictions on sharing information, one might say that the perceived costs of IT capabilities to share information transcend the perceived benefits of sharing information. So, although the literature showed multiple upsides to supply chain collaboration, the return on investing in supply chain collaboration still needs to be researched.

This begs one to wonder how the management of organizations can be convinced to invest in sufficient (IT)capabilities to ensure supply chain collaboration. In a world where competition is high, the supply chain remains volatile and sustainability awareness increases, it is quite surprising that even the biggest wholesalers in The Netherlands do not have sufficient IT systems, data, and willingness to start their supply chain collaboration. So, although the literature is clear on the importance and benefits of supply chain collaboration by sharing information, practice shows that we are a long way to making this a common practice. It seems therefore that there is a causation between the lack of data available and lack of willingness to share data, however after so many years this research showed there is minimum improvement and little progress, but since the literature states clearly identified benefits, one has to wonder if this causation is not just correlation and deeper, yet unidentified issues, have to be uncovered to actually make supply chain collaboration standard practice.

So where do organizations need to start? As this study shows, supply chains first need to invest in effective IT systems and capabilities which take away the barriers to sharing information as this would allow companies to generate lots of data and facilitate the integration of such systems throughout the supply chain wherefore information can conveniently and accessibly be shared as this will positively contribute to both the availability of and willingness to share information. Only if these first steps are taken, can supply chain collaboration by sharing information efficiently and effectively take form between food manufacturers and wholesalers which would allow food manufacturers such as Frymaster &Co. to optimize its demand planning process by using more accurate data to improve their forecast accuracy.

VI. Bibliography

Arzu Akyuz, G., & Erman Erkan, T. (2010). Supply chain performance measurement: a literature review. *International Journal of Production Research*, *48*(17), 5137-5155. https://doi.org/10.1080/00207540903089536

Bagchi, P. K., Chun ha, B., Skjoett-Larsen, T., & Boege Soerensen, L. (2005). Supply chain integration: A European survey [Article]. *The International Journal of Logistics Management*, *16*(2), 275-294. https://doi.org/10.1108/09574090510634557

Bastiaansen, E. (2022). *Internal interview Manager Commercial Operations* [Interview].

Bowen, G. (2015). Preparing a Qualitative Research-Based Dissertation: Lessons Learned. *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2005.1846

Byrne, P. J., & Heavey, C. (2006). The impact of information sharing and forecasting in capacitated industrial supply chains: A case study. *International Journal of Production Economics*, *103*(1), 420-437. https://doi.org/10.1016/j.ijpe.2005.10.007

Cavusoglu, H., Cavusoglu, H., & Raghunathan, S. (2012). Value of and Interaction between Production Postponement and Information Sharing Strategies for Supply Chain Firms. *Production and Operations Management*, *21*(3), 470-488. https://doi.org/10.1111/j.1937-5956.2011.01286.x

Cheikhrouhou, N., Marmier, F., Ayadi, O., & Wieser, P. (2011). A collaborative demand forecasting process with event-based fuzzy judgements. *Computers & Industrial Engineering*, *61*(2), 409-421. https://doi.org/10.1016/j.cie.2011.07.002

Chen, F., Drezner, Z., Ryan, J. K., & Simchi-Levi, D. (2000). Quantifying the bullwhip effect in a simple supply chain: the impact of forecasting, lead times, and information [Article]. *Management Science*, *46*(3), 436-443. https://doi.org/10.1287/mnsc.46.3.436.12069

Childerhouse, P., & Towill, D. R. (2011). Arcs of supply chain integration. *International Journal of Production Research*, *49*(24), 7441-7468. https://doi.org/10.1080/00207543.2010.524259

Collin, J., & Lorenzin, D. (2006). Plan for supply chain agility at Nokia. *International Journal of Physical Distribution & Logistics Management*, *36*(6), 418-430. https://doi.org/10.1108/09600030610677375

Corsten, D., & Gruen, T. (2016). On Shelf Availability: An Examination of the Extent, the Causes, and the Efforts to Address Retail Out-of-Stocks. In (pp. 131-149). Springer-Verlag. https://doi.org/10.1007/3-540-27059-0_9

Costantino, F., Di Gravio, G., Shaban, A., & Tronci, M. (2014). The impact of information sharing and inventory control coordination on supply chain performances. *Computers*

& Industrial Engineering, *76*, 292-306. https://doi.org/https://doi.org/10.1016/j.cie.2014.08.006

Cui, R., Allon, G., Bassamboo, A., & Van Mieghem, J. A. (2015). Information sharing in supply chains: An empirical and theoretical valuation [Article]. *Management Science*, *61*(11), 2803-2824. https://doi.org/10.1287/mnsc.2014.2132

Culot, G., Orzes, G., Sartor, M., & Nassimbeni, G. (2020). The future of manufacturing: A Delphi-based scenario analysis on Industry 4.0. *Technological Forecasting and Social Change*, *157*, 120092. https://doi.org/https://doi.org/10.1016/j.techfore.2020.120092

De Leeuw, S., Grotenhuis, R., & Van Goor, A. R. (2013). Assessing complexity of supply chains: evidence from wholesalers. *International Journal of Operations & Production Management*, *33*(8), 960-980. https://doi.org/10.1108/ijopm-07-2012-0258

Du, T. C., Lai, V. S., Cheung, W., & Cui, X. (2012). Willingness to share information in a supply chain: A partnership-data-process perspective. *Information & Management*, *49*(2), 89-98. https://doi.org/https://doi.org/10.1016/j.im.2011.10.003

Elofson, G., & Robinson, W. N. (2007). Collective customer collaboration impacts on supply-chain performance. *International Journal of Production Research*, *45*(11), 2567-2594. https://doi.org/10.1080/00207540601020528

Eurich, M., Oertel, N., & Boutellier, R. (2010). The impact of perceived privacy risks on organizations' willingness to share item-level event data across the supply chain. *Electronic Commerce Research*, *10*(3-4), 423-440. https://doi.org/10.1007/s10660-010-9062-0

Fawcett, S. E., Magnan, G. M., & McCarter, M. W. (2008). Benefits, barriers, and bridges to effective supply chain management. *Supply Chain Management: An International Journal*, *13*(1), 35-48. https://doi.org/10.1108/13598540810850300

Fawcett, S. E., Wallin, C., Allred, C., & Magnan, G. (2009). Supply chain information-sharing: benchmarking a proven path. *Benchmarking: An International Journal*, *16*(2), 222-246. https://doi.org/10.1108/14635770910948231

Fildes, R., Goodwin, P., Lawrence, M., & Nikolopoulos, K. (2009). Effective forecasting and judgmental adjustments: an empirical evaluation and strategies for improvement in supply-chain planning. *International Journal of Forecasting*, *25*(1), 3-23. https://doi.org/https://doi.org/10.1016/j.ijforecast.2008.11.010

Flynn, B. B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management*, *28*(1), 58-71. https://doi.org/10.1016/j.jom.2009.06.001

Fransoo, J. C., & Wouters, M. J. F. (2000). Measuring the bullwhip effect in the supply chain. *Supply Chain Management: An International Journal*, *5*(2), 78-89. https://doi.org/10.1108/13598540010319993

Geary, S., Disney, S. M., & Towill, D. R. (2006). On bullwhip in supply chains—historical review, present practice and expected future impact. *International Journal of Production Economics*, *101*(1), 2-18. https://doi.org/10.1016/j.ijpe.2005.05.009

Hartzel, K. S., & Wood, C. A. (2017). Factors that affect the improvement of demand forecast accuracy through point-of-sale reporting. *European Journal of Operational Research*, *260*(1), 171-182. https://doi.org/10.1016/j.ejor.2016.11.047

Holweg, M., Disney, S., Holmström, J., & Småros, J. (2005). Supply Chain Collaboration:: Making Sense of the Strategy Continuum. *European Management Journal*, *23*(2), 170-181. https://doi.org/https://doi.org/10.1016/j.emj.2005.02.008

Hosoda, T., Naim, M. M., Disney, S. M., & Potter, A. (2008). Is there a benefit to sharing market sales information? Linking theory and practice. *Computers & Industrial Engineering*, *54*(2), 315-326. https://doi.org/10.1016/j.cie.2007.07.014

Hübner, A. H., Kuhn, H., & Sternbeck, M. G. (2013). Demand and supply chain planning in grocery retail: an operations planning framework. *International Journal of Retail & Distribution Management*, *41*(7), 512-530. https://doi.org/10.1108/IJRDM-05-2013-0104

Iyer, A. V., & Ye, J. (2000). Assessing the Value of Information Sharing in a Promotional Retail Environment. *Manufacturing & Service Operations Management*, *2*(2), 128-143. https://doi.org/10.1287/msom.2.2.128.12350

Kaipia, R., & Hartiala, H. (2006). Information-sharing in supply chains: Five proposals on how to proceed [Article]. *The International Journal of Logistics Management*, *17*(3), 377-393. https://doi.org/10.1108/09574090610717536

Kilger, C., & Wagner, M. (2008). Demand Planning. In (pp. 133-160). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-74512-9_8

Kulp, S. C., Lee, H. L., & Ofek, E. (2004). Manufacturer Benefits from Information Integration with Retail Customers. *Management Science*, *50*(4), 431-444. https://doi.org/10.1287/mnsc.1030.0182

Lauer, T., & Franke, K. (2020). Behavioral analysis of information exchange digitalization in the context of demand planning. In *Advances in Intelligent Systems and Computing* (Vol. 1131 AISC, pp. 973-979).

Leusen, R. (2022). *Internal interview Manager Strategy Development* [Interview].

Li, T., & Zhang, H. (2015). Information sharing in a supply chain with a make-to-stock manufacturer. *Omega*, *50*, 115-125. https://doi.org/https://doi.org/10.1016/j.omega.2014.08.001

Lin, W., Ren, H., Peng, Q., Ye, S., Jiang, Z., & Wang, K. (2019). An Analysis of the Bullwhip Effect in Multi-echelon Hybrid Supply Chain. *IFAC-PapersOnLine*, *52*(13), 2419-2424. https://doi.org/10.1016/j.ifacol.2019.11.569

Matopoulos, A., Vlachopoulou, M., Manthou, V., & Manos, B. (2007). A conceptual framework for supply chain collaboration: empirical evidence from the agri-food industry. *Supply Chain Management: An International Journal*, *12*(3), 177-186. https://doi.org/10.1108/13598540710742491

Narayanan, A., Sahin, F., & Robinson, E. P. (2019). Demand and order-fulfillment planning: The impact of point-of-sale data, retailer orders and distribution center orders on forecast accuracy. *Journal of Operations Management*, *65*(5), 468-486. https://doi.org/10.1002/joom.1026

Nguyen, T. T. H., Le, T. M., Bekrar, A., & Abed, M. (2022). Some Insights Into Effective Demand Planning. *IEEE Engineering Management Review*, *50*(3), 141-148. https://doi.org/10.1109/emr.2022.3189028

Nimmy, J. S., Chilkapure, A., & Pillai, V. M. (2019). Literature review on supply chain collaboration: comparison of various collaborative techniques [Review]. *Journal of Advances in Management Research*, *16*(4), 537-562. https://doi.org/10.1108/JAMR-10-2018-0087

Novitasari, N., & Diah Damayanti, D. (2018, 2018). Systematic literature review and improved model for mitigating bullwhip effect in low shelf life food supply chain. International Conference on Industrial Engineering and Applications,

Nyaga, G. N., Whipple, J. M., & Lynch, D. F. (2010). Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ? [Article]. *Journal of Operations Management*, *28*(2), 101-114. https://doi.org/10.1016/j.jom.2009.07.005

Paik, S. K., & Bagchi, P. K. (2007). Understanding the causes of the bullwhip effect in a supply chain. *International Journal of Retail & Distribution Management*, *35*(4), 308-324. https://doi.org/10.1108/09590550710736229

Palomero, S., & Chalmeta, R. (2012). A guide for supply chain integration in SME's. *Prodcution Planning & Control, 2014*, *25*, 372-400. https://doi.org/10.1080/09537287.2012.698422

Panahifar, F., Heavey, C., Byrne, P., & Fazlollahtabar, H. (2015). A framework for Collaborative Planning, Forecasting and Replenishment (CPFR). *Journal of Enterprise Information Management*, *28*(6), 838-871. https://doi.org/10.1108/jeim-09-2014-0092

Petropoulos, F., & Carver, S. (2019). Chapter 16 - Forecasting for food demand. In R. Accorsi & R. Manzini (Eds.), *Sustainable Food Supply Chains* (pp. 237-248). Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-813411-5.00016-8

Purwanto, G. R., Siagian, H., & Yuliana, O. Y. (2024). The role of information technology implementation, information sharing, and supply chain collaboration in improving supply chain performance. AIP Conference Proceedings,

Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm Performance Impacts of Digitally Enabled Supply Chain Integration Capabilities. *MIS Quarterly*, *30*(2), 225-246. https://doi.org/10.2307/25148729

Ramanathan, U., & Gunasekaran, A. (2014). Supply chain collaboration: Impact of success in long-term partnerships [Article]. *International Journal of Production Economics*, *147*(PART B), 252-259. https://doi.org/10.1016/j.ijpe.2012.06.002

Sagaert, Y. R., Aghezzaf, E.-H., Kourentzes, N., & Desmet, B. (2018). Tactical sales forecasting using a very large set of macroeconomic indicators. *European Journal of Operational Research*, *264*(2), 558-569. https://doi.org/10.1016/j.ejor.2017.06.054

Saunders, M., Lewis, P., Thornhill, A., & Bristow, A. (2019a). "Research Methods for Business Students" Chapter 5: Qualitative research designs. In (pp. 179-219).

Saunders, M., Lewis, P., Thornhill, A., & Bristow, A. (2019b). “Research Methods for Business Students” Chapter 10: Collecting primary data using research interviews and research diaries. In (pp. 431-450).

Schreijen, S. (2021). Foodservice Groothandels - ook pijn achter de coulissen. https://research.rabobank.com/publicationservice/download/publication/token/g5dGz9urXM3Au25plzk8

Shaban, A., Costantino, F., Di Gravio, G., & Tronci, M. (2019). A new efficient collaboration model for multi-echelon supply chains. *Expert Systems with Applications*, *128*, 54-66. https://doi.org/https://doi.org/10.1016/j.eswa.2019.03.026

Simatupang, T. M., & Sridharan, R. (2004). Benchmarking supply chain collaboration. *Benchmarking: An International Journal*, *11*(5), 484-503. https://doi.org/10.1108/14635770410557717

Smits, E. (2019). *MT500 - Best in Groothandel*. https://mtsprout.nl/mt500/mt500-2019/mt500-best-in-groothandel

Trapero, J. R., Kourentzes, N., & Fildes, R. (2012). Impact of information exchange on supplier forecasting performance. *Omega*, *40*(6), 738-747. https://doi.org/10.1016/j.omega.2011.08.009

Van Belle, J., Guns, T., & Verbeke, W. (2021). Using shared sell-through data to forecast wholesaler demand in multi-echelon supply chains. *European Journal of Operational Research*, *288*(2), 466-479. https://doi.org/https://doi.org/10.1016/j.ejor.2020.05.059

Vereecke, A., Vanderheyden, K., Baecke, P., & Van Steendam, T. (2018). Mind the gap - Assessing maturity of demand planning, a cornerstone of S&OP. *International Journal*

of Operations and Production Management, *38*(8), 1618-1639. https://doi.org/10.1108/IJOPM-11-2016-0698

Wölfel, J., & Grosse-Ruyken, P. T. (2020). Bilateral Opportunism in Buyer–supplier Partnerships [Article]. *Journal of Business-to-Business Marketing*, *27*(3), 247-261. https://doi.org/10.1080/1051712X.2020.1787026

Wook Kim, S. (2006). Effects of supply chain management practices, integration and competition capability on performance. *Supply Chain Management: An International Journal*, *11*(3), 241-248. https://doi.org/10.1108/13598540610662149

Wu, I.-L., Chuang, C.-H., & Hsu, C.-H. (2014). Information sharing and collaborative behaviors in enabling supply chain performance: A social exchange perspective. *International Journal of Production Economics*, *148*, 122-132. https://doi.org/https://doi.org/10.1016/j.ijpe.2013.09.016

Yigitbasioglu, O. M. (2010). Information sharing with key suppliers: A transaction cost theory perspective [Article]. *International Journal of Physical Distribution and Logistics Management*, *40*(7), 550-578. https://doi.org/10.1108/09600031011072000

Zaheer, N., & Trkman, P. (2017). An information sharing theory perspective on willingness to share information in supply chains. *The International Journal of Logistics Management*, *28*(2), 417-443. https://doi.org/10.1108/ijlm-09-2015-0158

VII. Appendices

Appendix 1. List of figures, graphs, and tables

Appendix 2. Semi-structured interview questions

1. Introduction: what is your name, and what function do you have?

2. Do you have certain demand planning practices in place? Could you tell me something about your demand planning process?
   - 2.1. If so: could you tell me something about your demand planning process?
     - 2.1.1. What types of information/data do you use in your demand planning process?
   - 2.2. If not: how do you plan for future demand/plan for stock?

3. Are there any systems you use to sustain the demand planning process?
   - 3.1. If so: what types of systems?
     - 3.1.1. Could you describe what kind of data these systems store/process?
   - 3.2. If not: How do you treat your customer data to gain relevant demand information?

4. Is there currently any information regarding (future) demand that you are sharing with Frymaster &Co?
   - 4.1. If so: what kind of information is that?
   - 4.2. If not: what is the reason no information is shared?
5. Regarding sharing information: do you share this data with other actors? Or do you send specific information to different actors?
   - 5.1. If only with specific actors: Why only with them? How do you make this distinction?

6. If we look at the information on demand, do you have (one of) the following available:
   - the type of forecast model (parameters that are included and with which time horizon)

- historical sales data (number of historical sales and types of customers)
- point-of-sale data (inventory levels and replenishment practices)
- promotional events (information on future promotional events)
- end-user segmentation information (aggregated customer information in a way that they are divided into end-user segments (e.g.: type of business/market))
- long-term demand planning information (new customers, loss of customers, big upcoming events and disruptions, overstock information, and macroeconomic variables such as future expectations and inventory constraints)
- other types?

7. What are the reasons for you (not) to share this information with Frymaster &Co? Does (one of) the following play a part in the willingness to share demand information?
   - Trust or a lack thereof (*trusting the other party will keep the information confidential)*
   - Incentives (*gain better service performance if you share information)*
   - Commitment *(number of years you have been doing business together)*
   - IT capabilities (*easy ways to share information through IT systems)*

8. Do you believe IT systems contribute to sharing information within the supply chain?
   8.1. If so: do you have any such IT systems?
      8.1.1. Do you have a VIM system? (a system that allows the supplier to manage the inventory levels)
   8.2. If no capabilities are in place: do you believe this contributes to sharing information within the supply chain?

9. As a final question, in your opinion, how can Frymaster &Co. improve its demand planning process?