

# **Digitization in the B2B Pharmaceutical Industry: *A similar State of Technology Adoption as in the B2B Food and Beverage Industry? A comparison.***

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Master Thesis submitted in fulfillment of the Degree  
Master of Business Administration

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Vienna, 04 September 2021

## Affidavit

I hereby affirm that this Master's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

The thesis was not submitted in the same or in a substantially similar version, not even partially, to another examination board and was not published elsewhere.

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## Abstract

This thesis focuses on the degree of technology adoption in the food and beverage and pharmaceutical supply chains in the B2B space and attempts a comparison of the two. As a focus point, the sales process towards the end of the supply chains where trading processes occur between wholesalers, producers, or distributors on the one hand and end consumer facing players on the other hand.

The literature review sheds light on the status of technology adoption and elaborates on the growing importance of the same regarding growing competition and changing buyer expectations. In-depth interviews with relevant industry players from both industries provide an insight on current ways of working, process optimization and challenges resulting therefrom in terms of change management and adaptability.

Findings showed that the industries have undergone digitization of their ordering processes at very different times. The pharmaceutical industry has automated generic ordering processes several years ago already and still follow the same approach. This process is only taking place now in the food and beverage industry.

# 1. Introduction

## 1.1 Industry 4.0

Technologies applied to enhance and improve operational activities are collectively referred to as the fourth industrial revolution or the “Industry 4.0”, integrating technology in daily processes for smarter ways of working and tools like the internet of things. As a main target, productivity can be boosted allowing companies and teams to allocate resources to non-automatable processes (Behner & Ehrhardt, 2016).

Starting in the late 20th century, this fourth industrial revolution provided the cornerstone for structural innovation of manufacturing processes. The centre of attention lies in automation which explains the reason for a synonym that evolved next to the Industry 4.0, namely “smart factory”. Hence, firms and companies that have adopted technologies of Industry 4.0 are increasingly referred to as smart factories. Generally speaking, core components and technologies to this movement are the appliance of Internet of Things (IoT) devices and appliances as well as the communication between machinery and processes that allow enhanced and more efficient monitoring of processes. All these aspects have the avoidance of human capital needed in mind, which tends to be more prone to errors when it comes to such monitoring tasks. As a result, these technologies surely save costs over time, but also increase safety through their precise work processes. Meanwhile they enhance process efficiencies. Despite the numerous advantages Industry 4.0 implies, most companies have not yet accomplished a full integration of the automation.

## 1.2 The Five Stages of Industry 4.0

Generally, the implementation is split into five different stages. As described by Mishra (2020), stage one refers to the ability to monitor processes remotely, stage two to the ability to monitor remotely in real-time, stage three to the ability to detect anomalies from remote locations, stage four to the ability to develop predictive maintenance schemes and the final fifth stage to actual automated decision making which would result in no need for human labour for any decision-making process. As it turns out, most companies are at stage one, and the great minority at stage two or three (Mishra, 2020).

To go into more detail, stage one refers to companies' ability to monitor data, albeit data points are gathered in a manual process (Mishra, 2020). Common examples for such data tracking systems are

enterprise resource planning (ERP) systems or also CRMs, which describes customer relationship management software. Hence, improvements would only concern internal processes, and would not concern the interaction with other external parties (Ash & Burn, 2002). Hence, data systems are not automated but merely is the option to review data remotely. As a result, the level of gained efficiency is very limited as raw data is further processed by human capital.

The final goal of companies adopting Industry 4.0 technologies is the ability to forecast and predict actions and effects across the entire company and all processes. Artificial intelligence has reached a point of making the right adjustments of rules in place without the need of human supervision (Mishra, 2020).

Developing the capability to be able to move from one stage to another requires more than time and financial resources for successful implementation. Merging old and new ways of working is often a core challenge in a sense that they must complement each other to create sustainable value. In addition, the enhanced technological interaction between different market participants allows for value creation beyond the classical value chain. Rather, networks and ecosystems develop which then again must be managed appropriately (Li, Su, Zhang, & Mao, 2017). Next to these ever-fast developments companies must be increasingly aware of fast changing environments they start to be more and more intertwined with, including alterations of business models, but also environmental changes requiring fast entrepreneurial decision making and adaptation to remain competitive (Kohli & Melville, 2018).

As a matter of fact, and with reference to the discussion on the five stages of Industry 4.0, one must take into account that the adoption of technologies towards artificial intelligence bears strongly diverging difficulties among different industries. Especially companies handling sensitive data and processes face significant risks when changing processes in place. In reverse, one must take the cost of implementation and testing phases into account. Clearly, the current Covid-19 crisis has affected the progress in regard to these advancements, especially for rather unstable companies not willing to take any risk where not necessary for survival. On the other hand, companies who could afford it took the chance to set new standards and improved their companies' technological standing (Kark, Gill, & Smith, 2021).

The question arises whether (at least up to stage two or three) the timely adoption of Industry 4.0 technologies may have supported and positively affected companies' strength throughout the crisis.

On the other hand, stage five would have been a requirement for the technology to smoothly adjust processes and rules, without increased costs and error (Kark, Gill, & Smith, 2021).

This aspect is tackled by stage two of Industry 4.0 technologies. At this stage, companies start to make use of technology at the data system level. This includes the installation of IoT like sensors allowing for enhanced business intelligence. This way raw data is further analysed to allow easier decision making and predictions (Mishra, 2020).

It is only at stage three when data collected by companies can serve as predictors to enhance the companies` performance. It is artificial intelligence that creates rules based on amounts of data collected over months of operations. The effect is the mitigation of errors up to avoidance of malfunctions. As mentioned, first companies have entered this stage of technological advancement. These companies are now concerned with the smooth integration of the implemented technologies, working on accelerating the won improvements towards long-term cost efficiencies and further reduction of errors appearing in daily processes (Mishra, 2020).

The so-called “digital transformation of businesses” was triggered around understanding the end-consumer in greater detail. Top management therefore started to approach the industry 4.0 revolution by approaching their strategies from a more analytical angle, which was only achievable through new technologies, making the collection and understanding of data points possible. In that regard, a key requirement was the automated facilitation of generating reports in a fast and easy way for further regular analysis (Behner & Ehrhardt, 2016).

In the meantime, we can also see that trends have been shifting from a pure analytical nature towards the optimization of operations in general. This phenomenon appeared in numerous industries, including the food and beverage industry (Behner & Ehrhardt, 2016).

As a result, the digitization of supply chains has become apparent in many different industries throughout the past years. With industries moving faster through technological advancements, supply chain managers were forced to shift their focus from merely improving process efficiency to reinventing processes overall to meet the ever-faster pace of work (Van Wyck, Rose, Ahmad, & Küpper, 2019).

As found by a survey on digital maturity conducted by the Boston Consulting Group in 2019, digitisation can lead to a cut in production and supply chain cost of up to 10 % to 20 % for manufacturing companies. Furthermore, implemented solutions could lead to a revenue increase of up to 6 %, resulting from enhanced productivity levels (Van Wyck, Rose, Ahmad, & Küpper, 2019).

As a matter of fact, these changes and new technologies bring along new challenges and opportunities of implementation and overall ways of working (Agrawal & Narain, 2018). Enhanced ways of working create a higher pace of processes, increasing adaptability and responsiveness (Behner & Ehrhardt, 2016).

Interestingly, if one investigates processes of the pharmaceutical industry, the industry was not at the forefront of developments in regard to technological adoptions in operational activities and hence Industry 4.0 developments four to five years ago (Behner & Ehrhardt, 2016). Sooner or later pharmaceutical industries will need to reposition supply chains in their strategic planning assuring technological improvements to optimize the value chain (Wang & Jie, 2020). This aspect is specifically relevant regarding the purpose of this paper.

### 1.3 Digitization and Technology of Supply Chains

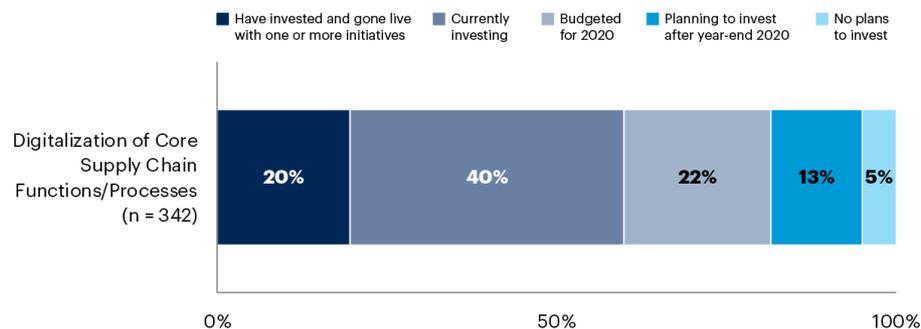
Before going into detail on the food and beverage and pharmaceutical supply chains and their status of innovation and technology adoption, this chapter shall provide a general overview of overall developments regarding supply chain technologies and attributed importance.

Especially throughout the past years, as mentioned in this paper, the overall focus on supply chain optimization has increased in most if not all industries. With more and more companies contributing to products and their development globally, the complexity of collaboration has increased considerably. In addition, with technology allowing for better monitoring, greater efficiencies and less human capital involved, trends have strongly shifted towards innovation in this field.

As the data below, (a survey outcome conducted by Klappich, De Muynck, Aimi, Titze, & Stevens, 2020 shows, nearly half of supply chain companies have accepted the importance and need for consistent investments in digital supply chains. Together with the group of executives who have planned to invest in technological advancements in their companies in the upcoming years, the figure reaches 62 %. This clearly indicates a trend and confirms the growing importance of digital ways of working of supply chains (Klappich, De Muynck, Aimi, Titze, & Stevens, 2020).

## Investment for Digital Supply Chain

Percentage of Respondents



n = Total respondents, excluding "don't know"

Q: Where is your organization currently investing or planning to invest for Digital in your Supply Chain?

Source: 2019 Gartner Supply Chain Technology User Wants and Needs Survey

731397\_C

**Gartner.**

Figure 1. Investment for Digital Supply Chain (Klappich, De Muynck, Aimi, Titze, & Stevens, 2020)

Especially the general increase of ecommerce in the B2B sector triggered entire supply chains to further optimize existing processes. As found in a study conducted by Singh (2020) and focussing on trends in 2021 around B2B and digital solutions, the optimization and hence digitalization of supply chains turned out to be key to stay competitive which became especially clear during the Covid-19 pandemic (SINGH, 2020).

## 2. Research Aims and Objectives

Following the previous discussion, this thesis aims to critically assess the pharmaceutical supply chain. Considering a comparable need for traceability in the food and beverage industry (Brito da Silva & de Mattos, 2019), and recent developments in order processing, supply chain management and the degree of digitalization of the food and beverage industry will be evaluated at first.

The aim is to demonstrate how and whether the food and beverage industry can be a leading example for the pharmaceutical industry. Thus, the purpose of this thesis is to evaluate and assess similarities and differences specifically in regard to the digitization of manual processes throughout the supply chain of the food and beverage and pharmaceutical industries.

This aspect shall later be paired with a benchmarking analysis of the processes apparent in the pharmaceutical industry and related supply chain optimization processes.

In doing so, the thesis questions the following: At which stage of the technology adoption lifecycle are the food and beverage and pharmaceutical industries and in which way is the supply chain of the food and beverage industry more progressed than supply chain processes of the pharmaceutical industry?

Thus, the thesis aims to 1) identify factors of similarities and differences between the different supply chains as a whole, 2) visualizing specifically the end of the supply chains of food and beverage and pharmaceutical products (meaning the last transaction between merchant and consumer in the B2B space) and 3) thirdly identifying the way orders are placed and processed by industry players and lastly, 4) whether the pharmaceutical industry can advance using leading examples from the food industry.

## 2.1 Managerial Implications

Considering the scope of this thesis the following implications must be considered for managerial purposes:

Firstly, the secondary research conducted is limited to German and English sources. As a result, several studies were not considered when conducting research on the current state of processes.

Secondly, another limitation linked to secondary research is that one must keep in mind that much data is sensitive to industry actors and hence not available for secondary research analysis.

Secondly, the sample size for primary research is limited. With in-depth interviews chosen as the research approach, time and availability are the clear limiting factors. Interviewees were partially limited by confidentiality agreements with their employers and some of the information gathered is based on subjective grounds.

Thirdly, findings cannot and must not be generalized for the entire supply chain and shall be applied to other industries only carefully. The focus of the thesis lies on the interaction and ways of communication between restaurateurs and restaurant employees with their suppliers on the one hand, and pharmacies and similar players and their suppliers on the other hand. No other process components or opinions are taken into account and therefore limit the generalisation capability of the outcome of this thesis.

### 3. Literature Review

This section of the thesis shall provide a theoretical overview of supply chains and their general purpose especially in regard to the transfer of goods and information. Light will be shed on the effect of globalisation and technological advancements changing the overall scope of supply chain structures (Patterson, Grimm, & Corsic, 2003).

#### 3.1. Supply Chain Overview

Generally speaking, a supply chain describes the interlinkage and value chain a product undergoes before the final consumption or buying moment. Put differently, it shows the path a product has completed from manufacturing or production to (mostly several) trading steps for efficient distribution (Lee & Kim, 2021).

With increased globalisation, supply chains have significantly gained in complexity. Networks have become more intertwined; customer expectations have been rising and product and technology lifecycles adapt faster than ever before. Clearly, these aspects affect risks involved when it comes to supply chain management and optimization. Next to that, cost reductions and on-time delivery are congruent factors putting managers and business model operations under pressure. Furthermore, uncertainties are tried to be undermined, as they increase risks for organizations involved. Certainly, these aspects are proportionally severe for industries like food and beverage or pharmaceuticals (Wang & Jie, 2020).

Another aspect to shed light on is supply chain effectiveness strongly affected by globally engaging supply chains. With rising risks companies outsource risk management of their supply chains more and more often, which many times turns out to be counterproductive in regard to supply chain effectiveness. Especially in the pharmaceutical industry, supply chains will need to become a more integral part of strategic planning, with technological improvements at the forefront to achieving efficient processes across the value chain (Wang & Jie, 2020).

## 3.2 Digitization in the Food and Beverage Industry

### 3.2.1 Digitization of Order Management Processes towards the End of the Supply Chain

Clearly, some industries have adopted digital technologies earlier than others. Rather recently, the food and beverage industry has developed faster ways of communication on the lower end of the supply chain, close to the final buying party, i.e. food and beverage outlets and the like. Regular orders which used to be exclusively handled by phone, email or fax are increasingly digitized. The means of digitisation are usually online shops and smartphone applications offered by suppliers and other companies detecting a market in this non-standardized environment (EasyVend, 2021).

On the supplier side, the traditional way of order processing involved a significant number of human resources, even if companies had enterprise resource planning systems in place. The reiterated process allows an application to be linked to such tracking system through an application programming interface. The high workload and cost resulting from manual data input are only two of the relevant disadvantages resulting from this process in the supply chain (Martin-Rios & Ciobanu, 2019).

At this point it shall be noted that supply chains of larger market players like hotels and restaurant chains have been previously further optimized, as opposed to those of smaller players like independent restaurants or specialty stores, where smaller structures often do not allow for high investment in technological change (NOVUM HOSPITALITY, 2018). Taking hotel chains as an example, enterprise resource planning systems usually allow personnel to send automated emails to suppliers, sometimes even without human interaction required, by recognizing empty stocks automatically. Other suppliers would build application programming interfaces to exchange data points on a company-to-company basis (Schomaker, 2020).

Considering the cost factor of implementing such interfaces a new way of ordering through applications opened new doors for the industry. To put it differently, now one application programming interface would be required to consolidate orders from all customers sending orders using the application, no matter whether they come from different individual restaurants (Schomaker, 2020). Generally speaking, the overall food and beverage industry, and as what research for this thesis found, in particular the German market, is experiencing significant changes in the landscape of technological advancements in terms of service providers.

With smaller food and beverage outlets and their tendency to regularly order from several suppliers, the question arises how an efficient alternative to a generally adopted method of calling or sending emails to each supplier could be found. It is though rather a matter of time, when a shift will occur, considering rising labour and cost of other resources demanding for enhanced efficiency to stay competitive (tageskarte.io, 2021).

After all, it is the trend towards platforms and online marketplaces, allowing consumers to navigate through the jungle of growing supply and information, be they are B2B or B2C clients (PRO Fachhandel, 2018).

### 3.2.2 Digitization beyond Order Management: Industry Trends

Beyond the digitization specifically towards the end of the supply chain digitization plays a significant role elsewhere as well. As discussed previously, the Industry 4.0 “revolution” is at the forefront of digitization for the industry. Furthermore, cloud computing overall enhances the ease to adopt technology across supply chain actors (Infor, 2021).

One of the strong trends across food and beverage supply chains resulting from these changes circles around the topic of data analytics. With the ability and implementation of enhanced tracking of processes manufacturers and producers can gain better understanding on their products’ quality and hence save costs through more accurate predictions. Paired with the optimization of transportation and data on best storage circumstances, these improvements allow for sustainable cost savings (Infor, 2021).

Another aspect to consider in terms of digitization across the supply chain is the increased use of robotics for process automation. In more and more manufacturing companies robots are used for packaging as well as cutting tasks and, next to the benefit of reduced costs, enhance cleanliness, accuracy and time-efficiency (Infor, 2021).

### 3.3 Digitization in the Pharmaceutical Industry

Similar to the food and beverage industry, the pharmaceutical industry has been rather careful in the application of technological solutions when it comes to daily operations. Especially for B2B sales, traditional approaches and structures involved sales representatives establishing strong relationships with their clients to build a strong recurring customer base (Chintan, 2020).

As a matter of fact, and as it is true for many other industries as well, also the pharmaceutical industry has started to face challenges. Mainly globalisation (and challenges like pressure on price and required enhanced economies of scale resulting therefrom) and need for supply chain optimization that could be tackled with the support and smart application of technological solutions (Behner & Ehrhardt, 2016).

The comparably slow adaptations towards technological processes in supply chains in this industry are strongly linked to regulations restricting market participants in such restructuring activities. These restrictions have a tremendous impact on operational efficiencies considering, amongst others, a high number of supply chain participants, counterfeit drugs requiring enhanced transparency and quality control as well as increased personalization of medications and competitive pricing; all this largely caused by globalisation. The fourth industrial revolution could hence trigger significant change for supply chains of the pharmaceutical industry (Behner & Ehrhardt, 2016).

A study on digitalization in life science conducted by KPMG in 2018 revealed that 85 % of companies within the sample were convinced that tech companies will have significant impact on their industry, most expected this shift in 2019 already. This finding shows how urgent the need for technological change is also for the pharmaceutical industry. The study further stresses the urgency of action, justified by the increasing number of interconnections. Strong communication flows are considered a prerequisite in this fast-moving developing ecosystem (Lakshman & Rohrbach, 2018).

As the illustration (Figure 1) below displays, there is a significant departmental difference in regard to the adoption of technology in the pharmaceutical industry. Focusing on the supply chain, and the logistics department being most relevant for this thesis, 40 % of survey respondents had in common that no projects to digitize the respective logistics department were planned at all (Lakshman & Rohrbach, 2018).



Figure 2: Digitalization projects in pharmaceutical companies split by department (Lakshman & Rohrbach, 2018)

### 3.4 Similarities and Differences between F&B and Pharmaceutical Supply Chains

Pharmaceutical supply chains (PSC) usually consist of five tiers and are hence more complex than typical food and beverage supply chains, which tend to involve two to three market players. To go into further detail, a pharmaceutical supply chain is started by primary manufacturers supplying drug contents to secondary manufacturers. From there, produced medicines enter the distribution sphere, where main distribution centres further disperse the products to local distribution centres. Distribution centres are commonly referred to as wholesalers. The final step of the supply chain are so-called demand points such as pharmacies and/or hospitals (Brito da Silva & de Mattos, 2019). Inefficiencies of supply chains are often reflected in the price of medicines and hence mostly born by the patient. As described by McGrail (2020), order management and the dependence on human resources are a challenge in regard to optimization and cost efficiency, as detected by the global information analytics business (McGrail, 2020). In addition, especially orders on short notice including emergency ordering and frequent ordering processes need further improvements. Complex ordering procedures combined with the lack of qualified employees further complicate the process. Therefore,

effective and easy-to-use IT (information technologies) systems are key to improve processes. As further noted by Privett and Gonsalvez (2014), the core issue with order management is the insufficient information on available stock levels, resulting on order decisions based on employees' best estimates. Further to this challenge come lead times averaging at three to six months. On top of these constraints, received orders often do not match the order placed (Privett & Gonsalvez, 2014).

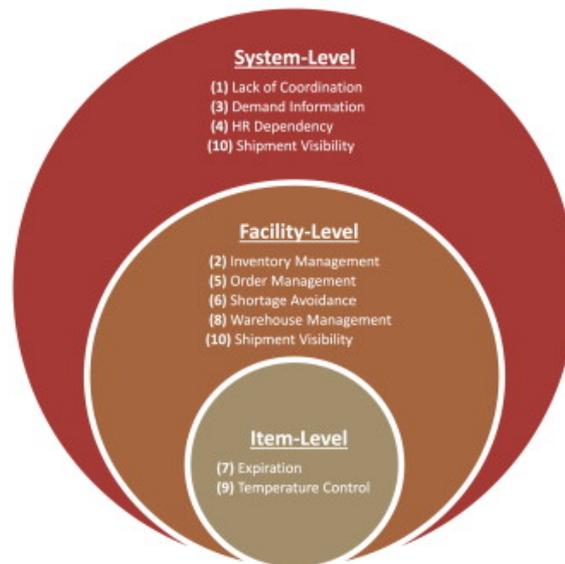


Figure 3: Dependency Model: Top Ten Supply Chain Issues (Privett & Gonsalvez, 2014)

Food and beverage supply chains usually comprise of producers, who partly continue with processing the foods and distribute directly to buyers. More common are structures where producers resell products to distributors. One must keep in mind that different sectors have developed varying approaches, hence comparing fruit and vegetable supply chains with e.g. the supply chain of beverages is impossible (Lüth, Spiller, & Wegener, 2005).

Another important aspect of similarity between food and beverage and pharmaceutical supply chains is the need for traceability (Brito da Silva & de Mattos, 2019). Despite this important fact, this thesis will focus on potential inefficiencies in regard to the ordering process, especially towards the end of the supply chains, i.e. buyer and distributor relationships. At the same time, it shall be investigated whether regulatory traceability requirements have led to enhanced efficiencies and order mechanisms in both industries. As found by Lovis (2018) traceability has the potential to enhance the efficiency of supply chains and reduced the number of errors detected (Lovis, 2018).

### 3.4.1 Blockchain Technology for the Pharmaceutical and Food and Beverage Industry

#### 3.4.1.1 General Overview and Definition of Blockchain Technology

Considering the regulative environment and resulting necessity for security measures, blockchain is a technology allowing for safe data transfer and independence of single data warehouses (Lakshman & Rohrbach, 2018).

So far, blockchains have been applied in many different industries, most and foremost the financial sector, very much linked to the cryptocurrency Bitcoin, indeed. Next to that, many supply chains have been optimized in regard to secure administration and digital authentication possible through blockchain technology (Sharma & Singh, 2020).

The reason why blockchains oftentimes find application across supply chains is that the characteristic of decentralized data supports the information flow between different parties working together across the chains. Other important aspects contributing to the growing amount of blockchain use cases are transparency and immutability of data and transactions between parties, meaning general data accessibility despite of parties' anonymity (and hence identity privacy) and no changes of data points after a fulfilled transaction, respectively (Sharma & Singh, 2020).

#### 3.4.1.2 Blockchain Technology for the Food and Beverage Industry

As previously mentioned, digitization of the food and beverage industry tends to occur with significant delay when compared to other industries. The reason for rather late responses to new technologies tends to be comparably heavy regulatory requirements to be adhered to across the supply chain. This is surely the case due to strict handling to enable and guarantee food safety and avoidance of fraud (Creydt & Fischer, 2019).

The food industry is specifically at the centre of related discussions, as several different parties are usually involved in the production and processing of resources: from the production by a farmer, for instance, produce is sold to a production company further processing the produce. Already at this point traceability must be ensured to be able to trace back any potential anomalies detected at a later stage (Sharma & Singh, 2020).

Albeit the investigation of this thesis concerns B2B processes and transactions, it shall be mentioned that blockchain technology provides further information on food history. This aspect is increasingly important to consumers so that food and beverage outlets who mostly form the end of the B2B supply chain will pay increasing attention to product information supported by blockchain tracking opportunities and enhanced options to differentiate in terms of food quality (Sharma & Singh, 2020).

#### 3.4.1.2 Blockchain Technology for the Pharmaceutical Industry

Similar to the food and beverage industry, supply chain security is at the centre of discussion of optimization for pharmaceutical supply chains: the complexity of supply chains and repeated change of product ownership before the sale to the end consumer increases the risk for errors and pharmaceutical counterfeiting (OPTEL, n.d.).

In order to ensure traceability, the United States of America even passed the Drug Supply Chain Security Act under Obamacare. As opposed to the food and beverage industry, the black market is a severe issue to the healthcare system. In addition, and next to the black-market selling copies of drugs, the resale for margin across borders from poorer to richer countries has become an issue. These arbitrage cases are hard to get hold of considering the incentive for participants. Hence, it is of utmost importance to track the origin of any drug to assure its quality and composition. Here, blockchain technology can support to trace back every package going across the counter (Schöner, Kourouklis, Sandner, Gonzalez, & Förster, 2017).

As a matter of fact, blockchain does allow for enhanced traceability and therefore security for quality and proof of origin (Haq & Muselemu Esuka, 2018).

### 3.5 The Growth of B2B eCommerce

Nowadays, the importance of ecommerce for the B2C industry is barely questioned anymore. Rather, discussions evolve around the best channels and strategies to optimize one`s online sales figures. As a matter of fact, these successful developments in B2C ecommerce have started to impact processes earlier in the supply chain where trade happens between businesses: increasingly, businesses consider similar digital order processes to enhance efficiency (Goldberg, 2021).

Hence, it does not come as a surprise that the majority of companies active in the B2B space exploring digital ways of boosting sales is applying and/or testing ecommerce strategies from the business to consumer segment. This was also found in a study conducted by Netsolutions in 2020 (SINGH, 2020).

Next to that, the openness to digitization in the B2B environment was strongly influenced by the Covid-19 pandemic, whereas managers and employees were forced to become more flexible in daily work processes, especially when it comes to deal making and product exchange outside the four walls of the own company (SINGH, 2020).

### 3.6 Digital Transformation: Digitization and Digitalization

The discussion of this thesis circles around digital ordering processes and procedures to be implemented into companies' structures and hence ultimately their business models. Put differently, digital transformation is the goal and part of Industry 4.0 (Nadkarni & Prügl, 2020). In that regard also people pursuing change come into play.

#### 3.6.1 The Importance of People for Sustainable Technological Change

The first important note to recognize is the fact that digital transformation requires significant effort and skill of people involved. The right and appropriate human capital is a prerequisite to successful implementation of any, but in this case technological change (Nadkarni & Prügl, 2020). As described by (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013), it is fundamental for companies to understand and shift the positioning of IT within a company away from considering it as part of mere administration and instead considering it as an integral part of the business strategy. Hence, companies must shift towards "digital business strategies" in order to benefit from technological advancements bottom line (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). As a result, and in order to reflect the importance and necessity, more and more companies have introduced the key management position of the "Chief Digital Officer" (Dremel, Wulf, Herterich, & Brenner, 2017). Next to the need for the right managers and leaders to implement new technologies, one must take into account that so-called organizational resistance is often an issue and hindrance. Here, employees are reluctant to adopt newly created work processes and insist on or at least try to stick to known ways of working. In addition, technology is often known to replace human labour which may lead to enhanced rejection (Mugge, Abbu, Michaelis, Kwiatkowski, & Gudergan, 2020).

Another important aspect needed to be discussed at this point is of significant relevance for successful implementation of new tools for digitalization: the integration of new technology with existent technological solutions. This is first and foremost a bottleneck or even significant barrier for companies to adopt state of the art technologies. In order to allow for automated data exchange, companies must be able to connect new solutions with existing software which is nowadays mostly in place for internal management and bookkeeping. As a matter of fact, this reveals that human hesitation is often linked to previous negative experiences in regard to facilitating the communication between systems of different technological statuses (Urbach, Drews, & Ross, 2017).

### 3.6.2 Terms Around Digital: Digitization, Digitalization and Digital Transformation

When talking about digital transformation, one must outline the details and types of technological change in further detail. Oftentimes both terms are used interchangeably, while digitized processes are often understood as leading to digitalization. This though is not the case. Hence, the difference between digitalization and digitization shall be now clarified (Chapco-Wade, 2018).

Digitization describes the shift from one-to-one analogue processes to digital ones (Lee & Kim, 2021). The clear effect of digitizing processes lies in cost reduction triggered by automation within a company. The implementation of enterprise resource planning systems is an example for digitization (Chapco-Wade, 2018). This step of technological advancements correlates with stage one of the five stages included in the so-called "Industry 4.0" discussed earlier in this thesis: no impact on relationships and ways of working or a company's core business model, but rather solely affecting internal structures and ways of working (Mishra, 2020).

Digitalization, on the other hand, builds upon digitization and allows for the development of processes beyond "basic" automation of known processes, such as the use of artificial intelligence in science (Lee & Kim, 2021). In other words, digitalization has a strategic impact on a company's business overall. In that sense, applying digitalization results in new revenue potential and value creation. Further, it is argued in the literature that digitalization must involve numerous digitalized processes, so that only the sum of those could be considered digitalization (Chapco-Wade, 2018).

Finally, the successful combination of the above may lead to the digital transformation of an organization. As mentioned by Chapco-Wade (2020), digital transformation and digitalization are often mistakenly used interchangeably. As described in this chapter, it is though ultimately the

combination of digitalizing processes (which must be built upon digitized ones) and right combination with the people driving the organization which is referred to as digital transformation (Chapco-Wade, 2018).

To clarify the stage under investigation in this thesis, it is especially digitalization and to some extent digital transformation which are the subjects to be discussed in more detail for the food and beverage and pharmaceutical industries. As a matter of fact, supply chains are paths of interlinkages between companies that must communicate and cooperate effectively to gain mutual success. Clearly, communication has long been key for achieving such synergies. Today, with technology entering all aspects of our lives and globalisation as well as regulations putting more and more pressure on acting parties, time and accuracy have gained and are gaining significant importance. Still, we are at the verge of industry-wide acceptance to achieve this state of digital transformation (Patterson, Grimm, & Corsic, 2003).

### 3.7 Supply Chains as a Source for Social Capital – Acceptance Levels of Digitization

#### 3.7.1 Supply Chains and Technology

As the purpose of this thesis is to investigate and compare the digitization process of the food and beverage and pharmaceuticals supply chains, thus, at the focus point are the end nodes of the chain, i.e. the last B2B exchange before the patient buys the product.

Now, the question arises how strongly technological advancements have entered the two industries under discussion.

Generally speaking, with the rising importance of innovation, in general, the field of information technology has surely entered most industry and business structures known today. Already in 2003, executives of the United States would invest nearly half of their budgets into the advancement of information technology systems (Patterson, Grimm, & Corsic, 2003). As further stated by (Klappich, De Muynck, Aimi, Titze, & Stevens, Predicts 2021: Supply Chain Technology, 2020), more than 50 % of companies leading in supply chain optimizations have dedicated several roles to IT related responsibilities, with the goal to further optimize supply chain processes. Despite IT is taking on a specifically important role in supply chain companies, at the same time less than half have started actively implementing agile methods to advance their supply chains (Klappich, De Muynck, Aimi, Titze, & Stevens, Gartner, 2020). Since technology has formed the way industry players compete, the

effective collaboration between companies must have become part of the discussion at some point. Clearly, effective supply chains significantly impact overall business success and potential competitive advantages. Therefore, the importance of information technology in this space has been broadly accepted (Patterson, Grimm, & Corsic, 2003).

### 3.7.2 Supply Chains and Social Capital

The growing importance of cooperation and collaboration between market players has become an undoubted phenomenon in today's globalized markets. As a matter of fact, the readiness of industry players to adjust their ways of working for a business partner allows for the creation of social capital. Such relational capital has led to the built up of competitive advantages against competitors who stayed away from costly adaptations to tie themselves to other industry players, in this sense in the vertical supply chain. Important to note is that it was found that adaptability from both parties involved is a prerequisite for successful relational capital development (Roden & Lawson, 2014). Furthermore, digitalizing pharmaceutical suppliers has supported manufacturers in the creation of sticky partnerships and allowed for easier acquisition of new trading partners (Lee & Kim, 2021). The growing importance of strong partnerships also on a digital level is further stressed by Patterson, Grimm and Corsi, who have already discussed the importance of digitalization as a response to globalisation effects in 2003, i.e. 18 years ago. One apparent reason for that is the growing ease of substitution of different companies. This has become increasingly apparent with diminishing trade barriers and market entrance of companies stemming from less developed countries compared to Europe. Lower wages and more labour-intensive jobs have oftentimes led to European companies staying behind their new competitors from overseas. As a matter of fact, these changes have brought about intensified states of competition leading to higher risks and surely more complexity in daily processes. This again leads to the importance of the successful and smart business-wide implementation of technologies (Patterson, Grimm, & Corsic, 2003).

In regard to the adoption of technological approaches digitizing analogue processes between suppliers and buyers this concept is often challenged in the food and beverage industry. Players consider personal interactions and service as their unique selling point, fearing the loss of customers due to automation and less direct regular interactions (Trienekens, Hagelaar, & Pascucci, 2018).

With the generation of millennials gaining more and more influence in company-wide decisions, this mindset seems to change slowly but surely, allowing technological solutions to enhance efficiencies within the far end of the supply chain (Wirthman, 2020).

In addition, one must consider that supply chains tend to become increasingly compartmentalized towards the final destination of the produce. As a result, wholesalers working directly with restaurateurs face the challenge of handling large amounts of small orders creating significant overhead costs (Huck, 2021).

### 3.8 The Impact of Covid-19 on SMEs` Response to Digitization

The current global Covid-19 pandemic has also strongly impacted actors` attitudes towards technological advancements in daily processes for small and medium enterprises (SMEs). As a report by the globally active customer resource management software “Salesforce” reveals, SMEs try to offer their customers more flexibility and increasingly focus on building long lasting customer relationships. In that sense related technologies find more application to facilitate customer engagement more easily (Salesforce Research, 2020).

Furthermore, growing SMEs share the opinion that digitalisation in the fields of client interactions, workflow optimization in general and internal communication is significant when it comes to strengthening one`s position in the future market and fighting potential crises (Salesforce Research, 2020).

As the table below displays, the appliance of technological solutions supports many SMEs in regard to differentiation to competition, which is especially the case for growing companies. At the same time, 55 % of survey respondents mention an enhancement of customer acquisitions powered by their strategically technological positioning. At this point it shall be stressed that, in the state of a crisis, it is only growing companies who remain to be willing to invest in technological advancements of their companies. As a result, stagnating or shrinking companies tend to reduce avoidable technological investments in uncertain times (Salesforce Research, 2020).

## Einfluss von Technologien auf den KMU-Betrieb

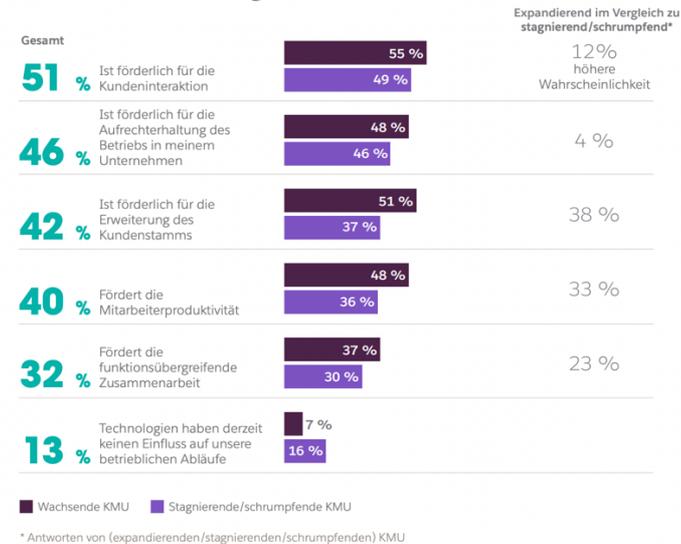


Figure 4: Influence of Technologies on SMEs (Salesforce Research, 2020)

Turning to the changes undergone by the healthcare manufacturing industry, and hence part of the pharmaceutical supply chain, the crisis significantly triggered the importance of digitalization for industry activities. Not only when it comes to efficiency, but also social capital has turned out to be fundamental and was considerably impacted by digitalization, such as the integration of the right artificial intelligence tools. This way relationships could be strengthened and supported companies in building a competitive advantage in times of great uncertainty (Lee & Kim, 2021).

## 3.9 Acceptance Levels of Digitalization

### 3.9.1 The Importance of Technology Adoption

As previously pointed out in this thesis and in regard to developments for the implementation of industry 4.0 within and between companies, the importance of employees' acceptance of technological change is fundamental. Surely, this aspect affects any type of company, but specifically small and medium sized enterprises with less hierarchy and more influence and impact in regard to work process adoption are dependent on their team's input for successful change (Merhar, Berger, Braunreuther, & Reinhart, 2018).

With mobile applications becoming increasingly common in the work environment, such technologies move closer to the individual employee. From a psychological point of view, it can be mentioned, that the acceptance of wearables carrying technologies to be applied for work imply a different level of potential rejection (Merhar, Berger, Braunreuther, & Reinhart, 2018).

On the other hand, the use of devices known from private life may trigger a sense of familiarity leading to faster understanding of related processes and avoidance of first-time usage frustration (Merhar, Berger, Braunreuther, & Reinhart, 2018).

### 3.9.2 Barriers to Technology Adoption within Enterprises

Today, it is out of the question that technology supports and helps companies to make processes more efficient through more streamlined processes, less errors and manual processes all together resulting in increased speed and cost reductions (Vogelsang, Packmohr, Liere-Netheler, & Hoppe, 2019).

In order to successfully introduce and implement new technologies within their businesses, it is fundamental for companies to also understand potential barriers and hindrances to a successful and sustainable introduction of new technologies. This is especially due to the fact that numerous companies seem to struggle with the shift towards "digital first" (Vogelsang, Packmohr, Liere-Netheler, & Hoppe, 2019).

Main barriers detected through a study by Vogelsang, Packmohr et al. (2019) were (1) missing skills, (2) technical barriers, (3) individual barriers, (4) organizational and cultural barriers and (5) environmental barriers. While all five barriers were mentioned during the conducted interviews,

reasons within the category of missing knowledge such as a lack of overall IT and process knowledge or details on the decision basis to introduce a specific technology, were the core reason why a new technology was not accepted within a company (Vogelsang, Packmohr, Liere-Netheler, & Hoppe, 2019).

Furthermore, the interdependencies of different technologies and programmes requires a certain level of overall technology literacy, leading to the study recommendation of enhanced education in regard to technology overall. This fact is related to technical barriers which are further intertwined with data security issues and the current state of infrastructure of a business (Vogelsang, Packmohr, Liere-Netheler, & Hoppe, 2019).

Albeit all these aspects are tremendous and necessary to eliminate for successful process adaptation, the core point of issue has remained to be the individual employee reluctance and openness to change existing procedures.

Next to the plain need of learning and adaptation, many employees may be concerned about the use of their data when using user-based software and resulting options to track output in further detail. Furthermore, the fear of making their own jobs obsolete by adopting a software for support is a clear barrier for technologies' integration (Vogelsang, Packmohr, Liere-Netheler, & Hoppe, 2019).

### 3.9.3 Technology Adoption in Food and Beverage and Pharmaceutical Supply Chains

As a matter of fact, and as the supply chain networks of the two industries under investigation show, the implementation of digitization and digitalization tend to be stronger earlier in the supply chain, i.e. the closer to the producer, the more automation is already in place. Surely, this also strongly correlates with the size of the engaging companies. As previously mentioned, the smaller the company, the harder it gets to implement innovative ways of working. This again explains the reason for the developments of higher automation at the start of the supply chain because supply chains tend to spread out and become more dispersed. The underlying reason is of course the compartmentalized distribution of products towards the end user of the products, hence food and beverage outlets on the food industry side and pharmacies or hospitals on the pharmaceutical side (Huck, 2021).

## 3.10 The Technology Adoption Lifecycle

When it comes to introducing new technologies to industries and specific markets, the question arises how the specific target audience reacts to automation and digitization of known processes. The

concept discussing the stage at which a potential customer for a product or service involving technology may be is referred to as a stage within the technology adoption lifecycle. The lifecycle describes the different stages a target audience can be in in respect to its openness for and use of technology (Moore, 2014).

A second theory discussing the way people react to innovation in general, which shall also be mentioned at this point is the diffusion of innovation (DOI) theory. As stated by Rogers (2010) the adoption of innovation occurs in five consecutive steps. The first step, “knowledge” is the stage where the first contact with the innovation takes place. Thereafter, the person forms an opinion about the innovation, be it positive or negative. This stage is referred to as “persuasion”. Next, a decision is made whether the innovation will be adopted or not. Depending on the outcome of the decision phase, the implementation of the innovation within the business follows. Finally, the innovation may be confirmed if used or applied in continuum (Rogers, 1995).

As the Technology Adoption Lifecycle sheds light on technological innovation specifically, this section will aim to describe the different stages of the Technology Adoption Lifecycle and discuss the degree of adoption and how the two industries under discussion in this thesis (food and beverage and pharmaceutical) are broadly positioned. As a matter of fact, the adoption stage is highly market dependent (Moore, 2014) so that, for instance, developments we currently see in the German food industry were undergone in The Netherlands some twenty to thirty years ago (Leenders, 2020).

The adoption of technology and new products and services in general normally starts with a minority. As the graph below illustrates, the Technology Adoption Lifecycle is shaped like a bell curve. At the very beginning and end of the curve are the minority of users, innovators, and laggards, respectively. The early adopters, early majority and late majority sum up the largest number of product or service adopters (Moore, 2014).

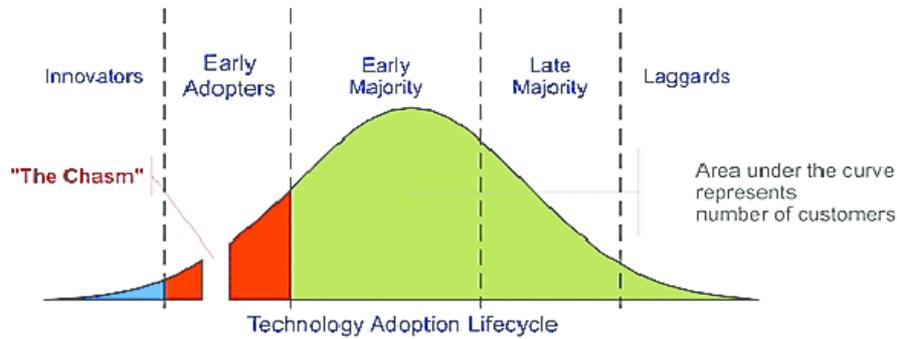


Figure 5: Technology Adoption Lifecycle, "The Chasm", (Moore, 2014)

### 3.10.1 The Five Stages of the Technology Adoption Lifecycle

A group of people open for innovation, with great interest in the unknown and optimistic belief that those new products and services have the potential to become the new status quo and general standard (Moore, 2014). As further defined by Moore (2014), this group of people is referred to as "the innovators". They are proud to be the first users or customers, are patient when it comes to difficulties or bugs with the system. Furthermore, innovators consider being amongst the first users as a first mover and competitive advantage against their competition. At the same time, solutions staying at this customer stage will barely become profitable or achieve a critical mass in the market they are operating in (Moore, 2014).

The stage of early adopters is a very critical one when it comes to the evaluation of success. Also referred to "the chasm", there is a moment in this stage, where the service or product needs to prove itself to be "ready for the masses". Once it was found useful by the innovators, more and more users are fond of the innovation. Slowly but surely expectations develop and rise, standards are created, and producers are confronted with customer demands. The following stage allows the product or service to become somewhat mainstream. This is the time when the product – market fit is clear and scaling becomes reality (Moore, 2014).

The last two stages of late majority and laggards are those where potential users lose their scepticism and adopt the product or service – practically after everyone else has done so already. In some cases, it may have regulatory reasons why people adopted the service (Moore, 2014).

### 3.10.2 The Technology Adoption Lifecycle for the Food and Beverage and Pharmaceutical Industry

With technology adoption within the food and beverage and pharmaceutical industries at the centre of this thesis, this section shall be dedicated to the discussion of the adoption level of technology in the respective industries.

#### 3.10.2.1 Technology Adoption in the Food and Beverage Industry

Effective supply chains are significant attributes for both industries, whereas the food and beverage industry may be considered more people dependent. With a more compartmentalized structure, processes towards the end of the supply chain tend to be less digitized. Taking ordering processes between food and beverage outlets like restaurants or bars and their suppliers as an example, the majority of orders are done by phone, email or fax, whereas the Nordics are an exception to this rule in Europe. Despite this repetitive process, only large restaurant and hotel chains have made the step to more automation, usually for the simple reason of more control, supervision, and process oversight. Hand in hand with this need goes process efficiency and seeking options to save time and money. Put differently, restaurant operators and personnel tend to avoid automated ordering processes where possible and claim to do so out of trust and relational reasons (Brownell & Reynolds, 2002).

Analysing this claim in regard to the technology adoption lifecycle those restaurants and suppliers making use of the latest technologies to automate frequent ordering processes remain to be innovators, or medium paced early adopters (DiegoCoquillat, 2021).

Still, an increasingly strong trend is seen in terms of technology adoption on the buyer side. In that sense, sales representatives who used to be the only order channel for food and beverage outlets are turning into consultants, whenever needed. Orders are though placed via more and more channels, mostly digital (Kompass International, n.d.).

As previously discussed, this development is highly market dependent. Hence, the Dutch have been ordering digitally already two centuries ago, usually through suppliers' website portals. There, suppliers not offering such service but being part of the HORECA (hotels, restaurants, and catering) business may even be considered laggards (Moore, 2014).

In Germany, on the other hand, developments have just started to take off, whereas mobile apps and web shops allow restaurants to order with their different suppliers. So far, the vast majority of ordering processes have been taking place by fax, phone or email (2.order, n.d.).

### 3.10.2.2 Technology Adoption in the Pharmaceutical Industry

As stated by Morrill (2020), the pharmaceutical industry has taken comparably long until it started to climb the bell curve of the technology adoption lifecycle (B2B WAVE, 2018). Typical for a rather old-fashioned industry and need for differentiation of wholesalers with same or similar product portfolios to their direct competition, relationship building has remained key to success. Hence, sales representatives visit existing customers regularly to take new orders and present new products added to the portfolio. Earlier, retailers and other B2B customers would rely on their sales representative's updates on the status quo and product availability. But, as ecommerce has overall become the new status quo in any purchasing process, same starts to apply to research on pharmaceuticals. As a result, research is increasingly followed by online order placements (Chintan, 2020).

Three years ago, in 2018, only 11 % of wholesalers active in the pharmaceutical industry were offering online ordering systems to their B2B customers. At the same time, companies who had started to digitize their order management process experience significant cost reduction and an increase in revenue of close to 50 %. Furthermore, it became obvious that customers enjoyed the mobile service, allowing them to trigger orders from anywhere (B2B WAVE, 2018).

On the one hand, a necessity for technological support, but at the same time the core reason for technological innovation lagging behind other industries, strict regulations and difficulties to enter the market were the reasons why the capital heavy sector has kept structures as they had grown throughout history. Put differently, innovation was somewhat avoided, and barriers were high enough to hinder penetration (Morrill, 2020).

All this held true until the Covid-19 pandemic hit, and human capital was restricted to work as usual (Morrill, 2020). Furthermore, the current crisis resulted in overall growth for the pharmaceutical industry, as a report by MARKETSANDMARKETS Research (2020) found. Based on this growth trend combined with a general rise in B2B ecommerce activities, several companies active in the space have started to act upon those two, well combinable trends. The readiness of the market to take order management online is very apparent, considering the fact that more than two thirds of market players research their purchases on wholesalers' and distributors' websites (MARKETSANDMARKETS, 2020).

The crisis has literally forced sales representatives to adjust their ways of working and interaction with physicians they supply with medications. As per results from a study on the likelihood of these changes to remain market practice conducted by Bain & Company (2020), nearly 50 % of physicians prefer virtual product introductions and trainings (Johnson & Evers, 2020).

Prior to the pandemic 75 % of the respondents were fond of personal meetings to discuss these matters. As a result, sales will need to adjust, and the involvement of technological solutions will most surely be part of it. As further displayed in the charts below, personal meetings will not be replaced fully, but will play an increasingly significant role (Johnson & Evers, 2020).

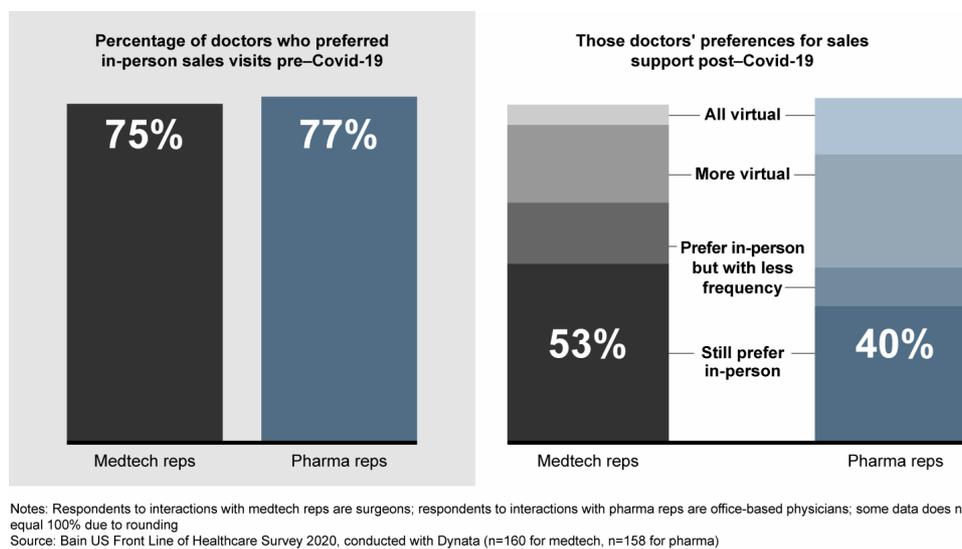


Figure 6: Figure: Commercial Model For Pharma And Medtech Reps After Covid-19 (Bain & Company, 2020)

Working remotely and allowing for processes to adapt thereto, opened the door to a new way of thinking on a leadership level. The general understanding of long-term investments in technological solutions resulting in positive long-term effects on the bottom line support the new approach. Especially in collaborations and relationships between businesses, a certain level of technological advancement is increasingly expected from counterparties (Morrill, 2020).

Next to that, technology is turning into a weapon of competitive advantage, as it has turned out in many other industries. Saving costs and investing in the right ways of digitization and digitalization may allow some pharmaceutical companies to grow ahead of their close competition they had been working side by side throughout the past decades (Morrill, 2020).

At the same time, one must be aware of the overall shift towards sustainable growth. Before the era of globalisation, companies generally focussed on ways to reduce costs and offer their customers more quality and service. Today, this focus has mostly shifted as saving costs was not sufficient when trying to keep a competitive advantage. Much more, competition on a global level implies the requirement for continuous innovation to push the status quo to new levels (Patterson, Grill & Corsi, 2003). All in all, moving away from growth through human capital only allows for scalability, which has seemingly lagged in this industry for many decades. Furthermore, a reorganisation and strategic adjustment will allow some companies to stay more flexible and adapt to different (economic) challenges more easily and rapidly than others (Morrill, 2020).

An aspect not yet touched upon in the discussion on the importance of technology in the pharmaceutical industry is data. As it is true for many other industries advancing technological ways of working and communicating, also the pharmaceutical industry will start to build on data and analysis to further enhance operational processes and decision making, both in the short and long run (Morrill, 2020).

Research has shown that the majority of market players in the pharmaceutical industry research potential products to buy online. Considering the fact that just over 10 % of suppliers offer digital order management tools, more than half of B2B customers using digital ways to research items needed are forced to use traditional order methods like email, phone or the like to place their order with a supplier. The resulting gap and missing customer loyalty can lead to fundamental risks to the acting companies. As previously mentioned, this aspect underlines the importance of competitive advantages towards other industry merchants with similar portfolios (Chintan, 2020).

### 3.11 Summarizing Thoughts

Concluding the literature review and thereby all topics surrounding the research question and thesis topic, secondary research shows that growing complexity and competition strongly triggered by globalization are forcing many industries to optimize processes and communication across the supply chains.

The so-called “Industry 4.0” is making its way to supply chain processes, aiming at digitalized, and not only digitized processes, so that also the concept of internet of things and the full replacement of human labour come into play.

At the same time, the acceptance of technology as a supporting power within teams is an aspect to consider for successful change management.

Supportive technologies such as blockchains enhancing the security of data exchange and avoidance of fraud but at the same time sales and trade happening on a digital level strongly affect the way of working and relationships built throughout many years, which is often the reason for difficulties in regard to trust and adaptation to novelty.

A closer look at the literature focusing on the pharmaceutical and food and beverage supply chains revealed that the degree of digitization is picking up in more and more areas, despite the heterogeneity of market players results in quite significant differences within the industry supply chains. To give an example, large food and beverage outlets like hotels have streamlined ordering processes with external suppliers several years ago, while individual restaurants are getting to do so only nowadays.

One must though mention that general technological advancements allow for more cost-effective solutions that make economic sense for small players alike. Using the concept of the technology adoption lifecycle allowed to assess both industries under investigation. This lifecycle assesses the openness and acceptance of technology for the respective industry.

Finally, the Covid-19 crisis also affected this readiness and understanding of the use of technology in the industry to enhance and improve processes.

The table below shall summarize the similarities and differences of both industries as discussed in this chapter.

Industry Aspect	Food and Beverage Industry	Pharmaceutical Industry
<b>MARKET CHARACTERISTICS</b>		
Supply Chain Complexity	Commonly three tiers.	Commonly five tiers.
<u>Need for Traceability and Appliance of Blockchain Technology</u>	High and increasingly a requirement.	Industry-shaping requirement.
Number Of Suppliers Per Buyer	Numerous, ranging from 4 to 10.	Limited to one or two.
<u>Importance of data</u>	High.	High.
<u>Importance of Personal Relationships</u>	Very high.	Very high.
<b>TECHNOLOGICAL ASPECTS</b>		
High number of digitization projects regarding ordering	Yes.	No.
<u>Regulatory requirements affecting technology adoption</u>	Have an effect but do not hinder technology adoption.	Have a significant effect and affect technology adoption due to increased complexity.
Digitisation of Ordering Processes Across the Supply Chain	Automated for larger customers.	Industry standard.
Digitisation Projects of Ordering Processes	Focus on the end of the supply chain, currently much movement for SMEs ordering.	Focus on the end of the supply chain, no recent changes.
Software Used	Third party cloud based.	Company specific and on-site installation.
Digitization vs Digitalization	Focus on digitization.	Focus on digitalization.
<b>COMPARISON BASED ON MODELS</b>		
Industry Stage (Industry 4.0)	Stage 1 to Stage 2.	Stage 2 to Stage 3.
Degree Of Digital Ordering Acceptance (Moore)	Early adopters.	Early majority.

\*Underlined aspects display similarities between the two industries.

## 4. Primary Research: Business Model Examples of the Food & Beverage and Pharmaceutical Industries

This section shall focus on practical examples of ways supply chains and specifically the ways of communication between industry partners towards the end of the supply chains are digitalized and/or digitized. Regarding the food and beverage industry it shall be noted that the author of this thesis shares market knowledge as an expert in this field.

### B2B Single Shops and Customer Portals

The classic B2B web shop or login portal belonging to a company remains part of the food and beverage industry and is commonly used in the pharmaceutical industry. Overall, one can say that developments vary significantly from one market and industry to another. Generally speaking, and as previously discussed, B2B ecommerce is on the rise but not close to B2C web shop experiences. It is important to note that B2B shops are generally more complex as prices and product portfolios are oftentimes customer specific.

In the German market, for instance, web shops are starting to become a standard and are accepted as the status quo. Often though, suppliers are unhappy with their web shop performance once implemented as customers stick to known routines of sending emails and making or expecting phone calls to place their orders. A quite contrary market are The Netherlands: here, online portals have been implemented several years ago and are in strong use by existing customers. Same seems to apply to the Nordics.

In terms of investment cost, especially medium and large enterprises are willing to invest higher amounts in order to keep their brand more present. Still, software providers tend to work with modules, so that more cost-efficient developments have become the standard. It shall though be stressed that such developments remain to be by far the most expensive, also in terms of maintenance as adaptations and customer expectations require continuous changes and updates.

## B2B Market Places: A concept originating from the B2C market

More or less at the same time, several young companies developed with a different approach. Based on the hypothesis that B2B ordering will take place majorly online in the future, and for the HORECA industry specifically on mobile, so-called “multi shop app solutions” entered into the market. The basic idea is to create a platform gathering as many buyers and suppliers as possible to allow for vivid exchange and easy research of suppliers. At the same time, suppliers have an easier chance to find new customers, which is otherwise very costly and mostly done by a sales force visiting restaurants in person. Clearly, a marketplace dynamic comes with numerous advantages.

In addition, one must take into account that comparability and price competition are very common. Especially in the B2B food and beverage market, companies operate rather regionally, making local competition very strong. As a result, suppliers tend to avoid platforms as they see a strong disadvantage: increasing dependence on the platform, price competition and the risk of regional price wars. The common monetization strategy of marketplaces are revenue-based fees. As margins of HORECA suppliers tend to be comparably low, this structure is prone to creating a rather toxic economic environment for market players on the seller side.

## B2B Multi Shops Counteracting Market Places

The basic idea behind the alternative solutions is to gather different suppliers in one app, or at least allow for the option to order at several shops from the same interface. As it is common for many hotel chains and restaurant chains, also individual food and beverage outlets would be able to manage all orders from the same interface.

The alternative in the future may be that restaurateurs would need to trigger orders from several different applications and systems with varying login credentials and procedures: a rather inefficient and hence objectively rather unlikely scenario.

This argument holds true for the marketplace concept as well. That being said, multi shop concepts tend to be more supplier friendly and supplier focussed. As opposed to marketplace concepts, suppliers actively invite their customers to use their shop within the interface rather than allowing customers to randomly select and switch suppliers. In addition, suppliers remain the point of contact to their existing customers and rarely use the platform to acquire new customers. Put differently, such

solutions enable process optimization of existing buyer-supplier relationships as well as improved information flows to allow for stronger customer loyalty.

#### 4.1 Examples of Business Model Examples of the Food and Beverage Industry

Especially within the past years the topic of order management and increasingly inefficient processes was more and more thematised. One of the reasons was the rising number of channels customers would use to place their orders. This phenomenon was surely also triggered by the younger generation, i.e. generation Y, the Millennials, slowly but surely taking over responsibilities involving order management with suppliers. At the same time, this generation change is happening on the supplier side, so that especially SMEs start to challenge the status quo of technological efficiencies in place.

As a result of the increasing demand of customers requesting digital ways to place their orders, IT companies were repeatedly asked to build websites and web shops to allow for B2B online ordering. Considering customer-specific pricing, portfolio ranges and the like, such web shops tend to be complex and hence rather expensive. Mostly, initial budgets were exceeded by additional requests from the supplier side to optimize the web shop and its integration with internal systems.

Sooner or later, word of mouth lead to the hesitation of many small and medium sized enterprises to invest in new web shops and the like. On the other hand, investments made needed to be maintained, thereby creating additional costs repeatedly.

Now, this issue and the need to digitalize small enterprises that would not be able to afford their own software programming became stringent. As a result, several different approaches to allow for cheaper and leaner ways to digitalize the business appeared.

Based on the multi-shop and marketplace business models companies have developed solutions with varying background intentions and ideas.

##### 4.1.1 Choco

The young company and startup “Choco” was founded in Berlin in 2018. The company markets a platform for restaurateurs that shall improve and enhance the ordering process with suppliers. Building a classic marketplace, restaurants use the application free of charge.

So far, and based on information from the market, several suppliers have made the decision to connect to the application's software as a result from an increasing number of orders received through Choco. The question arises what the business model is based on and when and how the company will reach a critical mass to introduce a monetization model beyond fees paid by specific suppliers for Choco's application programming interface. Attempting the comparison of Choco's business model and vision to an existing company that is well-known, Amazon may be used for comparison: a marketplace aiming to gather as many suppliers as possible and buyers to allow for online trade and new customers and suppliers alike.

#### 4.1.2 Orderlion

The Austrian startup Orderlion follows a multi – shop approach in the form of a so-called SaaS business model, as opposed to a marketplace business model. To be more precise, license fees for the respective web shop are paid by the supplier, who is the company's sole customer. As opposed to a classic marketplace, Orderlion is not a platform to connect buyer and supplier, but rather supplies the seller with a tool used to communicate with his existing customers.

Comparing the business model to existing companies, which shall simplify the understanding for the reader, Orderlion follows the approach of the well-known company "Shopify": The company builds upon the idea to allow for digitization for any enterprise and take its communication to a digital level.

#### 4.1.3 Chefslist

Similar to Orderlion, the startup in the Berlin area follows the multi shop approach, whereas the supplier is monetized from the very beginning of the partnership and is the sole customer to the software provider. The startup is based in the Berlin area and has started to expand across the DACH region.

Founded in 2018, the company is funded by venture capital, allowing for its third-party neutrality when it comes to data security and suppliers' hesitation to join alternative solutions under influence of strong market players.

#### 4.1.4 Kollex

Kollex is the first company of the examples listed herein, which is owned by industry players. The startup is a joint venture between the Bitburger and Krombacher breweries, the Coca-Cola European Partners Germany, and the Rotkäppchen-Mumm champagne producer (GetränkeNews!, 2020).

Based on market knowledge, numerous suppliers make use of the free service, while others stay away from the offering as they are concerned about data privacy. Considering the comparably more intense difficulty in differentiation as resellers, data is often considered an especially strategic aspect, as many wholesalers build their customer base through special price setting.

Industry knowledge shows that the platform indeed recommends alternative suppliers to restaurants and other food and beverage outlets. Since several wholesalers are owned or work in a close partnership with Coca Cola or one of the other joint venture partners, this rumour creates hesitation among many wholesalers.

#### 4.1.5 Octopus

Similar to Kollex, Octopus is owned by an industry player. Initially a startup, the company was acquired by the organization "GES - Süßwaren- und Getränkehandels eG". Based on a similar structure, the ordering tool allows to bundle suppliers from the beverage industry in one interface. When it comes to product offerings, one can highlight a significant difference to other alternatives on the market: Octopus does not allow usage without integration with suppliers' enterprise resource planning system. Furthermore, no supplier interface itself is existent, which could allow the management of campaigns and customer specific adjustments or communication via a chat. Hence, the question on Octopus' intention for their solution arises. Strengthening the existing organizations' digital standing and disinterest in going beyond this circle seems to be the strategy followed here (PRO Fachhandel, 2018; OCTOPUS ORDER, n.d.).

#### 4.1.6 Mein Getränkemobil

Another industry example similar to Octopus, but in this case an in-house development is the solution "Mein Getränkemobil" which was developed by the joint venture "2G+ Plattform GmbH" between the organizations "GEFAKO" and "Gedig", whose headquarters are located close to Stuttgart in Germany. With a comparable organizational structure to the GES (owners of the ordering app "Octopus"), and

more than 200 companies as the organization's shareholders, GEFAKO understood the necessity of positioning the association on a digital level. In hesitation to create dependency on an external party's solution, GEFAKO developed their own application to offer customers a platform for order management (MEIN GETRÄNKEMOBIL, n.d.; GEFAKO GmbH & Co., n.d.).

Surely, the solution offers the option to order from several suppliers within the association but is closed to external suppliers. With current market developments and a growing requirement for channelling all orders from one interface and all suppliers, the question will be how "Mein Getränkemobil" will be able to keep its standing with competitors allowing for multichannel supplier interfaces across HORECA industries.

## 4.2 Business Model Examples in the Pharmaceutical Industry

Based on secondary research conducted, companies active in the B2B pharmaceutical space and focusing on the order management process, the hypothesis is made that the DACH region has not made significant progress in online order management. It is worth mentioning that several online portals exist that are owned and operated by specific wholesalers and hence comparable to a single shop, as previously explained. An example for such a portal is the Austrian company "pharmacom" providing a login page on the web for existing customers to place orders (pharmacom handels gmbh, n.d.). Hence, this analysis to provide an insight on existing solutions takes a more global view.

### 4.2.1 Newired

Newired is a software solution aiming to support employees in the pharmaceutical industries in their daily work processes. With regulations becoming stricter, companies are forced to track information more thoroughly, which results in the need for different software solutions which tend not to be self-explanatory. Companies like Siemens make use of the service, avoiding never-ending employee training and cutting costs (Newired, n.d.).

### 4.2.2 Reap

The company Reap is a startup based in Mumbai, India. Started in 2015, the company is building a platform to support digital order processes across the pharmaceutical supply chain. Beyond that, the company is aiming to build a community on a digital level, where latest information and news of the industry are shared. With an app-based solution, Reap further allows producing and distributing

companies to interact with existing and potential customers from displaying information on new products, to conducting surveys to collect feedback on new releases (Tracxn, 2021).

#### 4.2.3 TRxADE Group

TRxADE Group is a US company in existence for more than 15 years. Compared to other markets like India and Europe, the United States have seen faster development in digital order management and hence find themselves at a completely different stage of the technology adoption lifecycle. Solely by the fact that the company building a marketplace for B2B sales in pharmaceuticals shows that openness for digital trade in this area is existent. Going beyond the procurement process for pharmacies, TRxADE supports pharmacies in engaging patients through the so-called telehealth services and optimization of the “prescription journey” (TRxADE, n.d.).

#### 4.2.4 apolino – das Apotheken Bestellportal

Similar to TRxADE apolino, located in Germany, aims to create a marketplace for producers and pharmacies. The aim is to connect as many pharmacies with as many producers as possible, to allow for direct but efficient trade. The concept clearly focusses on direct trade with pharmacies, leaving wholesalers out and allowing for reduced cost by cutting out the middleman reducing producers’ margins and often retail prices for pharmacies. Like most marketplace concepts, monetization is reached through a revenue-based cut paid by the selling party. One reason why such concepts have not taken off ground in Europe as compared to the United States may be the regulatory environment restricting B2B ecommerce. As apolino announced, products available only on prescription are sellable via the platform since 2015 only (Schmidt, Gröber, & Burgers, n.d.).

#### 4.2.5 Medibox

A second startup based in India (Bangalore) is Medibox, founded in 2015. The company supports e-procurement as a cloud-based solution. Target market is the trade between pharmacies and distributors. Besides the discovery option to find new suppliers, the company support in accurate product information flow and features like real-time visibility and control. In addition, which is similar to some food and beverage companies previously discussed, Medibox allows its suppliers to manage campaigns via the cloud-based solution. Overall, the company operates very much according to the current status-quo, also supplying the buyer with an application to place orders directly on the smartphone when checking available stock at the pharmacy (TRxADE, n.d.).

#### 4.2.6 Pharma Sources

Another example for a B2B marketplace is pharma source. The Chinese company focuses on trade throughout the pharmaceutical supply chain and across the globe. Despite coming close to B2B ecommerce, the platform allows only for matchmaking between suppliers and buyers. As a result, suppliers pay a membership fee to be listed on the platform and place adverts on the homepage (pharmasources, n.d.).

## 5. Primary Research

### 5.1 Methodology

In order to better understand and analyse the technology adoption lifecycle stage of the two industries under investigation, in-depth interviews were conducted with industry experts focusing on supply chains and specifically the last mile in the B2B trading process. All interviewees are knowledgeable of the ordering processes in place and challenges faced therewith, so that an impression on the degree of technology adoption could be shared by all interviewees.

In total, a number of 11 in depth interviews (five interviews with representatives from the food and beverage industry and 6 interviews with representatives from the pharmaceutical industry) were conducted with industry representatives in German or English.

Considering the sensitivity of the data shared which oftentimes shapes industry players' competitive advantage, all data will be anonymised on an industry level. More detailed information will not be required for comparing the status quo of the pharmaceutical and food and beverage industries.

At this point it shall further be mentioned that all but one interviewees stem from employees working in Germany or Austria. Surely, this aspect narrows the degree of generalisation capability and will be considered for analysis. Further, the sample was not fully randomized but rather mainly selected from the interviewer's personal and professional network. The main reason behind this approach lay in the seniority of interviewees and sensitivity of data.

### 5.2 Food and Beverage Industry

#### 5.2.1 General Insights and Current Way of Working

All interviews with experts from the food and beverage industry were conducted with wholesalers directly involved with the end of the B2B supply chain, i.e. delivering to restaurants and other food and beverage outlets. Put differently, all interviewees are directly involved with order processing of incoming orders from food and beverage outlets and partially retail establishments.

In terms of industry focus, most interview partners distribute beverages or fruit and vegetables. The topic of digitization of information flows within the supply chains is specifically interesting for those

industry branches, since the order frequency is extremely high, while baskets tend to stay similar. At the same time, order values and margins are comparably low, hence demanding efficiency to save costs: oftentimes, several hundreds of orders are processed per day. This high volume asks for technological support.

Next to that, the interacting actors of the supply chain, i.e. restaurants and their suppliers, have different working hours with limited to no time overlap, which makes direct communication difficult and results in processes prone to errors.

#### 5.2.1.1 The Ordering Process

All interview partners confirmed that the ordering process is not generalized. Much more, suppliers try to offer their customers as many different ways of ordering as desired, in order to stress their focus on customer-oriented service. The mere fear of losing the customer to the competition is though undoubtedly another reason. Hence, suppliers often consider this their competitive advantage and main reason for their strong customer base. Amongst ordering channels used are phone, email, fax and seldomly also web shops, which are though barely used.

Especially in the beverage industry a system has been established, where an internal team calls all customers to take their orders every day. At the same time, they of course remind the customer to place the order on time and try to upsell where possible. This clearly shows that late orders have become an issue for wholesalers, as they trigger additional logistics costs, trying to please every customer even when orders come in after the order deadline. Also, customers have gotten used to receiving the call as a reminder to place their order. At the same time, the responsibility for on-time orders was moved back to the supplier creating more risk on their side. "The customer is king!", seems to be the motto wholesalers go after here.

#### 5.2.2 Digitization Stage in the Industry

Moving on to the question of what to be improved in the current ordering process and management thereof, the majority of interviewees stated the manual data input of orders as a core issue. With the requirement to feed each order into the wholesaler's operating system to continue with dispatch and invoicing, this step is a clear requirement and often bottleneck.

Next to the generated labour cost, errors occur many times since employees and customers are working under pressure. As a result, volumes are often wrong, items are missing, or wrong ones are delivered. These misunderstandings surely have an effect on the wholesaler's reputation, who tend to struggle to clarify on whose side the mistake lies. At the same time, many wholesalers claim that customers enjoy the direct (and often daily) contact with their suppliers.

In addition, the awareness of a growing demand in customers wanting to order digitally but smoothly was shown by all interviewees. Interview partners further stressed that this group of customers remains to be the minority and that most customers are more old-fashioned. Still, one can summarize that all interviewees agreed on the growing importance of smart ordering solutions in the coming years.

#### 5.2.2.1 Objections Towards Digital Ordering Solutions

Going into detail on what the solution may look like, wholesalers are sceptic when it comes to convincing customers to move away from their familiar way of ordering. As mentioned in the previous section, the fear to lose customers over forcing them to order in a specific way is significant.

Other wholesalers reported that their existent web shop is not delivering expected results, meaning that customers stick to the way of ordering they are used to, i.e. usually calling, emailing or faxing orders every day.

The combination of results not meeting expectations paired with high investment and maintenance costs often leads wholesalers to become highly risk averse when it comes to new technology investments aiming to automate communication streams.

Another aspect to consider regarding wholesalers' resistance to change are the limitations in representation of pricing and product ranges. Communicating directly with the customer allows for assistance, recommendations, and upselling. Using a technological solution instead might result in respective losses.

In addition, wholesalers admit that technology usually adapts to their ways of working, so that also operating systems tend to be programmed to the needs of the wholesaler. An example would be customer specific pricing or discounts linked to the order volume.

Interview partners representing smaller wholesalers are often family-owned businesses. From those interviewees, several also mentioned that the technical implementation is mostly another big hurdle to take. Mostly based on previous negative experience resulting in much higher investment costs than budgeted, hesitations towards new investments of such kind are higher because of the missing knowledge on actual complexity of the project. This knowledge gap is mostly only bridged by IT partners the wholesalers cooperate with. After all, depending on their expertise implementations turn out to be more or less complex.

#### 5.2.2.2 Current and Near Future Plans regarding Digitization and the Effect of Covid-19

Most interviews were conducted during the summer months of 2021. When discussing the question of companies' current and future plans involving digitization, interviewees' responses could be separated in two groups: one group of respondents stated that several projects had been pushed during the lockdowns throughout the pandemic. This group of wholesalers mentioned that the openness towards digitization had been there before, but the timing was never right, as such changes demand a high number of internal resources. Hence, calm periods were used to overthink processes and find ways to make them leaner and less labour intensive.

The second group of respondents stated that the topic is of importance, but that the timing was not right just yet. Those companies underwent significant struggles to get through the pandemic, not risking any investment, especially not where it was avoidable. They though mentioned that plans have been made to investigate options in the winter months when the high season and strong revenue period is over again. Just now, though, the focus lies on revenue and rebuilding the customer base.

Specifically asking about the overall effect of the pandemic on the industry's mindset and thinking about the importance of digitization revealed a clear shift on both supplier and customer side towards higher efficiency and more automation.

#### 5.2.3 Strengths and Weaknesses of the Food and Beverage Supply Chain

A clear reason why technological change is so hard to achieve in the food and beverage industry are the strong relationships across the supply chain. It is a somewhat cultural aspect that has evolved, building trust, and working side by side for years and decades. Many respondents pronounced that their customers would never switch to another supplier, no matter how much cheaper the products may be. This reliance on relationship and trust is, in the wholesalers' opinion, largely possible due to

the fact that direct contact is so frequent. This, of course, can also be considered a strong advantage protecting the industry from price wars and price dumping.

One aspect to reflect on as a weakness in the industry are comparably low margins for wholesalers, especially in the beverage branch. This leads to significant pressure on wholesalers to cut costs where possible, hence calling for affordable technological solutions to cut overhead costs and errors in the long run.

In the fruit and vegetable sector another aspect is leading: the produce is rather cheap and especially cheaper than the equipment needed to transport it. Paired with the high order volume required to stay profitable, smart logistics to manage and tracking moving equipment through technology can become a clear competitive advantage.

#### 5.2.4 Overall Conclusion

Based on the information gathered through the conducted interviews and the technology adoption lifecycle discussed previously in this thesis, the German and Austrian markets are at a similar stage, albeit more German wholesalers are ready to adopt a technological solution for order management; possibly the reason lies in the overall larger average company size in Germany allowing for more leverage on the wholesaler side when it comes to convincing customers to change their ordering habits. In addition, a larger company size also allows for comparably bigger issues in the recording of orders, meaning more errors, more labour and hence higher costs overall triggered by such manual processes.

In terms of technology adoption, and an aimed generalization based on a small sample size, most industry players would find themselves in the stage of early majority of the technology adoption lifecycle. Hence, some wholesalers are convinced of the need of a digital ordering channel, while others chose to move an implementation by several years, still.

At the end of the day the benefit of the technological advancement is clear to every market player involved in this process. This shows that the adoption process is happening at large scale, and that it is a matter of time until the majority of actors has successfully adopted it; with a difference in timing based on different reasons ranging from adoption issues by customers to a general hesitation to invest based on internal (generation clashes) and external (e.g. Covid-19 crisis) reasons.

One must note that the readiness of wholesalers to switch to digital order management is majorly given, but hesitations are still there. There also seems to be a correlation between the size of the company and the risk profile, so that smaller wholesalers are less open to invest and take the risk of failure. Here, they often claim the size of the company to be the reason for restrictions in digitization.

## 5.3 Pharmaceutical Industry

### 5.3.1 General Insights and Current Way of Working

Interviews conducted in the supply chain of the pharmaceutical industry involved representatives from pharmacies (in cities and on the countryside), wholesalers and producers / manufacturers. The reason for this more diverse sample is the fact that all industry players interact with each other in the last mile B2B ordering processes. Surely, a general structure is in place, but there is not just the one typical process connecting manufacturers with wholesalers who interact with hospitals and pharmacies. As described below, there are indeed cases where manufacturers work with the final B2B buyer directly.

Generally, every hospital and pharmacy work with one to three wholesalers to order products of all kind and assure availability. In addition, order frequencies are extremely high (compared to other industries) ranging from two to six delivery slots per day to assure optimal medical supply. Hence, pharmacists also know by what time medication will arrive and can share expected times of arrival with their patients.

Before going into detail on the ordering process in the next section it shall be noted that the focus lay on medication rather than other products regularly supplied to hospitals and pharmacies. The reason for the focus on pharmaceutical produce is the high order frequency and hence significant timely effect on daily operations.

#### 5.3.1.1 The Ordering Process

Results of the first question on the general ordering process between the last “node” of the supply chain and distributors or producers showed that there is a generally established standard of digitization in place so that orders can and are usually placed digitally. The systems used are normally provided by wholesalers, whereas for large customers like hospitals EDI connections allow for data exchange between two different operating systems involved.

Another reason for the structure of high order frequency is the bound capital in stored medication. Especially costly products only demanded by a specific customer group, such as oncological drugs. Storing them in high quantity would increase the bound capital and hence be too risky for an individual pharmacy to have in stock. Hence, such medication is ordered on demand and usually on the patient's pick-up day.

Looking at the ordering process itself in more detail, pharmacies in cities generally have software installed that allow to trigger orders directly with different wholesalers linked to the system.

Doctors managing a pharmacy on the countryside usually receive the login to a portal from their wholesaler of choice. They then scan the QR codes of products to trigger orders. Hence, the process is automated, and orders can be processed right away. The automation of this process is key due to the very high order frequencies.

In terms of competition, the industry has developed a structure that created a very high entry barrier. Wholesalers lock their customers in by installing their software right on the customer's device and establish a process allowing for easy delivery handling: delivery agents usually have access to the pharmacy or office and safely store the packages. Considering the need for such a secure setup, pharmacies and doctors usually work with maximum two wholesalers and rarely switch.

### 5.3.1.2 Importance of Personal Contact and Points of Improvement

Next to the ordering process, direct contact between wholesalers, manufacturers and final buyers like pharmacies and hospitals is of significant importance. Considering the fact that the industry is moving fast, with new product releases and continuous promotions and offers, dedicated representatives visit their customer base to discuss, advise and inform them on news, opportunities and industry changes worth knowing. This service aspect is specifically important to wholesalers, as it is their core option for differentiation. As a reseller of manufacturers' produce, no other aspect can lead to a competitive advantage. Despite most direct contact takes place between representatives of wholesalers and the B2B end user, also manufacturers visit pharmacies and hospitals on a regular basis, to explain and share information about changes and adaptations of their products.

This relationship also affects wholesalers to a certain extent, as pharmacies sometimes order with manufacturers directly when it comes to products that are in high need and hence ordered in bulk.

For these cases communication takes place directly, so that no automation is established, and representatives call and receive orders via email or directly on the phone.

Despite the basic structure being fully automated, personal contact and support in daily processes remain to be a requirement. One of the points mentioned from the ordering side was that products listed in the product directory are not in alphabetical order in regard to the product specification, but rather listed by manufacturer. Hence, finding the product needed is oftentimes a challenge and time consuming, especially when manufacturers change names and branding of the same product. As a result, pharmacists ring wholesaler representatives several times a day to get support to find the product of choice and get its availability confirmed.

Another important topic are order reminders, especially for doctors managing their own medication stock on the countryside. In order to avoid late or missing orders, wholesale representatives call their clients to remind them of placing their order. This system is expectedly inefficient and costly, as doctors often need to be called several times until reached.

### 5.3.2 Digitization Stage in the Industry

In regard to availability of products ordered, not all systems fulfil the same standards. As shared in one of the interviews, some wholesalers' software does not track stock levels, so that all incoming orders are checked manually. In case a product is not available doctors are called up to be informed about an unavailability and/or to offer alternatives.

This widely accepted approach is applied in many European countries, so that also the automation has widely found acceptance. Surely, there are pharmacies not willing to move away from phone and fax, but they have become the clear minority.

#### 5.3.2.1 Digitization beyond the Final B2B Sale Towards the End of the Supply Chain

A short glimpse at a different stage in the supply chain, i.e. further up in the ordering process and hence concerning interactions between manufacturer and wholesaler, reveal that, as one interviewee from Germany described, all communication is managed via email or fax. The reason for the non-digitization in this case are extremely high regulatory requirements such as logging into one's account based on document identification. Such prerequisites clearly increase the barrier of entrance to automated ordering processes. As a result, small manufacturers who may not have IT in-house and

cannot afford complex code to meet all requirements stick to old structures to avoid such high investment costs. Overall, the pharmaceutical manufacturing industry is largely dominated by a handful of strong players adapting to complex requirements more easily and hence the ability to move faster with technological evolution.

Looking at the processes within a hospital shared by one of the interviewees, it becomes clear that the supply chain does not necessarily end at the hospital's pharmacy. Beyond that, reordering processes take place between the pharmacy and different departments. Here, automation is highly limited so that remaining stock is not tracked automatically. Rather, employees are responsible to check, and reorder needed medication. For the case at hand, the hospital has a logistics team stocking all departments and taking care of medical orders.

Interestingly, it seems to be very common to handle the tracking of addictive substances manually, still. As described by a doctor practicing at a German hospital, all addictive substances are stored in a separate safe. Every time a pill or similar is needed, a nurse must protocol all details, which are quacked in pairs as part of every shift change. Here, the interviewee stressed that this process is extremely labour intensive and inefficient. Similar procedures were shared by other interview respondents.

#### 5.3.2.2 Current and Near Future Plans regarding Digitization and the Effect of Covid-19

As for the interviews with representatives from the food and beverage industry, also all interviewees from the pharmaceutical industry were posed the question on current and future plans regarding digitization as well as effects the Covid-19 crisis may have had on the way of doing business. Surely, the answer always involved that personal meetings were reduced to the absolute minimum but interestingly, they picked up again once the pandemic got more under control. In fact, people returned to all personal meetings as before, despite one respondent mentioned that they were less intense in terms of time, so that more caution is taken subjectively. Similarly, pharmacy's customers would pre-order medications during the pandemic and only pass by for pick-up. Meanwhile, also here old habits returned.

In terms of digitization projects, there did not seem to be an interlinkage with the covid crisis. Albeit a pharmacy introduced a digital so-called "Suchtgiftbuch" allowing to track narcotic drug stock

automatically, (which has previously been done manually), this was rather linked to the best use of time during the lockdowns than to the realization of needed automation linked to the pandemic.

### 5.3.3 Strengths and Weaknesses of the Pharmaceutical Industry

What became clear from all conversations with representatives of all kinds is that personal relationships across the supply chain are a clear strength in the industry. What is key for each player is to allow for product availability and minimized delivery bottlenecks. Surely, for the case of Europe the dependence on Asian manufacturers is a weakness there. As it was mentioned by two respondents, their companies are currently working on moving more production centres to Europe to assure delivery. Albeit not specifically mentioned, this issue has intensified during the current Covid-19 crisis.

Another aspect considered as a strength within the industry by interviewees, is the strong symbiosis between manufacturers, wholesalers and pharmacies and hospitals. The interdependency to assure medical supply for the end user supports teamwork and strong relationships. At the same time and looking at the technological status quo, one could argue that high entry barriers paired with the interdependency result in a lack of continuous process improvement, leaving the industry with comparably old technologies in operation. Further to this point technological improvements are always subject to compliance with regulatory requirements, such as scanning of packages leaving the wholesaler's warehouse and tracking throughout the delivery process. The costs involved in advancements with this significant back log might also be hindering change, which was also specifically confirmed by an interviewee stated that

“Every potential advancement of a cumbersome yet functioning process is a big risk to the entire system”.

In addition, several parties are involved in the evaluation and implementation process so that it requires strong commitment to convince all players and have everyone on board for successful implementation.

#### 5.3.4 Overall Conclusion

With information gathered from all actors within the pharmaceutical supply chain it becomes quite clear that the established system is not flawless but has made it to a respectable standard to optimize repeated processes. Evaluating the state of the art in regard to the technology adoption lifecycle, Germany and Austria seem to work with similar standards which have been established several years ago and involved on site installed software and comparably old-fashioned technology. Such software includes manual data input requirements and often data actualization is hard to track back. As a result, technology is in use but does not replace daily human interaction across the supply chain to avoid misunderstandings and unclarities arising from inconsistent data display across the database.

The analysis based on the technology adoption lifecycle curve would hence show a very advanced stage so that remaining players to adopt the existing technology would be considered laggards.

At the same time, one could question the overall state of technology in respect to solutions developing in India or China. Such solutions and ordering apps have not made it to the German speaking market at all and would position market players adopting those new solutions as innovators at the very beginning of the innovation curve. Such hypothesis must also be challenged by regulatory frameworks that may not be in place in other markets.

Furthermore, on the one hand, regulatory requirements strongly influence and guide the market and its development and, on the other hand, large manufacturers and wholesalers have established strong synergies protecting all parties involved from potential competition.

As it applied for the food and beverage industry, also the sample size of interviews conducted for the pharmaceutical industry comes with limitations. Clearly, not all pharmacies will follow the same ways of working. The aim of this thesis is though to shed light on overall supply chain structures and technology stages.

## 5.4 Comparing the Two Industries: Similarities and Differences between Supply Chains of the Pharmaceutical and Food and Beverage Industries

The aim of this thesis is to compare the state of technology adoption of the supply chains of the pharmaceutical and food and beverage industry. This section aims to draw conclusions from the shared knowledge and compare the supply chains' technology adoption regarding the concept of the technology adoption lifecycle.

At this point it shall be mentioned that the German speaking region was a focus region for the sample, albeit one interviewee is based in The Netherlands, although working for a pharmaceutical manufacturer specifically active in Germany.

### 5.4.1 General Differences and Similarities

#### 5.4.1.1 Similarities

When analysing the two different supply chains it becomes clear that there are several similarities to detect. One core aspect is the distribution factor. Be it food or medication, wholesalers tend to resell produce from manufacturers and producers, not adding significant value beyond consultation and the efficient logistics. The dependency and need for the wholesaler active between manufacturer and B2B consumer are undoubtedly there.

Another characteristic both industries share is the shelf life of products linking to a required high order frequency. This similarity explains the comparable order processes followed. Especially the personal contact buyers expect from wholesalers' and manufacturers' representatives is special for the industries. Linked to this fact is also the higher entry barrier for new industry players, though linked to different reasons: for the food and beverage industry it is merely the strong relationship and trust that allows for long lasting business relationships. As mentioned, this is surely also an important factor in the pharmaceutical industry, but in addition the logistical handling and ordering system is very unique, making it very cumbersome to work with various wholesalers in parallel.

#### 5.4.1.2 Differences

Looking at the order process in more detail it becomes clear that the pharmaceutical industry has started to introduce technological solutions much earlier than the food and beverage industry, when it comes to small scale buyers like independent restaurants: While many restaurants still order with

their different suppliers by phone, email or fax, pharmacies have adopted ordering systems already several years ago.

Also, in regard to the personal contact expected in both industries, differences lie in the purpose of personal engagement: in the pharmaceutical industry, representatives visit their customers in person to advise and discuss on products to buy or news to be shared. The food and beverage industry though relies on phone calls and emails as the regular personal interaction to take customers' orders. Surely, advice and relationship building are part of the process as well, but significantly less time intense and neither in person.

Albeit there are many similarities in the ordering process involving personal contact, it can be concluded that the status quo of technology use is the greatest difference detected between the industries, at least for the sample and the regional focus on Germany and Austria. The next chapter will go into detail on this difference, based on the technology adoption lifecycle model discussed in the literature review.

#### 5.4.2 Technology Adoption Lifecycle Stage Comparison

Moving on to the technology adoption lifecycle, it is impossible to “place” the two industries on the same bell curve.

The food and beverage industry used to be significantly behind in terms of digitizing order processes, largely due to the fragmented buyer market and the high on-premises installation costs that would have been required.

Throughout the past years cloud-based solutions allowed for a big technological but less capital-intensive shift across the industry. Based on the technology adoption lifecycle and ordering apps and marketplaces now growing at fast pace one could categorize the industry as early majority.

The pharmaceutical industry, on the contrary, has made the step towards digital order management several years ago. Surely, installation costs were significantly higher, but worth the effort as order frequencies are still higher than in the food and beverage industry, so that the pain to solve the issues of time flowing into reordering was significantly greater. As a result, wholesalers invested in the technology and provided doctors on the countryside managing a pharmacy with the software. Stand-alone pharmacies usually invested in the software themselves, bearing the amortization risk and

accepting it as a standard to assure fluent work processes and lower labour costs. Mirroring this stage on a technology adoption lifecycle curve, industry players due to adopt the common systems would already be categorized as laggards, i.e. very late users delaying technology adoption as long as possible.

As discussed in the literature review, there are modern applications developing for the pharmaceutical industry as well. Apparently, those new solutions have not yet entered the German speaking market. The question arises whether this is due to the established system that may not be optimal in terms of user friendliness and self-explanation but does meet the needed requirements. Hence, time will show whether new apps will create more added value over time to overcome the barrier and turn out to be worth a new software investment.

In summary, one could argue that the pharmaceutical industry could learn from the new systems developing in the food and beverage industry today. On the other hand, the food and beverage industry has remained with manual ordering processes much longer, while pharmacists had already adopted more efficient ways of working still applied today.

The table below summarizes main similarities and differences between the two industries.

Industry Aspect	Food and Beverage Industry	Pharmaceutical Industry
<b>MARKET CHARACTERISTICS</b>		
Number of Ordering Channels with Suppliers	Numerous.	One.
<u>Distribution Structure</u>	Manufacturer – Wholesaler – Final Stage	Manufacturer – Wholesaler – Final Stage
<u>Importance of Relationships across the Supply Chain</u>	Very high.	Very high.
Manual Data Input of Orders	Significant.	Highly limited.
Fluctuating Quality of Products	Yes.	No.
Order Frequency	Daily to weekly, depending on the product.	Three times a day.
Entry Barrier for Competition	Low.	High.
<b>TECHNOLOGICAL ASPECTS</b>		
Digital Ordering	Considered a new trend.	Widely established.
Customer Engagement	Taking orders.	Consulting.
Objections towards digital ordering solutions by Sellers	High.	Low, only investment cost high.
Objections towards digital ordering solutions by Buyers	High.	Low.
Current Trend Towards Digital Ordering at all Industry Player Sizes	Yes.	No.
Software Used by Buyer (if in use)	Cloud-based by third party.	On-site by wholesaler.
<b>EFFECT OF COVID-19</b>		
<u>Delay of Projects</u>	Yes.	Yes.
<u>Growing Importance of Digital</u>	Yes.	Yes.

\*Underlined aspects display similarities between the two industries.

## 6. Conclusion

With globalisation and digitalization as the buzz words reigning today's economic world companies and supply chains are confronted with the need for innovation and enhanced efficiency to keep their competitive edge. The concept around the "Industry 4.0" allows for the categorisation of industries and their stakeholders in terms of technology adoption and effective appliance to enhance business processes. As it showed, neither the food and beverage nor the pharmaceutical industry are at the forefront in climbing the stages towards "Stage 4", which symbolises the use of technology not only to automate processes but rather to allow for automated forecasting and strategic business decisions.

Much more, secondary and primary research showed that both industries are very much involved in stages one and two, trying to optimize all means of digitization, i.e. automating manual processes. The precise aim of this thesis was to analyse and compare the technological status quo of supply chains of the pharmaceutical and food and beverage industries, with a focus on the end of the supply chains and ordering processes between final B2B buyer and supplier.

Secondary research focussed on supply chain structures of both industries under investigation as well as technology adoption for the industries overall. This included theoretical concepts like the technology adoption lifecycle or the differentiation between digitalization and digitization, flowing together in the concept of the Industry 4.0 having technology as a data driven competitive advantage at its core.

As primary research showed, the industries' supply chains do indeed show numerous similarities in terms of handling, ordering procedures and linked complexities.

Still, the technological landscape is quite different between the two industries. Reasons for the incomparability range from sales margins allowing or disallowing for high investments in technological infrastructure to the overall buyer and seller landscape, whereas the food and beverage industry is more fragmented on both, the buyer and the supplier side.

These structural differences lead to a great difference in timing for technological advancements but overall, one can conclude technology plays a more and more indispensable role for both industries. As outlined with Moore's concept of the Technology Adoption Lifecycle (Moore, 2014), the certain level of automation and digitization in the pharmaceutical industry would leave non-adopters behind

as laggards. This group would only implement technology if forced to so one way or another. This was also clearly proven in the interview outcome, as order automation is in place with each of the final players of the supply chain and accepted as an industry standard. Applying the same model to the food and beverage industry and interviews conducted revealed digitization of the ordering process (and hence an important relational interaction points with customers by suppliers) as a very new trend in the German speaking region.

Albeit the pharmaceutical industry may have a level of digitization established, it must be said that primary research revealed that processes are not as automated yet in reality: Interviewees reported that wholesalers are contacted several times a day to avoid misunderstandings and errors in order records. With the food and beverage industry applying more modern cloud-based technologies it may occur that the pharmaceutical industry will be behind in regard to effective implementation of automation technologies rather sooner than later.

## 6.1 Practical Implications

The results of the in-depth interviews conducted in the thesis, paired with the learnings from the literature review show that technology's role in today's supply chain optimization has become central and critical. With increasing competition through globalisation efficient processes across supply chains are key to success and often turn out to be a competitive advantage.

Albeit regulatory requirements and established work structures often hinder fast implementation of new technologies, innovative systems have in the end and are making their way into everyday processes. Hence, the analysis of primary research would recommend that players of the pharmaceutical industry shall stay on top of improvements of ordering processes, especially to keep the control and relationship to their customers and avoid a similar market structure increasingly dominated by third party marketplaces as it shows in the food and beverage industry. In addition, the industry must accept that the current status quo does not meet the requirements of full automation of order management processes and imply a strong dependence on human resources to replicate daily processes. In turn, new technologies applied in the food and beverage industry seem to achieve this automation across all customer sizes.

As was displayed in the comparison between the pharmaceutical and food and beverage industries, the timing must be right to adopt technology effectively. Such market readiness is not only dependent on the industry itself, but also strongly varies in terms of cultures.

Further, global changes and events like the Covid-19 pandemic impact actors' ways of thinking and often imply faster change and adaption. It is times of crisis that force companies to rethink their ways of working and frequently ignite creativity and readiness to change. The crisis has specifically forced relationships to move to digital and non-personal ways of communicating, and surely displayed those collaborations often work despite distance and allow for significant cost savings.

## 6.2 Limitations

As previously mentioned in this thesis the sample size is limited by number of interviewees and geography. The focus on Germany and Austria does hence not allow for generalization across Europe or worldwide. As a matter of fact, even in Europe bordering markets show significant difference in terms of technology adoption and readiness to accept or implement change. In order to make generalisation possible, more interviews would need to be conducted across the supply chains.

Further, not all potential long-term changes triggered by the Covid-19 pandemic could be considered, as interviews were not necessarily conducted in the same month. In addition, the pandemic affected different regions in varying ways at altering times.

Future research will show how technology will continue to shape communication across supply chains and many different industries strongly relying on people and their strong relationships and interdependencies.

## 7. Bibliography

- Agrawal, P., & Narain, R. (2018). Digital supply chain management: An Overview. IOP Conference Series: Materials Science and Engineering.
- Martin-Rios, C., & Ciobanu, T. (2019). Hospitality innovation strategies: An analysis of success factors and challenges. ELSEVIER: Tourism Management, 218-229.
- Behner, P., & Ehrhardt, D. (2016). Digitization in pharma: gaining an edge in operations. Berlin / New York: pwc.
- Salesforce Research. (2020). VIERTE AUSGABE: STUDIE ZU TRENDS IN KLEINEN UND MITTLEREN UNTERNEHMEN: Einblicke von über 2.300 Geschäftsinhabern und Führungskräften weltweit. Salesforce Research.
- Van Wyck, J., Rose, J., Ahmad, J., & Küpper, D. (2019, March 15). The How-To Guide to Digital Operations. From The How-To Guide to Digital Operations: <https://www.bcg.com/publications/2019/how-to-guide-digital-operations>
- Lakshman, V., & Rohrbach, M. (2018). Digitalization in Life Science. Basel: KPMG.
- Brito da Silva, R., & de Mattos, C. (2019). Critical Success Factors of a Drug Traceability System for Creating Value in a Pharmaceutical Supply Chain (PSC). Sao Bernardo: International Journal of Environmental Research and Public Health .
- Lovis, C. (2008). Traceability in healthcare: Crossing boundaries. IMIA Yearb. Med. Inf.
- Lee, C., & Kim, H. (2021). Relationships among Healthcare Digitalization, Social Capital, and Supply Chain Performance in the Healthcare Manufacturing Industry. International Journal of Environmental Research and Public Health.
- Roden, S., & Lawson, B. (2014). Developing social capital in buyer–supplier relationships: The contingent effect of relationship-specific adaptations. ELSEVIER, 89-99.
- McGrail, S. (2020, July 1). PHARMANEWS INTELLIGENCE xtelligent HEALTHCARE MEDIA. From Fundamentals of the Pharmaceutical Supply Chain: <https://pharmanewsintel.com/news/fundamentals-of-the-pharmaceutical-supply-chain>
- Privett, N., & Gonsalvez, D. (2014). The top ten global health supply chain issues: Perspectives from the field. ELSEVIER, 226-230.
- Wang, M., & Jie, F. (2020). Managing supply chain uncertainty and risk in the pharmaceutical industry. Health Services management Research, 156-164.
- Mishra, D. (2020, October 19). Forbes. From The Stages Of Industry 4.0: Where Are You Now?: <https://www.forbes.com/sites/forbestechcouncil/2020/10/19/the-stages-of-industry-40-where-are-you-now/>
- Ash, C., & Burn, J. (2002, May 15). European Journal of Information Systems. From Assessing the benefits from e-business transformation through effective enterprise management: <https://orsociety.tandfonline.com/doi/abs/10.1057/palgrave.ejis.3000476?journalCode=tjis20&#.YH82LxSmPDI>
- Kohli, R., & Melville, N. (2018). Digital innovation: A review and synthesis . Information Systems Journal, 200-223. From Digital innovation: A review and synthesis: <https://onlinelibrary.wiley.com/doi/abs/10.1111/isj.12193>
- Li, L., Su, F., Zhang, W., & Mao, J.-Y. (2017). Digital transformation by SME entrepreneurs: A capability perspective. Information Systems Journal, 1129-1157.
- Kark, K., Gill, J., & Smith, T. (2021). Maximizing the impact of technology investments in the new normal. Deloitte Insights.
- Klappich, D., De Muynck, B., Aimi, G., Titze, C., & Stevens, A. (2020). Predicts 2021: Supply Chain Technology. Gartner.
- 2.order. (n.d.). 2.order. From IHRE BRANCHENÜBERGREIFENDE B2B-PLATTFORM: <https://2-order.de/index.php/homepage.html>

- B2B WAVE. (2018, October 16). B2B WAVE. From Why B2B eCommerce Is an Opportunity for Medical and Pharmaceutical Wholesalers: <https://www.b2bwave.com/p/why-b2b-ecommerce-is-an-opportunity-for-medical-and-pharmaceutical-wholesalers>
- Bharadwaj, A., El Sawy, O., Pavlou, P., & Venkatraman, N. (2013, June). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly*, pp. 471-482.
- Brownell, J., & Reynolds, D. (2002, December). Strengthening the F&B Purchaser–Supplier Partnership. *Cornell Hotel and Restaurant Administration Quarterly*, pp. 49-61.
- Chapco-Wade, C. (2018, October 21). medium.com. From Digitization, Digitalization, and Digital Transformation: What’s the Difference?: <https://medium.com/@colleenchapco/digitization-digitalization-and-digital-transformation-whats-the-difference-eff1d002fbdf>
- Chintan. (2020, November 29). ARCHISYS. From B2B Ecommerce for Pharma: What Problem does it Solve?: <https://www.archisys.co/b2b-ecommerce-for-pharma/>
- Creydt, M., & Fischer, M. (2019, May 19). Blockchain and more - Algorithm driven food traceability. *Food Control*, pp. 45-51.
- DiegoCoquillat. (2021, January 21). DiegoCoquillat: El Periódico Digital de los restaurantes. From Study on the influence of technology in restaurants 2020: <https://www.diegocoquillat.com/en/estudio-sobre-la-influencia-de-la-tecnologia-en-los-restaurantes-en-2020/>
- Dremel, C., Wulf, J., Herterich, M., & Brenner, W. (2017, January). ArticlePDF Available How AUDI AG Established Big Data Analytics in its Digital Transformation. *MIS Quarterly Executive* 16, pp. 81-100.
- EasyVend. (2021, August 14). BUSINESS DAILY MEDIA. From 3 Digital Trends Influencing the B2B Food & Beverage Industry in 2021: <https://www.businessdailymedia.com/sme-business-news/8220-3-digital-trends-influencing-the-b2b-food-beverage-industry-in-2021>
- GEFAKO GmbH & Co. (n.d.). Bundesverband des deutschen Getränkefachgroßhandels E.V. From GEFAKO - Die Getränkespezialisten: <https://bv-gfgh.de/project/gefako/>
- GetränkeNews! (2020, April 22). GetränkeNews! From Burger tritt in Geschäftsführung ein: <https://getraenke-news.de/burger-tritt-in-geschaeftsfuehrung-ein/>
- Goldberg, A. (2021, July 20). CIO. From Delivering a Compelling Commerce Experience: <https://www.cio.com/article/3625830/delivering-a-compelling-commerce-experience.html>
- Haq, I., & Muselemu Esuka, O. (2018). Blockchain Technology in Pharmaceutical Industry to Prevent Counterfeit Drugs. *International Journal of Computer Applications*.
- Huck, J. (2021, 06 14). Hospitality Technology: smarter hotels & restaurants. From Why It's Time to Digitize the Procurement Process: <https://hospitalitytech.com/why-its-time-digitize-procurement-process>
- Infor. (2021, January 5). Infor Blog. From Five 2021 technology trends for the food & beverage industry: <https://www.infor.com/blog/five-2021-technology-trends-for-the-food-beverage-industry>
- Johnson, T., & Evers, J. (2020, September 03). BAIN & COMPANY. From Medtech and Pharma Sales Go Virtual: <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>
- Klappich, D., De Muynck, B., Aimi, G., Titze, C., & Stevens, A. (2020, December 02). Gartner. From Predicts 2021: Supply Chain Technology: [https://www.gartner.com/doc/reprints?id=1-251QNHQR&ct=210119&st=sb&utm\\_campaign=Ebook%20%7C%20EN%20%7C%20A0Predict%20Gartner%202021&utm\\_medium=email&\\_hsmi=114972243&\\_hsenc=p2ANqtz-\\_INQ\\_Y84-4IGbvmBbEZonSyU1T3WT1WoD5V1XojhGwy8pA9LJ7LK5Rpx0zE7ZhlWuA3j317ukV](https://www.gartner.com/doc/reprints?id=1-251QNHQR&ct=210119&st=sb&utm_campaign=Ebook%20%7C%20EN%20%7C%20A0Predict%20Gartner%202021&utm_medium=email&_hsmi=114972243&_hsenc=p2ANqtz-_INQ_Y84-4IGbvmBbEZonSyU1T3WT1WoD5V1XojhGwy8pA9LJ7LK5Rpx0zE7ZhlWuA3j317ukV)
- Kompass International. (n.d.). KOMPASS: Your route to business worldwide. From What are the B2B buyers preferences today? : <https://www.solutions.kompass.com/blog/what-are-the-b2b-buyers-preferences-today/>

- Leenders, S. (2020, October 30). CROSS-BORDER MAGAZINE. From 48% of B2B orders in the Netherlands are placed online: <https://cross-border-magazine.com/48-of-b2b-orders-are-placed-online/>
- Lüth, M., Spiller, A., & Wegener, A. (2005). Kosten- oder Qualitätsführerschaft – Eine empirische Analyse zum Wareneinkauf in der Gastronomie. 1. Jahrbuch der Österreichischen Gesellschaft für Agrarökonomie.
- MARKETSANDMARKETS. (2020, April). COVID-19 impact on Medical Supplies Market. From COVID-19 impact on Medical Supplies Market by Type (Intubations, Personal Protective Equipment, Infusion, Radiology, Wound Care Supplies), End User (Hospitals, Clinics) - Global Forecast to 2021: <https://www.marketsandmarkets.com/Market-Reports/covid-19-impact-on-medical-supplies-market-158189339.html>
- MEIN GETRÄNKEMOBIL. (n.d.). From Impressum: <https://www.mein-getraenkemobil.de/impressum~14.de.html>
- Merhar, L., Berger, C., Braunreuther, S., & Reinhart, G. (2018, June 24). Digitization of Manufacturing Companies: Employee Acceptance Towards Mobile and Wearable Devices. *Advances in Human Factors in Wearable Technologies and Game Design*, pp. 187-197.
- Moore, G. A. (2014). *Crossing the Chasm, 3rd Edition: Marketing and Selling Disruptive Products to Mainstream Customers* (Collins Business Essentials). Harper Business.
- Morrill, L. (2020, September 7). pharmaphorum: bringing healthcare together. From Digital success for pharma services in a uncertain world: <https://pharmaphorum.com/views-analysis-digital/digital-success-for-pharma-services-in-a-uncertain-world/>
- Mugge, P., Abbu, H., Michaelis, T., Kwiatkowski, A., & Gudergan, G. (2020, February 26). *Patterns of Digitization: A Practical Guide to Digital Transformation*. *Research-Technology Management*, pp. 27-35.
- Nadkarni, S., & Prügl, R. (2020, April 18). Digital transformation: a review, synthesis and opportunities for future research. *Management Review Quarterly* volume 71, pp. 233-341.
- Newired. (n.d.). NEWIRED: Digital Transformers. From Let your employees fight the pandemic threats - and not struggle with digital tools: [https://www.newired.com/dap-for-pharma/?gclid=CjwKCAjwnPOEBhAOEiwA609ReeAJ6yc6t9wGelmuPmkN15hfmsy1sriPZoT625UU-ivul-eKDxNsBoCbf4QAvD\\_BwE](https://www.newired.com/dap-for-pharma/?gclid=CjwKCAjwnPOEBhAOEiwA609ReeAJ6yc6t9wGelmuPmkN15hfmsy1sriPZoT625UU-ivul-eKDxNsBoCbf4QAvD_BwE)
- NOVUM HOSPITALITY. (2018, April 03). Presse. From So geht Digitalisierung im Hotel: Im elektronischen Einkauf liegt der Gewinn : <https://www.novum-hospitality.com/so-geht-digitalisierung-im-hotel-im-elektronischen-einkauf-liegt-der-gewinn>
- OCTOPUS ORDER. (n.d.). From Eine App, alle Bestellungen - So einfach geht's!: <https://www.octopusorder.com/how-to/>
- OPTEL. (n.d.). Sicherheit der OPTEL. From Sicherheit der Lieferkette: <https://www.optelgroup.com/de/l%C3%B6sung/sicherheit-der-lieferkette/>
- Patterson, K., Grimm, C., & Corsic, T. (2003). Adopting new technologies for supply chain management. *Transportation Research Part E: Logistics and Transportation Review*, 95-121.
- pharmacom handels gmbh. (n.d.). From Login B2B-Bestellsystem: <https://b2b.pharmacom.at/pharmasources>.
- pharmasources. (n.d.). From <https://www.pharmasources.com/>
- PRO Fachhandel. (2018). PRESSEMITTEILUNG [www.profachhandel.de](http://www.profachhandel.de) Organisator: GES Generalversammlung und PRO FachHANDEL 2018: Aktuelle Themen, herausragende Zahlen und gelungener Branchentreff/ Veranstalter GES präsentiert dem Fachhandel zahlreiche Highlights. Nürnberg: PRO Fachhandel.
- Rogers, E. M. (1995). *Diffusion of Innovations*. New York: The Free Press.
- Schmidt, R., Gröber, F., & Burgers, C. (n.d.). apolino: das Apotheken Bestellportal. From <https://www.apolino.de/>
- Schomaker, L. (2020, November 8). Intelligent Technologies. From ERP for the Hospitality Industry: How it Can Help Your Business Succeed: <https://www.inteltech.com/erp-for-the-hospitality-industry-how-it-can-help-your-business-succeed/>

- Schöner, M., Kourouklis, D., Sandner, P., Gonzalez, E., & Förster, J. (2017). Blockchain Technology in the Pharmaceutical Industry. Frankfurt: Frankfurt School Blockchain Center.
- Sharma, S., & Singh, V. (2020, May 8). New Food Magazine. From Applications of blockchain technology in the food industry:  
<https://www.newfoodmagazine.com/article/110116/blockchain/>
- SINGH, B. (2020, December 10). net solutions. From Net Solutions' State of B2B Commerce Report – Top Trends for 2021: <https://www.netsolutions.com/insights/b2b-ecommerce-trends/>
- tageskarte.io. (2021, August 02). Tageskarte. From Routinen für effizientere Arbeitsabläufe:  
<https://www.tageskarte.io/detail/routinen-fuer-effizientere-arbeitsablaeufe.html>
- Tracxn. (2021, July 18). Tracxn. From Top Pharmacy B2B Ecommerce Startups :  
<https://tracxn.com/d/trending-themes/Startups-in-Pharmacy-B2B-Ecommerce>
- Trienekens, J., Hagelaar, G., & Pascucci, S. (2018). Patterns in sustainable relationships between buyers and suppliers: Evidence from the food and beverage industry. International Food and Agribusiness Management Association.
- TRxADE. (n.d.). TRxADE. From <https://www.trxadehealth.com/>
- Urbach, N., Drews, P., & Ross, J. (2017, February 16). Digital Business Transformation and the Changing Role of the IT Function. Bayreuth: Reserach Center Finance & Information Management and Fraunhofer FIT.
- Vogelsang, K., Packmohr, S., Liere-Netheler, K., & Hoppe, U. (2019, January). Research Gate. From Barriers to Digital Transformation in Manufacturing: Development of a Research Agenda:  
[https://www.researchgate.net/publication/332088866\\_Barriers\\_to\\_Digital\\_Transformation\\_in\\_Manufacturing\\_Development\\_of\\_a\\_Research\\_Agenda](https://www.researchgate.net/publication/332088866_Barriers_to_Digital_Transformation_in_Manufacturing_Development_of_a_Research_Agenda)
- Wirthman, L. (2020, February 10). DELL Technologies. From How Tech-Savvy Millennials Are Driving the Digital Workplace: <https://www.delltechnologies.com/en-us/perspectives/how-tech-savvy-millennials-are-driving-the-digital-workplace/>

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## 9. Appendix A: Interview Notes

### **Food and Beverage Industry**

#### Interview #1: Cash & Carry in NL

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

Deliver to food and beverage outlets of all kinds. All customers place their orders via the online portal.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

The interface is continuously improved by the internal tech team. Nearly 100% of orders are placed digitally. This is very common in the Netherlands as restaurants order from maximum four different suppliers, as opposed to about 14 in France or Italy.

At the moment they are focusing on further webshop improvement. Efforts put into these adaptations grew in importance through covid, as low time in the gastronomy sector also allowed for an increased number of resources to flow into this project. Specifically, the search and showing personalized alternatives to requested products not available. The trend towards smarter cooking is growing, meaning that chefs start to optimize and vary their menus according to availabilities and watching out for deals and fluctuating market prices.

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

Not very much. All projects are ongoing.

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

Very efficient processes and strong relationships across the supply chain (true for the Netherlands). A weakness of the industry is probably the expiration of the produce and hence the transportation and quality risk assurance.

#### Interview #2: Beverage Wholesaler

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

Mainly deliver to restaurants and hotels. Orders are placed very manually.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

Definitely. Ordering by phone and email is too old-fashioned. We need to digitize these processes. Labour is expensive and good people are harder and harder to find.

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

Not really, we decided to introduce a digital way of ordering quite a while ago. We though did not proceed as the crisis hit. My children are very much after digitizing as many processes as possible.

What are, in your opinion, the most important strengths and weaknesses of the food and beverage industry and its supply chain at the moment and for the future?

Relationships are core. We are trustworthy and our customers rely on our performance. This is different in other industries: restaurateurs highly value close relationships and stay with their suppliers for centuries.

A disadvantage may be that it is very labour intensive and hence quite volatile. You depend on good people. There is a lot of fraud in this industry as well and if you cannot trust your people you sort of lost the game.

### Interview #3: Fruit and Vegetable Wholesaler

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

We mainly deliver to restaurants and hotels and about 20% of our business comes from retail.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

We want to get rid of manual order processes. Most of our customers place their orders by phone.

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

We introduced a B2C business branch with the first lockdown. In terms of digitalization we understood the importance of digital ordering and also noticed a growth in an interest in digital ordering. Still, this requires an optimized app that reflects our specific customer relationships.

What are, in your opinion, the most important strengths and weaknesses of the food and beverage industry and its supply chain at the moment and for the future?

Customer relationships and trust are extremely strong. Next to that, knowledge and optimized quality assurance have allowed us to build a competitive advantage, as optimal quality is hard to achieve for fresh produce.

### Interview #4: Beverage Wholesaler

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

We are extremely strong in retail but of course deliver to restaurants and bars in the region as well. Orders are mostly place by phone and also by email. Most retailers order automatically via customer based built APIs.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

Receiving orders manually, especially by phone, is extremely cumbersome and time consuming. Receiving all orders (especially also from rather small customers) would significantly improve our efficiency and reduce the number of errors. Customers are though very used to the way they order, and it will be a great challenge and take quite some time to get them used to a new way of ordering. This is specifically true for older customers. I expect young customers to prefer digital ordering.

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

Well, the crisis made us cut nearly the entire marketing budget which includes online ways of ordering. All projects are hence postponed by at least one year. Then digital ordering will climb the priority list again.

What are, in your opinion, the most important strengths and weaknesses of the F&B industry and its supply chain at the moment and for the future?

We have a strong brand and are especially known in the region. The business is more volatile to crises like covid but still our customer base is extremely strong and there is no doubt we will get through the next crisis as well – people adopt a beer brand like a religion.

#### Interview #5: fruit and vegetable wholesaler

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

Deliver to food and beverage outlets which are all rather small-sized and some retail outlets. We introduced an app developed by our ERP partner just only several weeks ago. Most customers still prefer the personal interaction though and come in person to ask me directly what I would recommend from the current products on offer. The fluctuation of supply is tremendous in our industry which is why we see a great benefit in personal contact. This way we never have misunderstandings on quality or also quantities ordered, as customers take their orders with them right away. For suppliers catering to larger outlets this is a very different story.

We see that mostly retailers use the app, as they have a fixed range of products they need to restock.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

No, not really. The app is an experiment, really. I do not really see it take off. Of course, things could be handled more efficiently, but customers need the personal interaction. Some though started to use Whatsapp to communicate with us. I think this only works because they use Whatsapp in their private life as well.

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

Not at all, everything stayed the same, only masks were added to the shopping experience.

What are, in your opinion, the most important strengths and weaknesses of the F&B industry and its supply chain at the moment and for the future?

The volatility of supply makes this business very relationship dependent. As we built trust with our customers, we consider this aspect a clear advantage as our service is simply not easily replaced by the competition.

## **Pharmaceutical Industry**

### Notes Interview #1: wholesaler in Austria

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

Unterschied Bestellsystem Hausapotheke (Arzt bekommt einen Laptop von Großhändler, oder Programm wird auf Computer des Arztes installiert.: SAO oder AS400: jedes Medikament, das er braucht zieht er über den Scanner und sieht die BZN Nummer, die jedes Medikament hat und auch alle Preise und Details zum Medikament, auch produzierende Firma; am Ende der Ordination schickt er die Bestellung ab → klickt auf bestellen über Internet; Bestellung landet beim Großhandel. Wenn alles vorhanden wird es direkt ins Lager weitergeleitet und kommissioniert und zum Teil händisch / maschinell gelegt; Kiste kommt ins Exedit; Fahrer, der für diese Tour zuständig ist, muss die Kiste wieder einscannen und gibt die Kisten dann beim jeweiligen Arzt ab, muss aber dort wieder eine Plakette scannen, sodass die Firma weiß, wann Paket abgegeben wurde.) & Ordinationssoftware (Arzt wickelt alles mit Kassen ab)

Wenn etwas nicht lagernd ist, muss TVK zurückrufen und zukünftige Lieferung.  
Schlüssel bekommt Zulieferer. Apotheker muss Tageslieferschein aufbewahren.

Pharmareferenten verkaufen im Außendienst: kommt von einer Firma und erklärt mit Studien etc. und Vergleichen. Beraten Wirkstoffe.

GH Mitarbeiter im Außendienst: funktioniert Bestellsystem, holt sich aus dem System eine Liste raus, wo jedes Medikament, das er bestellt aufgelistet wird. Interviewpartner berät wirtschaftlich: im Jahr brauchen sie X → Rahmenauftrag machen, um Rabatt garantiert zu bekommen

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

Manche Hausapotheken haben 2 Großhändler im System. Schwieriger in Beratung, weil Gesamtmenge unbekannt.

Preise immer gleich. Differenzierung nur durch Kontaktpflege. 1x/Monat Besuch. Besuche bis zu 1 Stunde. Anpassungen je nach neuen Aktionen von Pharma Firmen. Sieht keinen Sinn in Änderung.

Which current and near future plans with regards to digitalization are there?

SAP wird als neues System eingeführt.

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Keine persönlichen Meetings während des Lockdowns, wollen aber generell persönlichen Kontakt. Kunden sind Mediziner, keine ITler: manche wollen nicht einmal, dass eine E-Mail-Adresse verwendet wird, sondern bevorzugen die Kommunikation per Fax. Neukundin nicht mal Website.

Restrukturierung innerhalb der Ordinationen (reine Abholung): Einige haben durch Covid die Ordination umorganisiert, um besuche in der Ordination zu verkürzen: eigene E-Mail-Adressen für Medikamentenbestellungen.

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

Größte Herausforderung sind Lieferengpässe; Bewusstsein, wie viel in Indien und China produziert wird; „fremdgesteuert sein“, starker persönlicher Kontakt als Notwendigkeit: vor 2 Jahren hat ein Kunde gewechselt, weil Mitarbeiter von Konkurrenten weg war und er einige Wochen nicht betreut wurde; niemand kam, der mit ihm gesprochen hat. Interviewpartner macht Ende des Monats einen Bestellschlag

Bestellt wird täglich wegen wenig Lagerraum und vergleichsweise hoher Fluktuation, Ablauf der Medikamente, Umstellung auf alternative Medikamente bei Kunden und somit zusammengefasst Risikominimierung.

Die Lieferung erfolgt innerhalb von 3 Stunden, der Großhändler muss Schwankungen in der Logistik in Kauf nehmen und kann diese nicht einpreisen. Bestellerinnerungen erfolgen per Tel vor Bestellschluss.

#### Notes Interview #2: Sales Representative of a Manufacturer (Netherlands)

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

NL: wholesalers rule the market, sell to the wholesalers who sell to hospitals and pharmacies, sometimes to direct sales to pharmacies and hospitals, despite easier via wholesalers. Warehouse is currently in Germany, which will change soon as the market is growing.

Work with SAP which is connected to the warehouse. Wholesalers or pharmacies send a PO (we want these SQUs etc.), Nick receives them by email once a week in a PDF file (!! ) and then they open SAP and insert the data there, then it gets transferred to the warehouse and the rest is automated.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

Would be great to automate this. Should be simple. As they are part of the German market it is hard, as they are very much behind in terms of technical innovations. They do not see a reason to innovate.

Mistakes happen. Fixing them takes a lot of energy and time: typical errors are for instance wrong amounts. Sometimes customers return the order. Another issue is that the system sometimes does not show that the product has expired (SAP should ring a bell, but it does not always do that).

Which current and near future plans with regards to digitalization are there?

No idea.

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

Joined the company during Covid: hospitals shut down, no visits because they do not want any visits. Would do that if it was not covid. Covid changed demand completely. Some products went down 100%. Had to manage existing stock to split it fairly. Transportation costs skyrocketed, hence also the warehouse project was postponed. At the same time the rise in transportation cost showed how important it was to get the warehouse to NL.

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

We do not invent medications; we just copy what comes off the patent after 30 years. Copy formula. Do not have quality competition and hence it is a price game. And you always need to be able to deliver. They try to optimize that. Chinese have delivery gaps. NL is moving into more secure supply chains. They produce in Germany, which makes it more secure. Security and adaptability are key for them.

Have an order list with suppliers and simply reorder, with own customers he needs to build trust. Believes that an app would work in NL. But it would need to work with all their suppliers.

### Interview #3 - Pharmacist in Austria

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

Es gibt 4-5 Großhändler in AT. Arbeiten mit zwei verschiedenen Großhändlern, 6x am Tag, für gute Versorgung (HIV-Medikament für Lieferung am selben Tag). Bestellung läuft über Tool (AVS, gibt auch andere Apothekensoftwares: Medikamente nachschlagen (OHNE BILDER IST SCHLECHT; manche Firmen ordnen nach Alphabet des Produktnamens, andere nach Firmennamen → nicht aufzufinden, weil nicht einheitlich)); Eingabe ob lagernd bei einem GH → ETA wird angekündigt & Patient holt es ab. Jede Apotheke muss Software kaufen. PKAs müssen Bestellliste zu GH zuordnen, der als nächstes kommt.

Häufige Kommunikation per Tel mit GH: rezeptfreie Wünsche: nachfragen, weil keine Struktur im System (Suchmaschinenoptimierung), Abkürzungen unverständlich.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

- Umstellung der Artikelbeschreibung durch Produzenten
- viele Firmen ändern ständig Sortiment → Kurztext Beschreibung

Früher kein Bestellsystem → jedes Medikament hatte ein Kärtchen, PKAs haben durchgesagt an den GH was besorgt werden muss; heute kann man einstellen, dass ein Minimum vorhanden sein muss; min Anzahl im System händisch hinterlegt.

Which current and near future plans with regards to digitalization are there?

Suchtgiftbuch war händisch (Lieferscheine) digitalisiert durch online Suchtgiftbuch

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Viel mehr Bestellungen per Tel, wollen persönlich kommen. Gespräche mit Pharmareferenten sind heute viel kürzer.

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

-News spreading ist nicht lückenlos (Produzenten)  
-schnelles Abrufen ist super von der Logisitk, optimiert, große Mengen als Vorrat werden direkt beim Produzenten bezogen (mit Pharmareferenten per E-Mail, Fax, Tel). Umgeht den GH. Gute Symbiose.

#### Interview Notes #4: Drug Manufacturer in Germany

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

We mostly deliver to pharmaceutical wholesalers. All orders are currently handled exclusively by email, albeit many wholesalers still send their orders by fax.

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

Definitely. The ordering process is extremely inefficient and labour intensive. With today's technology available this should not be necessary anymore. It will be difficult to find a smooth way for customers to order online that also adheres to all regulations applicable (identification documents must be exchanged for every order placed).

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

Less personal meetings, but I expect everything to go back to the old way once the crisis is over. Internally, no big changes have occurred, but the topic of the benefits of online ordering has grown in awareness.

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

There are way too many regulations that hinder effective implementation of technology without tremendous investment costs.

#### Interview Notes #5: Doctor Working at a Hospital in Germany

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

- Order from manufacturers directly
- Every station has one station secretary (medizinische Fachangestellte) who places orders with the clinic's pharmacy
- Person manually checks drawer so check what is missing; scans barcodes for each product (based on Wirkstoff & Dosierung) → pharmacy decides from which producer it is ordered
- No automated system alarming if product is out of stock
- „Rechts-links System“ (wenn links leer, nachbestellen)
- KH Logistik at every station checks everything but medications for restocking

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

- Suchtgiftmittel treated separately: must be confirmed by doctors; once received noted down in book whatever is put and taken out of the safe; Pflege kontrolliert nach jeder Schicht zu zweit, ob übereinstimmt, 1x/month one doctor with Pflege
- This process should be digitized: digital tracking: doctor verschreibt, Pflege gibt Medikament, autom. Austragung aus System; check if right still necessary; takes a lot of time

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

Not that I know.

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

Processes may be manual, but they are optimised quite well. Working with various wholesalers and manufacturers directly allows for great medical supply and rare shortages. A strong disadvantage is that companies in this space are very large and rigid. Introducing a new process takes ages and hence slows down innovation across the entire organisations.

#### Interview Notes #6: Wholesaler in Austria

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

- Kaufen von Produzenten, sind Wholesaler: rufen forecasts von Kunden ab (per E-Mail-Jahresbedarf), die sie ins System einpflegen (wann müssen Bestellungen getätigt werden). Bestellung wird dann von Einkäuferin per E-Mail an Produzenten geschickt. Produzent schickt per E-Mail-Auftragsbestätigung zurück (beide Aufträge werden in Betriebssystemen erstellt)
- Verkaufen an Pharma Betriebe wie Takeda, Baxter, die Produkte direkt verarbeiten
- Kommunikation mit Takeda (zB) immer per E-Mail oder auch manchmal per Telefon
- Kommissionsschein und Rechnung werden per Post oder E-Mail geschickt
- Eintippen immer manuell
- RS2 ist Wawi
- Bestellhäufigkeit ca 1x/Monat; 20 LKWs / Woche, 1 LKW

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

- Kürzere Lagerhaltungszeit wäre gut, um Effizienz zu steigern
- Bestellprozess „passt wie er ist“

Which current and near future plans with regards to digitalization are there?

- Verkauf will in Richtung CRM-System, um Kommunikation besser zu dokumentieren (derzeit alles per E-Mail)
- Persönliche Treffen fundamental zur Vertragsverlängerung / -verhandlungen und Produktneuheiten

Changes triggered by CoV

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

- Viel Richtung Skype für den Austausch auch durch home-office
- Kunden schätzen persönliche Treffen mehr
- Allerdings keine nachhaltige Veränderung

Industry Strengths & Weaknesses

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

- Stärke: schnelle Reaktionsmöglichkeit (Lieferung innerhalb von 1-2 Tagen); Logistik und Warehouse ist USP (just in time Lieferungen), auch eigene Logistikflotte → Verfügbarkeitsgarantie
- Schwäche: Zwischenhändler, Lieferanten versuchen das immer mehr zu umgehen; teilweise Kundenschutz; manche Lieferanten wollen reporting; versuchen Kunden nicht preiszugeben

Interview #7: Drug Manufacturer in Austria

Which players across the supply chain do you / your company engage with? How are order processes digitalized? Can you describe in more detail how orders are placed /processed?

- End-to-end supply chain: Bestellnetzwerk von internationalen Produzenten
- Third parties für Warenproduktion (Zulieferer: teilweise Hilfsstoffe: Kollaborationen → zB Novartis Bestandteil zukaufen)
- Bestellprozess: SAP als ERP: Nachfrage wird geplant in SAP APO (vorher IPP) um forecast zu verwalten. Supply Network Plan book wird dann damit verglichen (stock level und production) → gewisse lead times & frozen periods (um gewissen Stand zu halten). Global über 450 Hersteller + 60-70 Pfizer Hersteller Treffen 1x/Monat, um Forecast zu besprechen (Produktlaunch etc.): sales & operations planning (forecast, Verkauf, promotions)

Do you think current processes can be improved, in terms of efficiency, for example? If so, how, and why? Where do you see challenges to achieve this?

- Problem #1: Stammdaten & Stammdatenpflege: du brauchst global ein Team das zentral den Überblick über alle Stammdaten behält und sich in kleinen Hub mit Regionen abspricht (zB

komische Kennzahlen, Preise, die nicht ins System gepflegt sind) → brauchen besseres System für besseres Monitoring → derzeit passiert es des Öfteren, dass im Nachhinein in den Stammdaten oder den routings behoben werden müssen (MASTER DATA MAINTENANCE UND INTEGRITY)

- In einer globalen Firma alles zu standardisieren ist schwierig: versuchen derzeit von Ländern auf Region von Region auf global zu standardisieren, sodass man sich verlassen kann, dass man dieselben Prozesse und Abläufe verfolgt
- Verknüpfen mit continuous improvement loops (continuous improvement champion, process owners, (PARETO Analysen), user)
- Governance Organisation, die nur dafür zuständig sind Standards zu gewährleisten

Which current and near future plans with regards to digitalization are there?

- Arbeiten seit 10 Jahren an Verbesserungen
- Seit ca. 3 Jahren ein neues Programm für den Bestellprozess
- Generell viel mehr Digitalisierung, durch covid noch stärker forciert (mehr Video-Meetings, weniger business travels)

How did the Covid-19 crisis affect near future plans with regards to digitalization? Have changes been made? <https://www.bain.com/insights/medtech-and-pharma-sales-go-virtual/>

- Generell viel mehr Digitalisierung, durch covid noch stärker forciert (mehr Video-Meetings, weniger business travels)

Industry Strengths & Weaknesses

What are, in your opinion, the most important strengths and weaknesses of the pharmaceutical industry and its supply chain at the moment and for the future?

- Generelle Schwäche großer Firmen: Trägheit (Informationen fließen durch globale und virtuelle Zusammenarbeit zwar schneller, allerdings bleibt Entscheidungsfindung langsam): digitalisieren und visualisieren besser, aber es werden immer wieder viel mehr Personen in Entscheidungsprozesse involviert → zu wenig agil und flexibel
- Change-Management: die Leute abzuholen, wo sie sind, um sie dort hinzubringen, wo man sie haben will
- Projektfinanzierungsmöglichkeit und spezielle Ressourcen (Talent, Spezialisten) sodass sie Vorreiter in Forschung und Entwicklung sein können.