UNIVERSITY OF TWENTE.

Faculty of Behavioural, Management and Social Sciences

Department of Technology Management and Supply

Master Thesis

Master of Science (M.Sc.) Business Administration

Purchasing & Supply Management

Electronic Data Interchange implementation: a case study at a Dutch company in the steel industry

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Number of pages: 72 (129 in total)
Number of words: 46202

Abstract

Companies spend valuable time on processing transactions in the P2P process. This inefficient way or working damages the possible competitive advantage achieved by the purchasing department. This study investigates what influences the intention to implement EDI and which factors lead to successful EDI implementation. Empirical research was conducted in a Dutch case company in the steel industry. Data was collected by interviewing eighteen employees and suppliers. For this the UTAUT and TOE framework were combined to create a comprehensive framework for organizational EDI implementation. Research showed Performance expectancy is the most important variable defining intention to implement EDI. Further, moderating variables as turnover and relationship have an effect on implementation intention. Technological and organizational and product facilitators and inhibitors both have an effect on EDI implementation success.

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List of abbreviations

CPS	-	Cyber-physical system
EDI	-	Electronic Data Interchange
ESC	-	Electronically-enabled Supply Chain
FC	-	Facilitating Conditions
FTE	-	Full time equivalent
IOS	-	Interorganizational System
IS	-	Information System
IT	-	Information Technology
I4.0	-	Industry 4.0
KPI	-	Key Performance Indicator
P2P	-	Purchase-to-Pay
PO	-	Purchase order
PPM	-	Purchasing process model
SCM	-	Supply Chain Management
TOE	-	Technology-Organization-Environment framework
UTAUT	-	Unified Theory of Acceptance and Use of Technology

1 Valuable time is lost on processing transactions within the P2P process, EDI and RPA could be the solution

Within the purchase-to-pay (P2P) process data is transmitted and processed instantly between buyers and suppliers. Companies spend valuable time on processing transactions in the P2P process. This inefficient way of working damages the possible competitive advantage achieved by the purchasing department and a competitive supply chain. A company must have a competitive supply chain to be able to compete effectively in today's global marketplace. So, this requires the ability to communicate rapidly and accurately (C. Watts, Hogan, & Treleven, 1998, p. 7). This interorganizational communication in the supply chain relates to the exchange of information mainly with suppliers and customers. The exchanged information mainly deals with transactions for goods and services (Picot, Neuburger, & Niggl, 1993, p. 243). Businesses are developing closer relationships with their business partners through application of interorganizational systems (Yunitarini, Pratikto, Santoso, & Sugiono, 2018, Abstract). For these interorganizational systems, many businesses are adopting Electronic Data Interchange (EDI) to develop closer relationships with their business partners. The EDI connection provides a faster and cheaper form of communication instead of paper based or transaction-oriented systems.

As EDI provides substantial benefits for companies, it would make sense that all companies already implemented it. This is not the case as there are still a lot of companies performing the entire, or parts of the P2P process, manually. Approximately half of the communication between business partners is still conducted via e-mail (Veselá, 2017, p. 2128; Yunitarini et al., 2018, p. 118) The benefits of EDI are numerous, which will be explained further in a later chapter. After researching the motives and benefits, a company has to look at the process of how it should implement an EDI connection with a supplier. There are probably implementation processes from the EDI software itself, however these do not include critical success factors or facilitators and inhibitors. Besides EDI, there are multiple other technologies which increase in popularity. Another technology to improve data interchange is Robotic Process Automation (RPA). RPA is a technological application of Industry 4.0 and is concerned with the automation of complex processes replacing humans for robots (Kroll, Bujak, Darius, Enders, & Esser, 2016, p. 4). The implementation of I4.0 technologies might lead to substantial time and costs savings just as EDI. Currently, the debate is rising if EDI is still relevant for organizations and if other data exchange solutions

can be applied. One example of this is RPA and RPA can be applied in two ways in data interchange. First, after an EDI connection is made between the supplier and buyer, the buyer can optimize its own P2P process by implementing RPA. Second, RPA can be a substitute for the EDI connection as the robot could e.g. order goods independently and directly from the supplier catalogue. This raises the question if RPA as a substitute or process improvement has an effect on the implementation of EDI. These elements lead to the research question:

"What motivates companies to implement an EDI connection with suppliers or customers and how could a company select and implement a new EDI connection with a supplier to improve the P2P process and what role could RPA play in improving data interchange?"

By reviewing and combining theoretical models on technology acceptance, the Unified Theory of Acceptance and Use of Technology (UTAUT) from Venkatesh et al. (2003, p. 447) investigates the effect of different variables on behavioral intention and use behavior on new technologies. However, there is a limitation to their model as it takes an individual perspective on technology acceptance. Therefore, the scope of the model is changed to an organizational perspective in the buyer-supplier relationship. The buyer-supplier relationship is defined as business dealings between B2B companies regarding the acquisition and distribution of products or services by Helper and Sako (1995, p. 78). To expand the research, the model is supplemented with the Technology-Organization-Environment (TOE) framework of Tornatzky and Fleischer (1990, p. 153). The addition of the TOE framework makes the UTAUT more comprehensive and elaborated as there is no uniform model yet which includes both EDI implementation intention as well as the EDI implementation process. As a result, this research contributes in five ways. There are three theoretical contributions and two practical contributions. Firstly, a theoretical contribution is the application of UTAUT on an organizational level in the buyer-supplier relationship. Secondly, another theoretical contribution is the creation of information on whether organizational and relational aspects have an influence on the behavioral intention to use a new technology. Thirdly, information is created on the possibility of RPA as an EDI substitute and whether this has an effect on EDI implementation success. Fourthly, a practical contribution is that purchasing managers or employees gain a deeper understanding

of the intentions of suppliers to connect businesses with EDI. Lastly, purchasing managers or employees find out what the benefits of EDI implementation in the P2P process are and how implementation can be done successfully in the P2P process.

The structure of the paper is organized as followed. First, for chapter 2 a literature review is conducted in which the topics EDI, RPA, P2P, and Supply Chain Management (SCM) and the UTAUT and TOE models are explained. In the last part of the literature review, the theoretical framework of the research is presented. In chapter 3 the research methodology is described. In this chapter the research methods and data collection are explained. Then, in chapter 4, the case company is described and the findings of the research are discussed. Last, in the chapters 5 and 6, there will be a discussion of the results, a conclusion is drawn, and recommendations are made. The interview questions and interview protocol can be found in the appendix at the end of this thesis.

2 Literature Review on Electronic Data Interchange, Supply Chain Management, and Robotic Process Automation

2.1 Electronic Data Interchange transmits and processes data, leading to cost reductions, facilitated or inhibited by technological, organizational, and environmental factors

2.1.1 Electronic Data Interchange is the interorganizational exchange of business documentation in structured, machine-processable form

Kaufman (1966, p. 141) was one of the first to discuss the concept of information technologies that expand beyond the firms' boundaries to link with suppliers, customers and even competitors. Due to the advances in computer and communication technology, information systems (IS) have expanded from the traditional role of creating, storing, transforming and transmitting information within an organization to interorganizational information systems (IOS) that exchange or share information based on products and services between organizations. Barrett and Konsynski (1982, p. 94) state the information resources shared in IOS's include hardware, software, transmission facilities, rules and procedures, data/databases, and expertise. IOS's may lower costs, increase information speed and reduce information errors enabling an effective and efficient product flow among the participating organizations (Craighead, Patterson, Roth, & Segars, 2006, p. 136). EDI is a form of information technology (IT) which can be used within or as an IOS (Craighead et al., 2006, p. 136).

EDI technology was born in the United States during the 1960s (Vrbová, Cempírek, Stopková, & Bartuska, 2018, p. 187). Since EDI was popularized in the 1990s, most research on EDI has been conducted around 1990 and in the last decade (Yunitarini et al., 2018, p. 117). Multiple different definitions exist of EDI as there is no consensus about its definition. (Okano & Fernandes, 2019, p. 66). Lee & Lim state: "Electronic data interchange (EDI) is a form of inter-organizational electronic commerce where one trading partner (a buyer or a seller) establishes individual links with one or more trading partners through a computer-to-computer electronic communication method" (Sanhjae Lee & Lim, 2005, p. 503). Another definition given by Lou et al. is: "Electronic Data Interchange (EDI) is a technology which transmits business documents between the enterprises in a standard format with electronic methods" (Lou, Wang, Chen, Vatjanasaregagul, & Boger II, 2015, p. 24) . A short and compelling definition comes from Emmelhainz: "interorganizational exchange of business

documentation in structured, machine-processable form" (1990, p. 4). Besides the definitions of these and many other scholars, the European Union set up an EDI agreement in 1994. They define EDI as "Electronic data interchange is the electronic transfer, from computer to computer, of commercial and administrative data using an agreed standard to structure an EDI message" (European Commission, 1994, p. 3, Article 2.2)

The main focus of EDI is the transmission and processing of necessary data with minimal human intervention involved in the transmission or processing (Banerjee & Sriram, 1995, p. 29). Traditional communication between businesses exists in two forms, unstructured and structured communication. Unstructured communications include messages, memos and letters whereas structured communication includes purchase orders, invoices and payments. EDI enables businesses to transmit and process these structured messages as they are formatted following a pre-established pattern (Okano & Fernandes, 2019, p. 66). This electronic transmission of structured business documents, e.g. order confirmations, purchase orders and invoices, provides an alternative to other conventional or paper-based methods as post and e-mail (Jardini, Kyal, & Amri, 2016, p. 3; Vijayasarathy & Tyler, 1997, p. 287). In these conventional communication methods, more human intervention is needed compared to EDI, as the electronic transmission in standard format eliminates the rekeying and additional checking of data normally involved (Corbitt, 1992, p. 20). A significant difference has to be made between internal and external integration of EDI. Internal integration refers to the variety of applications interconnected through EDI within the organization, e.g. order entry, invoicing, billing, and payment transfer (Bergeron & Raymond, 1992, p. 21; Iacovou, Benbasat, & Dexter, 1995, p. 468; Yunitarini et al., 2018, p. 121). External integration refers to the various types of trading partners, e.g. suppliers, customers, financial institutions, with which the organization is connected via EDI (Bergeron & Raymond, 1992, p. 468; Iacovou et al., 1995, p. 479; Yunitarini et al., 2018, p. 121). When this external integration is on a high level, information flows seamlessly within between buyer and supplier, creating a virtual supply chain (Yunitarini et al., 2018, p. 122).

The adoption of EDI by businesses is labeled as important by several researchers. Keen argues that EDI is not a strategic or competitive weapon but a business necessity. For businesses this means that they should not question whether to adopt EDI but when to do so (Keen, 1991) cited according to Banerjee and Sriram (1995, p. 30). Translating this to

modern times and today's global marketplace, a company must have a competitive supply chain to compete effectively. This requires the ability to communicate rapidly and accurately with business partners (C. Watts et al., 1998, p. 7; Yunitarini et al., 2018, p. 118; Yunitarini, Pratikto, Santoso, & Sugiono, 2019, p. 67). As explained earlier, EDI is a method to communicate at a higher speed with more accuracy. Due to the need for faster communication between organizations and within supply chains, the use of EDI in businesses is growing rapidly. It is expected that it will be the dominant form of business communication between companies in several markets (Yunitarini et al., 2018, p. 117).

2.1.2 Cost reduction is the most important among direct, indirect, and strategic benefits

The literature indicates there are numerous benefits for companies implementing EDI in their organization. First of all, Marchand and Peppard (2008, p. 2) argue that most benefits from new IT come from changes in the way an organization does business and not directly from the new technology itself. These benefits could be either operational or strategic. Dearing (1990, p. 4) categorized EDI benefits in three classes: direct, indirect and strategic benefits. Direct benefits are based on the electronic transmissions of the information and do not rely on either business's making other changes in business practice. These direct changes are the easiest to identify and measure. Second, indirect benefits are less easy to identify and are related to efficiency improvements in the internal organization of a firm and changes in customer and supplier relationships (Jiménez-Martínez & Polo-Redondo, 2004, p. 74). The indirect benefits come from leveraging EDI to enable the technology to change the way a company does business (Dearing, 1990, p. 5). Finally, there are strategic benefits coming from EDI implementation. These strategic benefits are probably the most significant although they are the hardest to measure (Dearing, 1990, p. 5). Strategic benefits are obtained by the sharing of information with suppliers and can improve the long-term position on the market for the organization.

To summarize and analyze the potential benefits of EDI, an extensive literature review was conducted. In total 25 scientific papers from the period 1987-2019 were read and analyzed. The potential benefits found are divided over the three classes from Dearing (1990, p. 4). In Table 1, the potential benefits are connected with the scientific papers which acknowledged the benefit. Jiménez-Martínez and Polo-Redondo (2004, pp. 73-79)

conducted research on the benefits of EDI divided over these three classes. For the first class, direct benefits, they identified four benefits which are directly connected to the implementation of EDI.

Table 1: EDI benefits identified by Jiménez-Martínez and Polo-Redondo (2004, p. 74)

Direct benefit	Scientific paper
Paper savings	Hansen and Hill (1989, p. 403); Iacovou et al. (1995, p. 469); Lummus (1997, p. 81); Lummus and Duclos (1995, p. 43); Vijayasarathy and Tyler (1997, p. 287)
Avoiding filing costs and maintenance	Jiménez-Martínez and Polo-Redondo (2004, p. 74)
Avoiding repetitive administrative procedures	Corbitt (1992, p. 20); Hansen and Hill (1989, p. 403); Monczka and Carter (1988, p. 3); Scala and McGrath Jr (1993, p. 87); Vrbová et al. (2018, p. 188)
Less paperwork enables reduction in administrative personnel	Jiménez and Muñoz (2006, p. 2206); Scala and McGrath Jr (1993, p. 87)
Indirect benefits	
Avoiding errors	Jardini et al. (2016, p. 3); Jiménez and Muñoz (2006, p. 2206); Lummus (1997, p. 81); Lummus and Duclos (1995, p. 43); Vrbová et al. (2018, p. 188)
Faster payment/improved cashflow	Banerjee and Sriram (1995, p. 30); Dearing (1990, p. 4); Hansen and Hill (1989, p. 403); Iacovou et al. (1995, p. 469); Jardini et al. (2016, p. 3); Lummus and Duclos (1995, p. 43)
Avoiding production stoppages resulting from lack of material	Hansen and Hill (1989, p. 403); Jardini et al. (2016, p. 3); Vijayasarathy and Tyler (1997, p. 289); Vrbová et al. (2018, p. 188); Yunitarini et al. (2018, p. 123)
Reducing the purchasing/sales cycle (ordering, delivery, and invoice)(P2P)	Bamfield (1994, pp. 4-5); Banerjee and Sriram (1995, p. 31); Chang, Markatsoris, and Richards (2004); Emmelhainz (1987, p. 4); Jardini et al. (2016, p. 3); Lummus and Duclos (1995, p. 43); Monczka, Handfield, Giunipero, and Patterson (2016, p. 649); Murphy (2012, p. 6); Scala and McGrath Jr (1993, p. 87); Trkman and McCormack (2010, p. 339); Yunitarini et al. (2018, p. 123)
Reducing stock levels	Bamfield (1994, p. 4); Banerjee and Sriram (1995, p. 30); Dearing (1990, p. 4); Hansen and Hill (1989, p. 403); Iacovou et al. (1995, p. 469); Jardini et al. (2016, p. 3); Jelassi and Figon (1994, p. 342); Lummus and Duclos (1995, p. 43); Monczka and Carter (1988, p. 3); Scala and McGrath Jr (1993, p. 87); Vijayasarathy and Tyler (1997, p. 290); Vrbová et al. (2018, p. 187)
Strategic benefits	
Increasing business relationships with companies using EDI	Bamfield (1994, p. 5); Emmelhainz (1987, p. 6); Hill and Scudder (2002, p. 383); Lummus and Duclos (1995, p. 43); O'Callaghan, Kaufmann, and Konsynski (1992, p. 45); Scala and McGrath Jr (1993, p. 87); Vrbová et al. (2018, p. 187); Yunitarini et al. (2018, p. 118)
Improving customer loyalty	Okano and Fernandes (2019, p. 67)
Improving the quality and quantity of information	Bamfield (1994, p. 4); Hansen and Hill (1989, p. 403); Lummus and Duclos (1995, p. 43); Monczka and Carter (1988, p. 3); Scala and McGrath Jr (1993, p. 87)
Faster response and access to information	Hansen and Hill (1989, p. 403); Hill and Scudder (2002, p. 376); Lummus and Duclos (1995, p. 43); Vrbová et al. (2018, p. 188)
Gaining new business contacts using EDI	Bamfield (1994, p. 5)
Reducing the number of business contacts by concentrating on those that use EDI	Banerjee and Sriram (1995, p. 31)

Summarizing from this literature review, all benefits are widely acknowledged by scholars as most of them reoccur in multiple papers. A few benefits mentioned in the most papers were, avoiding repetitive administrative procedures, avoiding errors, reducing the purchase cycle, improving the quality and quantity of information, increasing business relationships with companies using EDI, and reducing stock levels. These benefits all represent the positive aspects of implementing and using EDI, however there can also be drawbacks. One of these drawbacks is purchasing inflexibility, which is perceived by a higher percentage of purchasing transactions using EDI. The use of data in a standard format, a requirement for EDI usage, may cause such an inflexible environment (Banerjee & Sriram, 1995, p. 37). Other possible disadvantages of EDI are that standards might change, it requires a high initial capital expense, and it is hard to quantify the return on investment using EDI (Chang et al., 2004, p. 636; Scala & McGrath Jr, 1993, p. 87). The lack of flexibility and the high initial investment make it not an appropriate investment for smaller organizations (Chang et al., 2004, p. 636).

A benefit not specifically mentioned in the tables is the reduction of costs, mentioned by Bamfield (1994, p. 4); Banerjee and Sriram (1995, p. 31); Hansen and Hill (1989, p. 403); Jardini et al. (2016, p. 3); Okano and Fernandes (2019, p. 67); Scala and McGrath Jr (1993, p. 90); Vijayasarathy and Tyler (1997, pp. 286-287); Vrbová et al. (2018, pp. 187-188); Yunitarini et al. (2018, p. 120). The reduction of cost might be a result of all the mentioned benefits. To mention a few examples, transaction, inventory, operating, order-processing, and transmission costs are the costs possibly reduced. The reduction of costs within purchasing, or the organization, could lead to an improved competitive advantage for a company (Bamfield, 1994, p. 3; Bergeron & Raymond, 1997, p. 321; Lummus, 1997, p. 82; Lummus & Duclos, 1995, p. 43; Okano & Fernandes, 2019, p. 67; Picot et al., 1993, p. 243; Yunitarini et al., 2018, p. 120).

After implementing EDI, the benefits will even increase for a company. As a higher level of EDI implementation leads to greater benefits experienced by the network participants (Bergeron & Raymond, 1997, p. 329; Premkumar, Ramamurthy, & Crum, 1997, pp. 117-118; Yunitarini et al., 2018, p. 120). This is visualized in Figure 1, where a small installed base has a low value to users. When the installed base grows, the value grows with the installed base. Initially, the benefits increase slowly, as one connected supplier does not

make a significant impact. When the network of connected suppliers grows, the network externality returns begin to increase rapidly (Schilling, 2017, p. 82). The effect that the installed base has on the benefits of EDI can be regarded as a contingency effect.
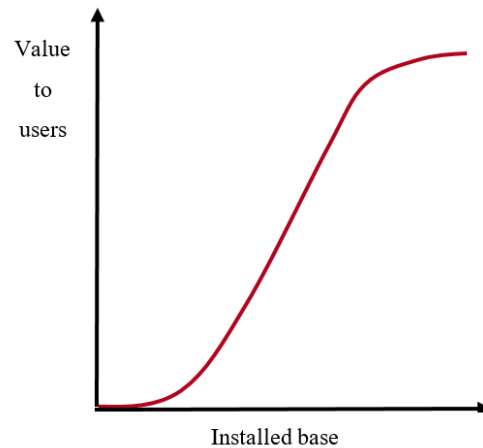
Figure 1: Increase in installed base leads to a higher value to users

2.2 Industry 4.0 and Robotic Process Automation and its application for purchasing

2.2.1 Industry 4.0 is the merging of the physical and digital world with cyber-physical systems and autonomous machine-to-machine communication

The term 'Industry 4.0' originated from a project of the German government for the promotion of the computerization of manufacturing (Sung, 2018, p. 40). This fourth industrial revolution, called Industry 4.0 or I4.0, has been conceptualized as "the merging of the physical and digital worlds by means of cyber-physical systems and autonomous machine-to-machine communication" (Schiele, Bos-Nehles, Delke, Stegmaier, & Torn, 2021, p. 1). This fourth industrial revolution is driven by the market and new technological possibilities (Bartodziej, 2017, p. 27). There is no consensus about the definition of I4.0 yet, Stork (2015, p. 21) provides a detailed definition in the context of purchasing studies: "the term Industry 4.0 […] refers to the 'fourth industrial revolution' or the introduction of internet technology in the manufacturing industry […] and integrates customers more closely into the product definition stage as well as business partners into the value and logistic chains". All industrial revolutions were characterized by a pacemaker technology, slow productivity gains in the begin, and emerged after reorganizing business (Schiele & Torn, 2020, p. 510; Torn, Pulles, & Schiele, 2018, p. 3). These revolutions do not affect only specific aspects of business or society, instead, revolutions are holistic phenomena. Which means they do not only affect technological developments and business models but also may

have societal implications for people's work and education (Schiele et al., 2021, p. 1). The third revolution was started by microprocessors or IT which led to automation advancements and is centered around the shift from analogue to digital technology, and is also referred to as the 'digital revolution' (Schiele & Torn, 2020, p. 508 and 510; Schuh, Potente, Varandani, Hausberg, & Fränken, 2014, p. 4). I4.0 differs from the third revolution which was focused on digitalization and roboticization without connection to the physical world, as it comprises cyber-physical systems (CPSs) characterized by autonomy and machine-to-machine communication (Schiele et al., 2021, p. 2; Schiele & Torn, 2020, pp. 512-513; Torn et al., 2018, p. 1). This fusion of the physical and digital world is underlined by J. S. Hwang (2016, p. 11), who states: "Through the fusion of the physical and the virtual world, interoperability, advanced artificial intelligence and autonomy will be integral parts of the new industrial era". A difference regarding I3.0 and I4.0 in purchasing can be seen in demand generation. In I3.0, an electronic catalogue would require the human purchaser to enter the desired products, whereas in I4.0, the demand is detected by sensors without the need for direct human intervention (Schiele & Torn, 2020, p. 513).

I4.0 is comprised of three elements, from these elements, CPSs are at the core of I4.0. CPSs refer to "transformative technologies for managing interconnected systems between its physical assets and computational capabilities" (J. Lee, Bagheri, & Kao, 2015, p. 18). The new feature regarding I4.0 is the connection between the physical and digital world trough sensors and actuators (Monostori, 2014, p. 4). There is no clear agreement on the most important I4.0 technology. An analysis of the literature has shown that CPSs receive the most attention in publications (Schiele & Torn, 2020, p. 512). The second element is autonomy, meaning the system can decide for itself and does not require additional human intervention to function (J. S. Hwang, 2016, p. 11; Schiele & Torn, 2020, p. 513; Torn et al., 2018, p. 5). For purchasing this implies e.g. an autonomous system which decides when to replenish materials based on information from the outside world, meaning the system can order goods autonomous (Schiele & Torn, 2020, p. 513; Viale & Zouari, 2020, p. 187). The third element is machine-to-machine communication and is critical because it requires IT security, reliability, and stability to function (Sung, 2018, p. 44). Machines can communicate with each other without requiring human interaction, which could imply that the computer of the buying firm negotiates prices with the computer of the supplier (Schiele & Torn, 2020, p. 513).

Although I4.0 can generate multiple benefits for companies, its technologies, e.g. Robotic Process Automation (RPA), Blockchain, and Artificial Intelligence, are only used in a small number of procurement processes, and also mainly in large companies (Viale & Zouari, 2020, p. 187). Also, digitalization in procurement, and then RPA in particular, has little been studied in the literature (Viale & Zouari, 2020, p. 188). I4.0 technologies can increase the productivity and capacity utilization which may lead to lower production cost. Also, real-time control may lead to a higher flexibility and quality of the production process enabling customized production with very low marginal costs (Dachs, Kinkel, & Jäger, 2019, p. 5). One I4.0 application, RPA can be applied in the P2P process and is explained further in the next chapter.

2.2.2 Robotic Process Automation replaces manual processes with automated processes leading to cost and time benefits

One technological application of I4.0 is Robotic Process Automation, or RPA. RPA is defined as "a preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management" (IEEE Corporate Advisory Group, 2017, p. 11) or shorter as "the automation of complex processes that replaces humans through the implementation of advanced software" (Kroll et al., 2016, p. 4). RPA is not intended to disrupt existing IS, but RPA replaces a manual process with an automated process (Huang & Vasarhelyi, 2019, p. 3). The automation of processes by RPA can also mean only the automation of individual activities or even tasks (Hofmann, Samp, & Urbach, 2020, p. 100). A process is suitable for RPA if it follows a standardized, rule-based structure (i.e. does not require cognitive or judgment effort), requires multiple-system access, and is conducted both often and manually by humans (Hofmann et al., 2020, pp. 100-101; Rutschi & Dibbern, 2020, p. 106). As back-office processes typically have these characteristics, they often become the implementation field of RPA (Aguirre & Rodriguez, 2017, p. 65). One example of an application of RPA for the P2P process is the back-end management of invoices. This task can be performed by the robot, thereby accelerating the process (Viale & Zouari, 2020, p. 191). Also other processes as contract management and the updating of supplier data can be automated within the procurement process (Viale & Zouari, 2020, p. 192). Multiple objectives can play a role in RPA implementation, e.g. process performance,

efficiency, scalability, auditability, security, convenience, and compliance (Hofmann et al., 2020, p. 103). RPA can have an impact on procurement on an operational (time management, process flexibility, automation), and relational (stakeholder satisfaction, buyer-supplier relationship quality) perspective (Viale & Zouari, 2020, p. 193). The RPA software robots can be differentiated into three types of robots. Rule-based robots apply predefined rules, learning-based robots may apply machine learning methods to learn its functions from given data, and knowledge-based robots search for information across systems (Hofmann et al., 2020, p. 101; Kroll et al., 2016, p. 12).

Improvements made by RPA implementation impact the P2P process in various ways. Most important is that the implementation of RPA saves organizations time and money. The purchasers' time management improves as a result of the implementation. Robots have the advantage of being capable to operate 24/7 and adapt to high workloads (Viale & Zouari, 2020, p. 191). RPA automates repetitive and tedious work which requires little mental effort, therefore human workers can dedicate their time and effort to more complex and value adding tasks which require creative thinking, judgment, and social interaction (Forrester Consulting, 2014, p. 2; Hofmann et al., 2020, p. 101; Lacity & Willcocks, 2016, p. 46; Leopold, van der Aa, & Reijers, 2018, p. 67; Rutschi & Dibbern, 2020, p. 106; Viale & Zouari, 2020, p. 187). Besides time, an organization can save money. The cost reduction can be significant, as the cost of a software robot mostly is between 10-19% of an in-house full-time equivalent (FTE) (Penttinen, Kasslin, & Asatiani, 2018, p. 4). But, the implementation of RPA does not necessarily lead to FTE job cut (Viale & Zouari, 2020, p. 193). This cost improvement also connects with a fast return on investment. As RPA can be implemented in a short timeframe, it allows for a fast return on investment (Penttinen et al., 2018, p. 4).

Regarding the quality of the process, RPA minimizes human error, as if a robot is properly configured, it will not make errors due to inattention or fatigue (Viale & Zouari, 2020, p. 191). As the process is speeded up and human errors are avoided, the operational quality of the process improves. This also has a strong impact on the suppliers' perception of the quality of the buyer. The increased operational efficiency also has a positive effect on supplier relationship management (Viale & Zouari, 2020, p. 191). Besides an increase in operational efficiency, RPA improves the buyer's legitimacy (Viale & Zouari, 2020, p. 192).

RPA technology gives organizations the opportunity to improve processes and simplify and rapidly streamline the end-to-end process (Viale & Zouari, 2020, p. 185). These benefits of RPA led to more corporate attention concerning automation initiatives (Hofmann et al., 2020, p. 99).

2.3 TOE framework in relation to facilitators and inhibitors and the UTAUT

2.3.1 The technology-organization-environment framework was used to organize facilitators and inhibitors for EDI implementation

The implementation of EDI within a company can be facilitated or inhibited by several factors. There is no or little consensus of opinion in the literature about the key facilitators and inhibitors for successful IS/IT projects (Fortune & White, 2006, p. 54). Organizational facilitators are factors that positively influence the ability of an organization to exploit information resources or that positively influence an organization's decision to use IT applications for strategic purposes. On the contrary, organizational inhibitors are factors that negatively influence this ability or those decisions (King, Grover, & Hufnagel, 1989, p. 91; King & Teo, 1996, p. 36). One organizational-level theory used to explain facilitators and inhibitors is the technology-organization-environment (TOE) framework of Tornatzky and Fleischer (1990, p. 153) (Figure 2), which is also used for EDI studies in the past (Zhu, Kraemer, & Xu, 2003, pp. 252-253). The TOE framework explains that three different elements of an organization's context influence adoption decisions (Baker, 2012, p. 232). The three elements within the model are the technological context, the organizational context, and the environmental context. The technological context is comprised of all the technologies that are relevant to the firm. This means both technologies already in use as well as the new technologies not in use, or internal and external technologies (Baker, 2012, p. 232; Tornatzky & Fleischer, 1990, pp. 152-154; Zhu et al., 2003, p. 252). The organizational context is comprised of the characteristics and resources of the firm. This includes centralization, formalization, linking structures, intra-firm communication processes, firm size and scope, and slack resources (Baker, 2012, p. 235; Tornatzky & Fleischer, 1990, pp. 152-154; Zhu et al., 2003, p. 252). Finally, the environmental context is the arena in which the company conducts its business, it refers to the structure of the industry, competitors, technology support infrastructure, and government regulations (Baker, 2012, p. 235; Tornatzky & Fleischer, 1990, p. 154; Zhu et al., 2003, p. 252). Summarizing these three

elements, they present both constraints and opportunities for technological innovation (Tornatzky & Fleischer, 1990, p. 154).
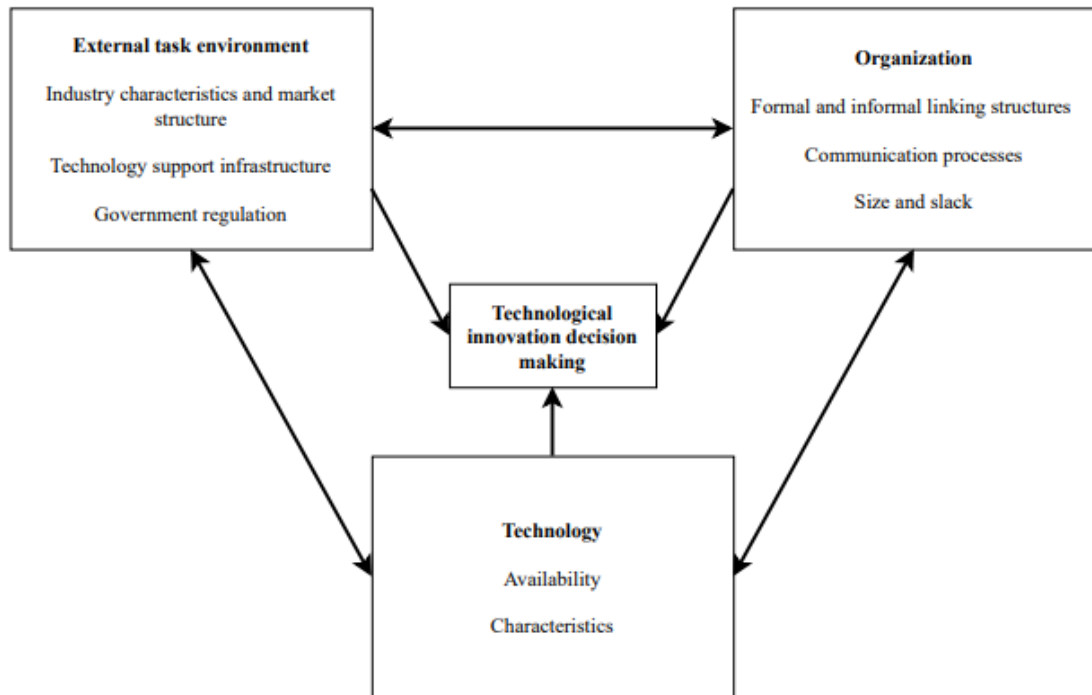
Figure 2: The technology-organization-environment framework (Tornatzky & Fleischer, 1990, p. 153)

2.3.2 Technological, organizational, and environmental factors which facilitate or inhibit EDI implementation

Within the three elements of the TOE framework there are multiple factors which can facilitate or inhibit organizational innovation adoption. One key characteristic of EDI is its ability to transmit and process documents in a standard format. Therefore, the success of EDI depends on the acceptance and diffusion of standardized formats (Picot et al., 1993, p. 243). A comprehensive world standard for EDI is a major technological facilitator for EDI adoption. When there is no uniform standard, this will act as an inhibitor for EDI adoption. Different standards can create uncertainty among organizations as they doubt about which standard to choose (Picot et al., 1993, p. 245). Other facilitators of EDI technology are the innovation characteristics of the technology, which can be e.g. the relative advantage, complexity, and compatibility of the technology (Iacovou et al., 1995, p. 467; S.-J. Lee, 2001, p. 28). Technical infrastructure problems have a positive relationship to the use of EDI and firms that use EDI consider technical infrastructure to be important facilitators or

inhibitors (C. Watts et al., 1998, pp. 12-13). The last technical facilitator is training on the use of the new technology (Coombs, 2015, p. 376).

Management support is an important facilitators or inhibitor in organizations (Coombs, 2015, pp. 365-366; Dong, Neufeld, & Higgins, 2009, p. 55; Fortune & White, 2006, pp. 54-55; King & Teo, 1996, p. 50; S.-J. Lee, 2001, p. 2001; Premkumar et al., 1997, p. 117; C. Watts et al., 1998, p. 13). When top management is not committed there is no reason to try to force EDI into an organization and it would be difficult to obtain the adequate resources for adopting the technology (Premkumar et al., 1997, p. 117; C. Watts et al., 1998, p. 13). Not only the commitment of the organization's own management is important, also the partner's top management commitment to EDI is crucial (Premkumar et al., 1997, p. 118). It is important that managers understand the facilitators and inhibitors to implement the technology and achieve its benefits (Coombs, 2015, p. 364).

The financial aspect of EDI implementation might be the best suited in the organizational environment as it deals with an organization's financial resources. There is debate in the literature whether this influences EDI or IT adoption. The resources required to implement EDI may favor bigger firms over smaller ones as size could indicate a higher level of resource availability (Iacovou et al., 1995, p. 477). EDI is not an appropriate investment for smaller organizations as it is too expensive, lacks flexibility and more difficult to cover the implementation efforts by the revenues achieved (Chang et al., 2004, p. 636; Premkumar et al., 1997, pp. 117-118; Yunitarini et al., 2018, p. 122; Zhu et al., 2003, p. 251). Therefore, smaller firms are slower in the adoption and are more likely to be non-adopters. On the contrary, C. Watts et al. (1998, p. 13) found that financial hurdles are not a barrier to use EDI and Iacovou et al. (1995, p. 477) stated that size does not play a major role. Next, technology competence is a significant adoption facilitator (Zhu et al., 2003, p. 251). The lack of technological skills within an organization can be an inhibitor to EDI implementation (Iacovou et al., 1995, p. 465). Related to these technological skills are the change management skills among IT employees. The deficit of these can be an inhibitor as many professionals lack sufficient knowledge in the planning, execution and evaluation of change management (Pare & Jutras, 2004, p. 669). The technological knowledge availability and resource availability of the organization can be summarized as organizational readiness (Iacovou et al., 1995, p. 465). Organizational resistance to change is a significant inhibitor

to implement EDI (C. Watts et al., 1998, p. 13). As organizational support is an important facilitator for the effective use of high technology (C. Watts et al., 1998, p. 13). The opposite of the organizational resistance is the commitment to change and implementation efforts within the organization (S.-J. Lee, 2001, p. 28). An inhibitor related to organizational resistance or commitment is the engagement of employees with new ways of working (Coombs, 2015, p. 376). Another facilitator or inhibitor of innovation, or EDI adoption, can be communication processes within the organization (Baker, 2012, p. 234). Finally, publishing positive outcomes of other firms' experiences with EDI might also facilitate EDI adoption (C. Watts et al., 1998, p. 13).

Competition or competitive pressure is a facilitator within the environmental context (Baker, 2012, p. 235; Iacovou et al., 1995, p. 465; King & Teo, 1996, p. 50; Zhu et al., 2003, p. 251; Zhu, Kraemer, & Xu, 2006, p. 1557). Especially for small firms, competitive pressure is a strong facilitator of EDI adoption (Iacovou et al., 1995, p. 477). Whereas competition positively affects initiation, on the contrary, competition negatively impacts routinization. Suggesting that too much competition drives firms to chase the latest technologies without getting used to existing ones (Zhu et al., 2006, p. 1557). Related to competitive pressure is customer support, as small firms are often intimidated by new technology and look for external support to implement it (Premkumar et al., 1997, p. 116). Consumer readiness is also perceived as a significant adoption facilitator (Zhu et al., 2003, p. 251). However, this is less relevant in a P2P process in a B2B environment. On the contrary to pressure from outside the organization, it is also possible that there is a lack of trading partner readiness which is a significant adoption inhibitor (Zhu et al., 2003, p. 251). An important sidenote to consumer readiness and lack of trading partner readiness is that as e-business intensity increases, these two factors become less important while competitive pressure remains significant (Zhu et al., 2003, p. 264). The imposition by trading partners can also act as an facilitator for EDI implementation (Iacovou et al., 1995, p. 470). The competitive pressure or trading partner pressure can be summarized as external pressure.

Innovative needs can be an organizational and environmental facilitator and inhibitor for a company at the same time (King & Teo, 1996, p. 50). As the need to innovate can come from the environment, e.g. in a competitive market, or from within the company. If there are innovative needs, on the one hand these can act as a facilitator where on the other hand, lack

of innovative needs can be an innovation inhibitor. The lack of IT drivers can be a technological and organizational inhibitor to EDI adoption (King & Teo, 1996, p. 50). As there can be a lack of availability within the EDI technology, so technological environment, and within the organization there can be a lack of IT technology and availability. Finally, according to Premkumar et al. (1997, p. 119), external environmental factors have a greater influence on EDI adoption compared to innovation factors But, no evidence or countermovement on this is found in the rest of the studied literature. Summarizing, all facilitators and inhibitors are displayed and summarized together in Table 2.

Table 2: Summarization of EDI facilitators and inhibitors (double factors in Italic)

Technology	Organization	Environment
Innovation characteristics and standard format acceptance and diffusion	Financial resources and organization size	Competitive pressure and trading partner imposition
Technology training	Change skills, commitment, and support or resistance	Consumer readiness and support
Technical infrastructure	Management support	*Innovative needs*
Lack of IT drivers	Organizational communication	
	Technology competence	
	Innovative needs	
	Lack of IT drivers	

2.3.3 RPA facilitators and inhibitors show similarities with EDI

Concerning RPA implementation there are multiple facilitators and inhibitors just as with EDI. First of all, Hofmann et al. (2020, p. 104) argue that decision-making in the context of RPA must have a strategical focus and should be concentrated not only on the short-term benefits. The first facilitator is process maturity, which is one of the key factors for the adoption of RPA (Viale & Zouari, 2020, p. 192). Process or procurement maturity has been defined as "the level of professionalism in the purchasing function" (Rozemeijer, van Weele, & Weggeman, 2003, p. 7). It is assumed that greater maturity is associated with better performance and that mature purchasing organizations apply world-class best practices (Schiele, 2007, p. 274). In a study from Schiele (2007, p. 283), more mature firms identified larger savings potential than did underdeveloped firms, which is beneficial for the implementation of RPA. Organizations could take into account leadership management and management support as an essential part of successful implementation (Bienhaus & Haddud, 2018, p. 979; Wewerka, Dax, & Reichert, 2020, p. 103). The head of procurement

encourages teams to be more committed and end-users to adopt the new tool (Viale & Zouari, 2020, p. 190). Management could also define a common mind-set and attitude towards the digital transformation or technology adoption (Bienhaus & Haddud, 2018, p. 979). The involvement of the procurement manager in the upstream process of project implementation is also a sign of the function's maturity (Viale & Zouari, 2020, p. 192). Connected to the management commitment is the necessity of a supply chain technology visionary. It is recommended that a company identifies a visionary who understands technologies, can intermediate between supply chain and IT, and possesses change management skills (Hartley & Sawaya, 2019, p. 712). When management implements RPA, a strategic management approach could be followed to conduct the implementation process as RPA involves cooperation between different departments (Hofmann et al., 2020, p. 103). This also means that IT personnel could be involved in the decision process as RPA is a form of IT (Hofmann et al., 2020, p. 103). Also, a technical roadmap could be developed for the supply chain processes, this can facilitate the adoption (Hartley & Sawaya, 2019, p. 712).

To implement RPA and handle the digital transformation organizations have to consider the existing procedures and processes from a system point of view as well as the current communication tools and channels to determine areas of improvement (Bienhaus & Haddud, 2018, p. 978). When implementing RPA, business processes need to be clear, well defined and rule based, and the inputs must be digital as RPA is a software-based solution (Penttinen et al., 2018, p. 4; Viale & Zouari, 2020, p. 192). As sometimes the procurement process is not clear internally and is not documented. RPA is then useful tool for process improvement as it can help managers to review their processes and standardize them (Viale & Zouari, 2020, p. 191). On the contrary to standard processes, organizations must have a certain degree of flexibility when implementing RPA (Viale & Zouari, 2020, p. 192). One major challenge regarding the implementation of RPA are the employees' habits. Employees' habits have to be changed and they have to be convinced that robots would help them to do their job better (Viale & Zouari, 2020, p. 192). Therefore, a change management program can be started to educate employees on the changes (Viale & Zouari, 2020, p. 193). (Viale & Zouari, 2020, p. 193). In order to successfully start up a RPA implementation project or implement RPA, organizations need to hire employees who already have the necessary capabilities for the new tasks, roles, and responsibilities (Bienhaus & Haddud, 2018, p. 979). Corresponding to employees' habits and change management, just as with

EDI implementation, it is important that organizations provide training to employees who need to work with RPA (Bienhaus & Haddud, 2018, p. 979).

Similar with EDI implementation, a robust technical infrastructure and capability to allow the implementation and operation of RPA is recommended (Hartley & Sawaya, 2019, p. 713; Hofmann et al., 2020, p. 101; Viale & Zouari, 2020, p. 192). RPA is qualified as lightweight IT infrastructure as it does not invade existing infrastructures (Hofmann et al., 2020, p. 102; Penttinen et al., 2018, pp. 2-4). Lightweight IT "is a socio-technical knowledge regime, driven by competent users' need for solutions, enabled by the consumerization of digital technology, and realized through innovation processes" (Penttinen et al., 2018, p. 1), or commercially available, front-end software that supports processes and which is typically adopted outside the control of the IT department (Bygstad, 2015, pp. 3-4; Willcocks, Lacity, & Craig, 2015, p. 7). As RPA is lightweight IT, no specialized programming knowledge or skills are required for developing software robots, only basic understanding of IS functionalities is necessary (Willcocks et al., 2015, p. 6). This low IT complexity makes RPA easy to use for different people and functions in a business. But, profound process knowledge is required however for software robot construction (Hofmann et al., 2020, p. 102). On the contrary, the complexity of the RPA tool is viewed as a potential barrier to the use, even if it can be a source of added value for buyers (Viale & Zouari, 2020, p. 190).

Finally, as it was important to publicize success stories for EDI implementation, there is a counterpart concerning RPA implementation. One main reason for the failure of RPA implementation is that organizations overestimate the potential gains, as management is sometimes disappointed with the difference between expected and actual gains (Viale & Zouari, 2020, p. 187 and 192). These differences in expected and actual gains can come from inefficient implementation. As not optimizing existing processes may lead to inefficient implementation that therefore do not deliver the expected benefits. Therefore, it is recommended to research into suitable procedures to implement software robots in daily process routines (Hofmann et al., 2020, p. 104). Table 3 shows a summary of the RPA facilitators and inhibitors. These facilitators and inhibitors all belong to the organizational context except for the complexity of the technology and technical infrastructure which belong to the technological context.

Table 3: Facilitators and inhibitors for RPA implementation

Facilitator or inhibitor	Reference
Organizational context	
Process or procurement maturity	Viale and Zouari (2020, p. 192)
Leadership management and management support	(Bienhaus & Haddud, 2018, p. 979; Wewerka et al., 2020, p. 103)
Common mindset towards change	(Bienhaus & Haddud, 2018, p. 979)
Supply chain technology visionary	(Hartley & Sawaya, 2019, p. 712)
Technical roadmap	(Hartley & Sawaya, 2019, p. 712)
IT involvement	(Hofmann et al., 2020, p. 103)
Clear, well defined, rule-based business processes	(Penttinen et al., 2018, p. 4; Viale & Zouari, 2020, p. 192)
Organizational flexibility	(Viale & Zouari, 2020, p. 192)
Employee training	(Bienhaus & Haddud, 2018, p. 979)
Overestimation of gains	(Viale & Zouari, 2020, p. 187 and 192)
Employee habits/change management program	(Viale & Zouari, 2020, pp. 192-193)
Hiring of employees with RPA experience	(Bienhaus & Haddud, 2018, p. 979)
Technological context	
Technical infrastructure	(Hartley & Sawaya, 2019, p. 713; Hofmann et al., 2020, p. 101; Viale & Zouari, 2020, p. 192)
Complexity of the technology	(Viale & Zouari, 2020, p. 190)

2.3.4 The Unified Theory of Acceptance and Use of Technology as a comprehensive model to measure intention and behavior

The Unified Theory of Acceptance and Use of Technology (UTAUT) (Figure 3) was formed by Venkatesh et al. (2003, p. 447). They studied eight key competing theoretical models on user technology acceptance and based upon conceptual and empirical similarities across models they formulated the UTAUT (Venkatesh et al., 2003, p. 426). To formulate the UTAUT, first they identified and discussed the eight models of the determinants of intention and usage of IT. After that, the eight models were empirically compared using within-subjects, longitudinal data from four organizations. Finally, conceptual and empirical similarities across the eight models were used to formulate the UTAUT (Venkatesh et al., 2003, p. 467). The eight models reviewed by Venkatesh et al. (2003, pp. 427-432) were the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT). These models hypothesize between two and seven determinants of acceptance, for a total of 32 constructs across the eight models. Of those 32 constructs, seven

constructs appeared to be significant direct determinants of intention or usage in one or more of the individual theoretical models (Venkatesh et al., 2003, p. 446).
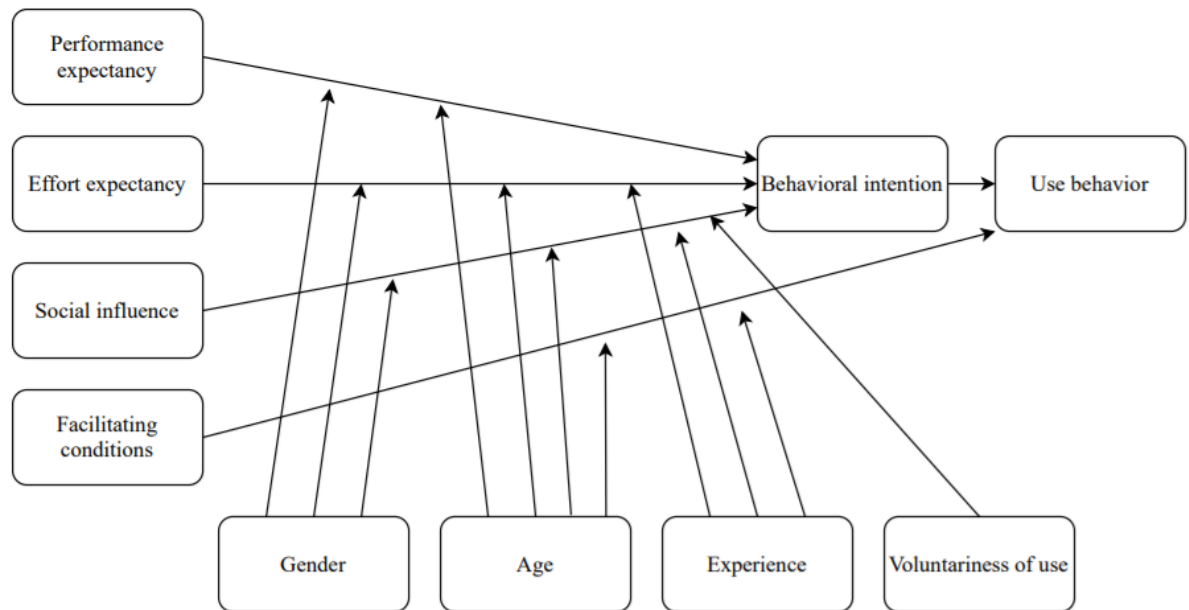
Figure 3: Original Unified Theory of Acceptance and Use of Technology (UTAUT) by (Venkatesh et al., 2003, p. 447)

The eight models and its constructs are summarized into four independent variables which predict the two dependent variables "Behavioral intention" and "Use behavior" in the UTAUT. The four independent variables are Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions (Venkatesh et al., 2003, pp. 446-447). Three other constructs, attitude towards using technology, self-efficacy, and anxiety are theorized not to be direct determinants of behavioral intention (Venkatesh et al., 2003, p. 447). Performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p. 447). This is the strongest predictor of intention and remained significant at all points of measurement in both voluntary and mandatory settings (Venkatesh et al., 2003, p. 447). Effort expectancy is defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). Those effort-oriented constructs are expected to be more conspicuous in the early stages of new behavior when process issues represent hurdles to be overcome. Later, they become overshadowed by instrumentality concerns (Venkatesh et al., 2003, p. 450).

Table 4: Performance expectancy and effort expectancy constructs, definitions and references

Construct	Definition	Reference
Performance expectancy		
Perceived usefulness	Degree to which a person believes that using a particular system would enhance his or her job performance	(Davis, 1989, p. 320; Moore & Benbasat, 1991, p. 197)
Extrinsic motivation	Perception that users will want to perform an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions	(Davis, Bagozzi, & Warshaw, 1992, p. 1112)
Job-fit	How the capabilities of a system enhance an individual's job performance	(Rogers & Shoemaker, 1971, p. 154; Thompson, Higgins, & Howell, 1991, p. 129)
Relative advantage	The degree to which using an innovation is perceived as being better than using its precursor	(Moore & Benbasat, 1991, p. 195)
Outcome expectations	Outcome expectations relate to the consequences of the behavior	(Compeau, Higgins, & Huff, 1999, pp. 147-148)
Effort expectancy		
Perceived ease of use	The degree to which a person believes that using a system would be free of physical and mental effort	(Davis, 1989, p. 320; Moore & Benbasat, 1991, p. 197)
Complexity	The degree to which a system is perceived as relatively difficult to understand and use	(Thompson et al., 1991, p. 128)
Ease of use	The degree to which using an innovation is perceived as being difficult to use	(Moore & Benbasat, 1991, p. 197)

Social influence is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). This refers to that the individual's behavior is influenced by the way in which they believe others will view them as a result of having used the technology (Venkatesh et al., 2003, p. 451). But, none of the social influence constructs are significant in voluntary contexts, however, each becomes significant when the use is mandated (Venkatesh et al., 2003, pp. 451-452). Also, individuals are more likely to comply with others' expectations when those referent others have the ability to reward or punish the behavior (Venkatesh et al., 2003, pp. 452-453). The social influence are also more likely to be noticeable at older workers, particularly women, and even during the early stages of experience/adoption (Venkatesh et al., 2003, p. 469). Facilitating conditions are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453). In contrary to performance expectancy,

effort expectancy, social influence, and facilitating conditions have a direct influence on use behavior beyond behavioral intention (Venkatesh et al., 2003, p. 454). The effect of the four independent variables, performance expectancy, effort expectancy, social influence, and facilitating conditions are moderated by gender, age, experience, and voluntariness of use (Venkatesh et al., 2003, p. 447). Table 4 and 5 show the four independent variables and its constructs, definitions, and references.

Table 5: Social influence and facilitating constructs, definitions and references

Construct	Definition	Reference
Social influence		
Subjective norm	The person's perception that most people who are important to him think he should or should not perform the behavior in question	(Ajzen, 1991, p. 188; Davis, Bagozzi, & Warshaw, 1989, p. 984)
Social factors	The individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations	(Thompson et al., 1991, p. 126)
Image	The degree to which use of an innovation is perceived to enhance one's image or status in one's social system	(Moore & Benbasat, 1991, p. 195)
Facilitating conditions		
Perceived behavioral control	Reflects perceptions of internal and external constraints on behavior and encompasses self-efficacy, resources facilitating conditions, and technology facilitating conditions	(Ajzen, 1991, p. 183)
Facilitating conditions	Objective factors in the environment that observers agree make an act easy to do, including the provision of computer support	(Thompson et al., 1991, p. 129)
Compatibility	The degree to which an innovation is perceived as being consistent with existing values, needs, and experiences of potential adopters	(Moore & Benbasat, 1991, p. 195)

2.4 Synthesis and theoretical framework

2.4.1 UTAUT and TOE framework combined to create a theoretical framework

As the goal of this research is to find out what motivates organizations to connect suppliers and/or buyers via EDI and measure their willingness to implement EDI connections the following model, derived from the literature review, was set up. The theoretical model is a combination of the UTAUT from Venkatesh et al. (2003, p. 447) and the TOE framework from Tornatzky and Fleischer (1990, p. 153). The UTAUT is applied

individually and therefore it is adapted to an organizational level for this research. To suit the organizational level, some variables were altered, removed, and added to the UTAUT. The independent variables performance expectancy and effort expectancy were not changed as these variables, definitions and constructs might be the same for organizations as individuals. In the UTAUT, the third independent variable of behavioral intention is social influence. Social influence is removed from the research model as it only has an effect in mandatory settings whereas this research tries to find out motivations in voluntary settings (Venkatesh et al., 2003, p. 439). To measure influences from the environment in a voluntary setting, the independent variable "environmental factors" is added. This variable comes from the TOE framework to test whether e.g. competing firms have an influence on the behavioral intention.

After the three independent variables, the behavioral intention is the dependent variable. In the UTAUT model, Venkatesh et al. (2003, p. 447) have included the moderating variables gender, age, experience, and voluntariness of use. As these factors are directed towards individual behavioral intention, other moderating effects are proposed. These effects are grouped into two moderating variables called "relational aspects" and "organizational aspects". Relational aspects are factors that deal with the relationship in the buyer-supplier relationship, e.g. the length of the business relationship and preferred customer status. A firm has preferred customer status with a supplier when the supplier offers the buyer preferential resource allocation (Steinle & Schiele, 2008, p. 11). Organizational aspects are factors which deal with organizational aspects of the buyer-supplier relationship, e.g. the number of order lines, and the purchase value at the supplier.

In the literature review, RPA was presented and researched. In recent years, RPA has grown in popularity. First, this technology offers the possibility to accelerate and improve back-office by processing data by robots (Aguirre & Rodriguez, 2017, p. 65). Second, RPA can act as a substitute for EDI as it offers the possibility to let the robot order goods directly at the supplier without sending data from the buyers' ERP to the suppliers' ERP. This could potentially have an effect on both the behavioral intention as the implementation success. Therefore, RPA is proposed as a moderating variable on the behavioral intention and whether it influences EDI implementation as a substitute.
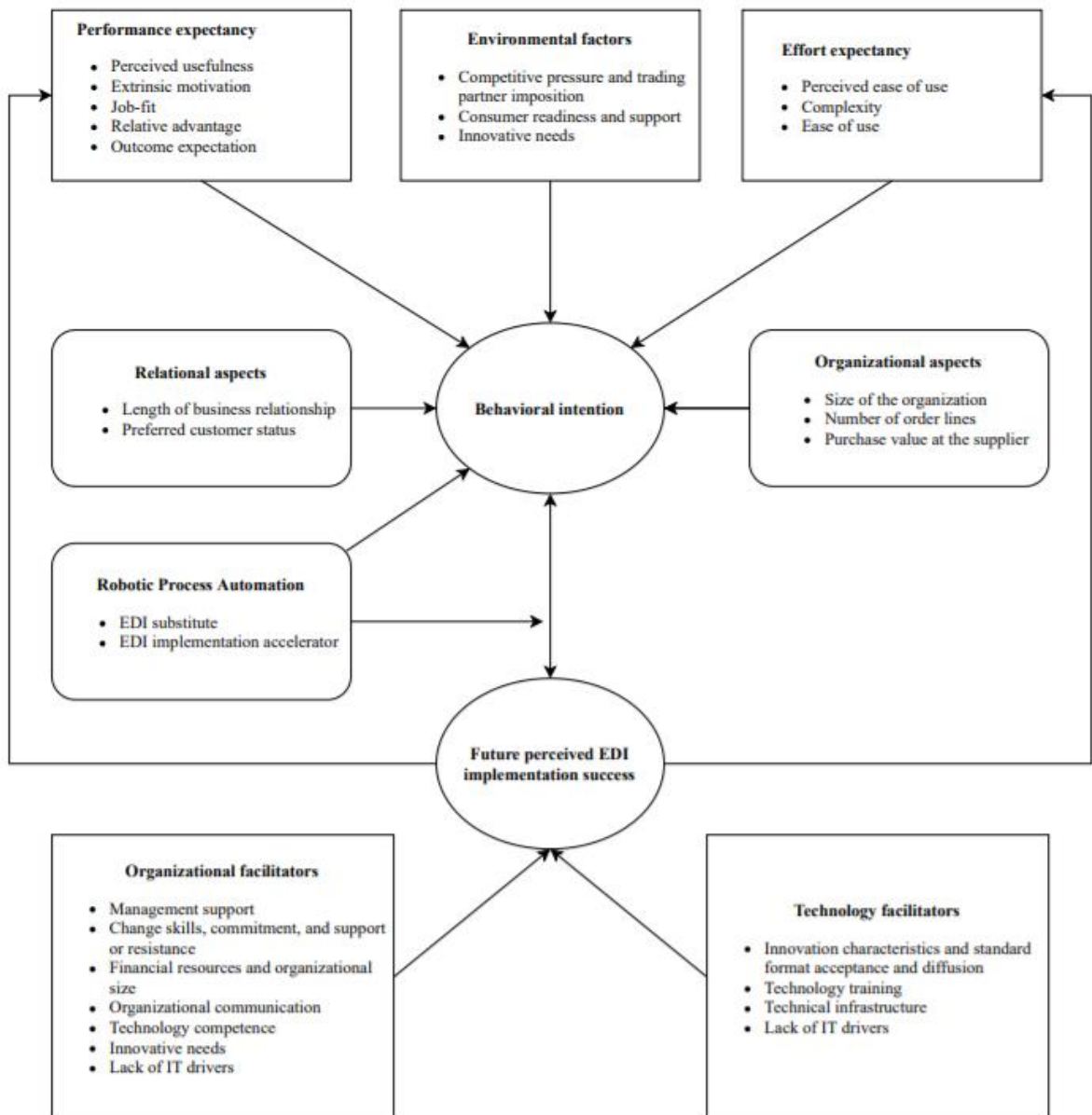
Figure 4: The theoretical framework of the research

The dependent variable "use behavior" from UTAUT is replaced by "EDI implementation success" as this aims at the same target but reframes the variable in another organizational, successful perspective. The TOE framework can be seen as a valuable addition for facilitating conditions on the UTAUT as Venkatesh et al. (2003, p. 447) include facilitating conditions as an independent variable to use behavior in their original model. The environmental factors of the TOE framework are used earlier in the model, as explained earlier. Leaving "technology facilitators" and "organizational facilitators" unused, which might have an effect on EDI implementation success. Summarizing, Figure 4 shows the theoretical framework of this research.

3   Methods

3.1   Literature review approach in Scopus

The research process started with a literature review of EDI, facilitators and inhibitors, purchasing, SCM, I4.0 and RPA literature. The strategy for the literature review was to find specific papers via keyword search which have a high information potential and then to find additional papers via the snowballing effect. To start the literature review, keyword search was conducted in Scopus. These keywords resulted in more specific search keys. Table 6 shows a summary of the keyword search. This keyword search did not result in much usable and assessed papers as they mostly did not contain information applicable to this research. In total 13 papers were used from the keyword search. This could be caused by a narrow timeframe (2018-2021) in which the keywords were applied. For the further literature used in the research, the snowballing effect led to the use of the majority of papers. As in the most recent papers, older literature was cited which was beneficial for this research. After the theoretical research was conducted, research at the case company started which is explained in the next sections.

Table 6: Literature review keyword search

Keywords	Initial hits	Hits in relevant subject area	Usable and assessed papers	Search key
Electronic Data Interchange	13705	1078	3	TITLE-ABS-KEY ("Electronic Data Interchange") AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018)) AND (LIMIT-TO (SUBJAREA , "BUSI"))
P2P	23552	857	1	TITLE-ABS-KEY ("P2P") AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018)) AND (LIMIT-TO (SUBJAREA , "BUSI"))
Industry 4.0	14860	2248	5	TITLE-ABS-KEY ("Industry 4.0") AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019 OR LIMIT-TO (PUBYEAR , 2018)) AND (LIMIT-TO (SUBJAREA , "BUSI"))
Robotic Process Automation	272	78	4	TITLE-ABS-KEY ("Robotic Process Automation") AND (LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020))

3.2   Case study at a company in the steel industry in the Netherlands with samples of suppliers and P2P process stakeholders

The research in this study was performed as a case study at a company in the steel industry in the Netherlands. More information on the company will be given in chapter 4. Case studies are used to gain an understanding in real life settings, e.g. business environment, and recommended to answer how and why research questions (Harrison, Birks, Franklin, & Mills, 2017, p. 12; Merriam & Tisdell, 2015, p. 37; Simons, 2009, p. 23; R. E. Stake, 2006, p. 3; Yin, 2018, p. 24). An extensive explanation of a case study is given by Simons (2009):

Case study is an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, programme or system in a 'real life' context. It is research-based, inclusive of different methods and is evidence-led. The primary purpose is to generate in-depth understanding of a specific topic (as in a thesis), programme, policy, institution or system to generate knowledge and/or inform policy development, professional practice and civil or community action (p. 21).

What comes clear from this definition is that a case study is about the particular rather than the general. Therefore one cannot generalize from a case study (Thomas, 2016, p. 3). Also, a case study is not a method in itself. Rather it is a methodology in which the research focusses on one thing which is looked at in depth and from many angles (Creswell, Hanson, Clark Plano, & Morales, 2007, p. 245; Thomas, 2016, p. 4). When looking from several directions, a more rounded, richer, and more balanced picture of the subject is developed, leading to a three-dimensional view on the subject (Thomas, 2016, p. 4). The outcomes of case study research can lead to an in-depth understanding of behaviors, processes, practices, and relationships in context (Harrison et al., 2017, p. 15). This is also demonstrated in business research and therefore it is a powerful form of qualitative research. This research focuses on one company making it a single case study. The company has an intrinsic interest in the outcome of the research, qualifying it as an intrinsic case (R.E. Stake, 1995, pp. 3-4). The company copes with a problem at their purchasing department making the research problem based. By selecting the company as case for the research, the boundaries of the case have been set at all the stakeholders of the company's P2P and implementation process. The departments involved in this process are purchasing, IT, finance, management, and

warehouse. As purchasing is not an isolated field within the company and should be treated in relationship with the other main stakeholders (Viale & Zouari, 2020, p. 190). Besides these internal stakeholders, the suppliers perform a vital role in the P2P process as they deliver the goods and services to the case company. So, the internal and external P2P stakeholders were interviewed as part of the case study. The bounding of the company and suppliers as case is essential to focusing, framing, and managing the data collection and analysis. Part of the process of setting the boundaries are identifying the parameters of the case including e.g. the participants and location and selecting the timeframe for the research (Harrison et al., 2017, p. 12; Merriam & Tisdell, 2015, p. 37; Yin, 2018, pp. 65-66). As the company and its suppliers are the subject of this case study, the employees from the earlier mentioned five departments and the suppliers employees' responsible for EDI were the participants. The research location was the case company's office and production facility. All interviews with suppliers and internal stakeholders were conducted June 2021. During the research, secondary data as e.g. turnover data was collected. The secondary data was taken for the period of 1 year from January 2021 till December 2021.

3.3 Suppliers and internal P2P stakeholders were part of the sampling frame

In the sampling frame for the interviews are the suppliers of the company and internal stakeholders of the P2P process. To acquire participants for the interviews, multiple composition methods were used. Therefore, the sample can be divided into suppliers and internal stakeholders. The next step was choosing the sampling technique. A form of non-probability sampling was used (Taherdoost, 2016, p. 20). As Taherdoost (2016) states: "non probability sampling is often associated with case study research design and qualitative research" (p. 22). In non-probability sampling, arbitrary or purposive sample selection is used by the researcher and so, there is an absence of random selection (Vehovar, Toepoel, & Steinmetz, 2016, p. 329).

The sample of suppliers was composed by purposive sampling. Purposive sampling, also known as judgmental, selective or subjective sampling is a strategy in which the sampling relies on the judgement of the researcher when it comes to selecting the units (Sharma, 2017, p. 751). In purposive sampling the researcher includes participants in the sample because they warrant inclusion or because the researcher looks for a "representative" sample (Taherdoost, 2016, p. 23; Vehovar et al., 2016, p. 330). Convenience sampling is

ideal for exploratory research but does also not allow generalization (Taherdoost, 2016, p. 23). Participating suppliers were selected based on their expertise. So, suppliers and its representatives were interviewed based on their expertise with EDI. The individual profiles including title, supplying goods, years business partners, and interview duration are listed in Table 7. The suppliers were ranked according to the total expected number of order lines for 2021 with 1 being the biggest and 10 the smallest supplier. In total 11 suppliers were contacted, 10 suppliers responded and were interviewed, which led to a response rate of 91%. For the internal interviews, purposive sampling was used as well. As the internal interviews were all conducted at five departments which all are stakeholders in the P2P (implementation) process. E.g. no factory workers or R&D employees could be selected. But, from these five departments all employees could be selected randomly. For the internal interviews 8 employees were contacted to be interviewed, in total 8 employees responded to the call which led to a response rate of 100 %. Table 8 shows the case company interviewees including title, department, years working experience, and interview duration. The use of interviews and secondary data will be explained in the next chapter.

Table 7: individual profiles supplier interviews including title, supplying goods, years business partner, interview duration, number of order lines, and annual purchase value

Company	Respondents title	Supplying goods	Years business partners	Interview duration	Number of order lines	Annual purchase value (2021)
Supplier 1	Sales Manager Back-office	Electrical materials	14 or more	50:35	19336	1305104
Supplier 2	Owner – Director	Metal plates	2,5 to 3	38:31	8017	708151
Supplier 3	Global Logistics Director	Plasma cutting	10 to 15	32:59	3149	2228116
Supplier 4	Product Manager Readychain	Dynamic power supply	15 to 20	42:55	2541	460076
Supplier 5	Account Development Manager	Industrial goods (Electronics, hydraulics, servo etc.)	15 or more	39:34	2487	2051450
Supplier 6	Manager Operations	Control Cabinet (components)	-	46:27	1805	776076
Supplier 7	Business Engineer	Electronic components	-	41:09	1333	375199

Supplier 8	Business Process Consultant	Industrial goods	20 or more	52:11	1310	1226931
Supplier 9	Hydraulics Specialist	Hydraulics	5 or 6	34:16	611	302003
Supplier 10	Manager Order Administration	Servo products	18 or 19	47:01	113	171248

Table 8: individual profiles internal interviews including title, department, years working experience, and interview duration

Respondent	Respondents title	Department	Years working experience	Interview duration
Intern 1	Supply Chain Engineer	Purchase & Supply Chain	2	42:05
Intern 2	Financial Controller	Finance	3	46:32
Intern 3	Purchase Manager	Operations/Purchase & Supply Chain	1,5	41:03
Intern 4	System Engineer	IT	8	36:25
Intern 5	Application Engineer	Business services/IT	2,5	31:17
Intern 6	Accounts Payable	Finance	3,5	37:19
Intern 7	Director Operations	Operations/Management	5	48:22
Intern 8	Teamleader Warehouse	Warehouse	21	23:57

3.4 The choice of gathering data: supplier and employee interviews and secondary data

To acquire data interviews were conducted and secondary data was collected, meaning the research is both qualitative and quantitative. These two methods are methods commonly used in case study research (Simons, 2009, p. 43). It is encouraged and mutually informative in case study research to use multiple methods to collect and analyze data. These multiple methods together provide a more synergistic and comprehensive view of the research object or issue (Harrison et al., 2017, p. 12; Merriam & Tisdell, 2015, p. 37).

Interviews were conducted with suppliers and case company employees to gain a deeper understanding of their motives or counter arguments and their willingness to implement EDI. With interviews it is possible to explore the reasoning behind arguments. As interviewing gives the advantage of gaining deep knowledge about a subject that goes beyond describing (Weiss, 1995, p. 3). Interviews are preferred over quantitative methods as quantitative methods have the disadvantage to not obtain full information and with

quantitative information it is rather difficult to find explanations (Weiss, 1995, p. 2). Therefore, quantitative methods make it more difficult to gain a deeper understanding. The interviews were conducted individually as in individual interviews mostly more information is shared. In this research individual interviews were preferred over group interviews because of different drawbacks of group interviews. Firstly, group interviews make it more difficult to ask targeted follow-up questions to individuals as there is a conversation in the entire group (M. Watts & Ebbutt, 1987, p. 33). Secondly, in group interviews it is possible that participants exaggerate their answers due to peer pressure or they might be more hesitant to show negative attitudes in fear of disapproval from others, so responses are not affected by other respondents (Folch-Lyon & Trost, 1981, p. 445). This was important as different persons from suppliers were interviewed, which might also be competitors of each other. These individual interviews were conducted in a semi-structured format, which is the most common of all qualitative research methods (Alvesson & Deetz, 2020, p. 194). Qu and Dumay (2011) describe a semi-structured interview as "prepared questioning guided by identified themes in a consistent and systematic manner interposed with probes designed to elicit more elaborate responses" (p. 246). So, interview questions were given but it was possible to deviate from this structure. E.g. when questions have been answered before or when more clarity is needed (Alsaawi, 2014, p. 151; Lavrakas, 2008, p. 260). The semi-structured interview is flexible, accessible, intelligible, and capable of disclosing important and often hidden facets of human and organizational behavior (Qu & Dumay, 2011, p. 246). In semi-structured interviews, it is possible to probe, which means it is possible to ask more specifically about relevant issues that are raised by the interviewee. This makes it possible to ask more about subjects which are not clear or draw more complete narratives from the interviewees, which increases reliability (Barriball & While, 1994, p. 331; Qu & Dumay, 2011, p. 247). The asked main questions were divided into two parts, corresponding with the research model. Table 9 shows the parts and its main questions. The full list of interview questions, including possible sub-questions, is listed in Appendix B. Before the start of the interviews, a small introduction on EDI and RPA was given as not all respondents have the required knowledge to answer all questions properly. In this introduction the subjects were introduced in an objective form, to let the participants start the interview unbiased. Appendix C shows the interview protocol with the script before the interview. In this introductory talk the interviewees was given the possibility to ask questions. Finally, it was asked if they agreed to record the interview. All interviewees consented with recording the interview.

Finally, secondary data was used to gather additional data on the case which might be useful. Secondary data can provide a baseline with which the primary data results can be compared to and can be helpful in the research design of primary research (Viale & Zouari, 2020, p. 188). This secondary data played a less important role than the interviews in the research.

Table 9: Main interview questions

Main interview questions
Part 1: Introduction questions on the interviewee
What do you deliver to (Name case company)? (Supplier question)
For how long are you business partners? (Supplier question)
What is your function at (Name company)? To which department belongs this function?
How much years working experience do you have in this function?
Part 2: Interview questions on EDI and RPA
When you think about the intention to implement EDI, what are the first things that come up?
What are motives for you to implement EDI with a supplier or customer?
What are important prerequisites for implementing EDI?
Which barriers are you willing to overcome when implementing EDI?
What are your expectations from EDI technology?
How does your organization change when implementing EDI?
What influence does the implementation of EDI have on your job or function?
Are there other, indirect aspects, that moderate or strengthen the behavioral intention to implement EDI?
Concluding on the factors you mentioned, what are the three most important factor that determine your behavioral intention to implement EDI with a supplier or customer?
Can you mention substitute technologies of EDI?
In which way could RPA have an impact on EDI implementation?
Are you familiar with facilitators and inhibitors of EDI implementation?
What are critical factors for successful EDI implementation?
What is important for your department/company when implementing EDI with another organization?
Which department has the strongest voice when implementing the EDI connection in the P2P process? (Department question)
Concluding on success factors you mentioned, which three basic factors are the most necessary EDI implementation?
After these three necessary facilitating factors, which three factors make the EDI implementation more successful?

3.4   Validity, reliability, and objectivity of the research

The validity, reliability, and objectivity of the research are essential to consider when executing semi-structured interviews. "Validity describes how well an instrument does what it is supposed to do" (Andrade, 2018, p. 498). Two types of validity exist, internal and external validity. "Internal validity examines whether the study design, conduct, and analysis answer the research question without bias" (Andrade, 2018, p. 498), and "External validity examines whether the study findings can be generalized to other contexts" (Andrade, 2018, p. 498). So, it involves the measurement of what is required to be measured. To achieve research validity, the interview questions are based on the findings of the literature review. To decrease bias the questions were asked in the same order and way. Reliability describes the consistency with which results are obtained or to which extent a measure produces the same answer (Andrade, 2018, p. 498; McDonald, Schoenebeck, & Forte, 2019, p. 4; Rose & Johnson, 2020, p. 437). Attention is paid to the number of participants and the extent to which the measures provide the same response to preserve research validity. Objectivity of the research means whether the analyses depend on the researcher (Rose & Johnson, 2020, p. 437). In order to guarantee objectivity, no leading questions are asked and the view of the researcher is omitted. The introduction about the topics before the interview was objective information.

3.5   The analysis of data: transcription, and multiple coding techniques

After conducting the interviews, the interviews were transcribed with Amberscript software. To increase reliability, all interviews were listened to and read again to correct mistakes. The transcription could then be used for analyzing the data. To analyze the interviews the program Atlas.ti was used in which it is possible to code and analyze multiple interviews. Coding means "thinking abstractly" and is an analytical process used to identify concepts, similarities and conceptual reoccurrences in data (Chun Tie, Birks, & Francis, 2019, p. 4; Corbin & Strauss, 2015, p. 216). Qualitative content analysis was used to analyze the interviews. Three distinct approaches exist for qualitative content analysis, being conventional, directed, and summative content analysis (Hsieh & Shannon, 2005, p. 1277). The main distinctions between the methods are coding techniques, the source of coding and the reliability implications. By applying these methods it is possible to derive interpretations from word content data. For conventional content analysis, the codes or keywords are defined during the data analysis and the codes are derived from the data (Hsieh & Shannon,

2005, p. 1286). At directed content analysis, the research mostly starts with theory and codes are defined before and during data analysis and are derived from theory or relevant research findings (Hsieh & Shannon, 2005, p. 1286). The goal at the directed content approach is to validate or extend conceptually a theoretical framework or theory (Hsieh & Shannon, 2005, p. 1281). Finally, at summative content analysis the keywords are identified before and during data analysis and keywords are derived from the interest of researchers or review of literature (Hsieh & Shannon, 2005, p. 1286). This approach starts with identifying and quantifying certain words or content in text with the purpose of understanding the contextual use of the words or content (Hsieh & Shannon, 2005, p. 1283). Two strategies can be used when coding, depending on the research question. If the goal of the research is to identify and categorize all instances of a particular phenomenon, it might be helpful to read the transcript and highlight all text that on first impression appears to represent that phenomenon. After this, all highlighted passages are coded using the predetermined codes and any text that could not be coded with the initial coding scheme would be given a new code (Hsieh & Shannon, 2005, p. 1281). The other strategy is to begin coding immediately with the predetermined codes. All data that cannot be coded with the predetermined codes are identified and analyzed later to determine if they represent a new category or subcategory of an existing code (Hsieh & Shannon, 2005, p. 1282).

As this research is concerned with validating and/or extending a theoretical framework, the directed content analysis is the most appropriate technique to use. The coding scheme was developed before coding, as is common with directed content analysis, but it is possible to add additional codes and the coding scheme can be revised and refined (Hsieh & Shannon, 2005, p. 1286). When coding, an inductive or deductive approach can be used. The inductive approach uses data to generate ideas while the deductive approach starts with a theoretical framework and then data is used to verify or disprove the framework (Ryan & Bernard, 2003, p. 88; Schadewitz & Jachna, 2007, p. 5). As this research started with formulating a theoretical framework, it was planned to use a deductive approach for coding the interviews. During the process this changed and turned into an abductive coding approach. Abductive coding is a form of coding which is a combination of inductive and deductive coding. For the coding, there are three common methods, which were all used in this research. These methods are open coding, axial coding, and selective coding. Open coding is a procedure for developing categories of information by breaking apart data and

delineating concepts (Chun Tie et al., 2019, p. 4; Corbin & Strauss, 2015, p. 240; DeCuir-Gunby, Marshall, & McCulloch, 2011, p. 138). For open coding, all interviews were read and relevant parts were coded with non-predefined codes. After open coding, axial coding was performed, which is the locating and linking of action-interaction within a framework of sub concepts that give it meaning or in other words a procedure for interconnecting the categories (Chun Tie et al., 2019, p. 4; Corbin & Strauss, 2015, p. 165; DeCuir-Gunby et al., 2011, p. 139). This enables to explain what interactions are occurring, and why and what consequences this has (Corbin & Strauss, 2015, p. 165). As the theoretical framework was used as a guideline in the interviews, categories for coding were made by using the theory. In this part, abductive coding was applied as there were codes which did not suit a category coming from the theory therefore leading to new categories. Finally, selective coding was performed, which is the process of building a storyline from core codes by associating categories with a key category which is the base of the theory (Chun Tie et al., 2019, p. 4). Appendix C shows the coding scheme of the interviews including all code groups and codes. After the interviews were transcribed and coding was performed, it was possible to analyze the findings and draw a conclusion.

4 Results

4.1 Case description, company situation and problem formulation

The case company for this research is a CNC machinery manufacturer providing solutions for steel fabricators and the manufacturing industry. The headquarter of the company is located in the Netherlands. Their customers originate from all over the world with their main markets being Europe, the USA, and Asia. The company purchases approximately 2,3 million products a year which are divided into 130.000 order lines. The processing of these order lines is labor-intensive and takes valuable time which can be saved by implementing a digital solution as EDI. At the moment they process approximately 70% of order lines automatically via an online platform bringing them several advantages and disadvantages. The advantage is that it is relatively cheap to let suppliers use the platform. One disadvantage is that the platform is one of many platforms and standards existing and therefore not all suppliers are or can be connected. Therefore, they intend to implement EDI connections with suppliers to improve the efficiency within their P2P process. But they do not know what drives suppliers and themselves to start up an EDI implementation project and what is necessary to implement EDI successfully.

4.2 Results of the interviews

4.2.1 Perceived usefulness and outcome expectations are the most important factors influencing intention, as long as the benefits outweigh the costs

Firstly, interviewees were asked questions about variables influencing their behavioral intention. These variables could be anything which influences their intention. Most interviewees mentioned the benefits and costs or implementation efforts of EDI implementation. During coding it became clear that the groups "perceived usefulness" and "outcome expectations" had much in common. As a result of this, these two groups were merged into the code group "perceived usefulness and outcome expectations". Besides "perceived usefulness and outcome expectations, the code groups "extrinsic motivation", "job-fit" and "relative advantage" are part of the performance expectancy variable which are explained in this section. Further in this section, the other variables environmental factors and effort expectancy are explained. In all tables, a distinction is made between supplier and customer interviews as there might be different expectations from EDI. In the third column the total number of interviews in which a code is mentioned is shown. Further, the last two columns show the interviews in which the code was mentioned. The number between brackets represents the number of how many times a code was mentioned in total as a code can be used in an interview multiple times. This interpretation of the numbers in brackets holds for Table 10 until Table 18.

Table 10: Performance expectancy factors and codes ((#) is total quotes)

Performance expectancy					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
Perceived usefulness and outcome expectations					
Reduction of errors	7	7	14 (34)	2, 3, 7, 8, 10	1, 2, 3, 4, 6, 7
Higher speed	7	7	14 (19)	1, 2, 4, 5, 6, 8, 10	1, 2, 3, 4, 5, 6, 7
Weighing costs and benefits	8	5	13 (35)	1, 3, 4, 5, 7, 8, 9, 10	1, 3, 4, 5, 7
Efficiency	5	6	11 (36)	2, 3, 7, 8, 10	1, 2, 3, 4, 6, 7
Extrinsic motivation					
More output with less/same employees	1	1	2 (5)	6	7
Increase in sales	2	0	2 (4)	3, 8	-
Technological image or marketing towards customers	2	0	2 (2)	7, 10	-
Job-fit					
Spend time on value-adding or important activities	7	5	11 (16)	1, 3, 4, 5, 6, 7, 9	1, 2, 4, 5, 7

Time reduction	7	3	10 (18)	1, 2, 5, 6, 7, 9, 10	1, 2, 5
No/less manual interference	6	3	9 (13)	1, 2, 3, 4, 6, 8, 9	2, 3, 7
Relative advantage					
Reduction of labor	6	3	9 (13)	1, 3, 5, 6, 7, 10	1, 2, 4
Insight and transparency	3	5	8 (12)	2, 3, 8	1, 2, 3, 6, 7
Manual order processing leads to errors	3	4	7 (8)	4, 5, 7	1, 3, 5, 6
Increased reliability	3	3	6 (14)	3, 4, 6	1, 2, 3

Table 10 visualizes the most important codes for the performance expectancy factors. As visible in Table 10, the four codes mentioned most frequent for perceived usefulness and outcome expectation are "reduction of errors", "higher speed", "weighing costs and benefits", and "efficiency". These codes were mentioned in at least two third of all interviews, showing the importance of these factors. Supplier 2 summarized his most important drivers for intention as: "That would include especially the efficiency, speed, less chance of errors" (Supplier 2, p. 2). Among others, this reduction of errors was also an important aspect for the case company as an employee stated: "Because it can prevent human error. If it's all automated, then at best you can automate it wrong because then you can retrieve it. And if you include human error then that's much more difficult" (Intern 4, p. 1). Beside the reduction of errors, the higher speed as a result of EDI was also indicated as an influencing factor. Supplier 5 summarized this as: "That's saving time, gaining speed, ultimately saving money. Preventing errors also saves money" (Supplier 5, p. 14). Most codes were mentioned by both supplier as case company interviewees.

Extrinsic motivation also played a role in determining the intention to implement EDI with another organization. Having a minor role compared to e.g. the perceived usefulness and outcome expectations as the most frequently mentioned code "more output with less/same employees" was mentioned only in two interviews with a total of five quotations. Supplier 3 stated that the possibility of increasing sales to that customer also influences their intention: "Well, if that customer, is an important customer and we want to develop it, so grow it, than that just matters." (Supplier 3, p. 6). Further, job-fit also played a role in EDI implementation intention, overlapping with the codes of "perceived usefulness and outcome expectations" as all these codes were previously mentioned in other code groups. As Table 10 shows, "spend time on value-adding or important activities" is mentioned by eleven out of eighteen interviewees and deemed important by both suppliers and internal interviewees.

The last factor of performance expectancy is the relative advantage the innovation or technology offers. In this code group there were also many codes which were categorized in other code groups as well. According to interviewees, a relative advantage EDI offers is "reduction of labor". This reduction of labor was often mentioned together with "no/less manual interference" as EDI implementation offers labor reduction due to no or less manual interference in the P2P process. Supplier 7 stated EDI implementation could save 60 to 70 percent of work at order intake (p. 5). The reduction of labor was emphasized by supplier 6: "on the front end, we don't have people in it. So I'm actually saving on FTEs" (Supplier 6, p. 3). Another two codes related to each other are "increased reliability" and "insight and transparency". One case company employee pointed out that there is a wish to gain more insight in cash outflows and EDI could be helpful in this (Supplier 8, p. 6).

During coding and analyzing the data, it became clear that the environmental constructs had too much overlap or did not occur at all. Therefore, the variable was renamed "environmental and organizational factors". Meaning there are other, non-effort expectancy or performance expectancy factors, possibly influencing the intention to implement EDI (Table 11). During coding, some changes were made with the code groups or categories as this suited the codes better. This led to the code group "external support", adapted from the factor "customer readiness and support". The group "innovative needs" was unused as there were no corresponding codes. The first code group for environmental factors is "external support", existing of only four codes. These codes were mostly mentioned only a few times and mentioned the most frequent by suppliers. The code mentioned the most frequent, only three times, is "help supplier/customer implement EDI", which intern 7 explained as follows: "who can support in connecting that, what IT knowledge there is or how certain things should be generated, exploited. … If we want to, we should also facilitate some to help customers, or take a supplier along in that, to support" (Intern 7, p. 11).

Table 11: Environmental and organizational factors and codes ((#) is total quotes)

Environmental and organizational factors					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
External support					
Help supplier/customer implement EDI	1	2	3 (3)	6	2, 7
Competitive pressure and trading partner imposition					
Environmental pressure	4	3	7 (7)	2, 4, 8, 9	1, 3, 5
Demands from supplier/customer	1	2	3 (3)	7	4, 7
Customer pressure	3	0	3 (3)	1, 5, 10	-

The second environmental factors category is "competitive pressure and trading partner imposition". 17 codes are in this category with most codes being mentioned only a few times. The most frequently mentioned code "environmental pressure" was mentioned by six out of seven interviewees in a way that they do not experience environmental pressure. This was e.g. emphasized by intern 3 as he stated that EDI is an internal matter: "No. That is really an internal matter and also from the customers' point of view I don't think we are lagging behind in that" (Intern 3, p. 8). Furthermore, interviewees tend to formulate the environmental pressure in a different way. As supplier 3 stated he prefers to create that pressure instead of being subject to pressure: "I don't know if that's really … pressure from competitors because I would prefer to create that pressure myself" (Supplier 3, p. 8).

The third possible variable affecting EDI intention is effort expectancy, which Table 12 visualizes. Effort expectancy is composed of the code groups "perceived ease of use and implementation" and "complexity". These code groups were changed during coding as these names would cover the codes better. The code group "ease of use" was omitted due to too much overlap with other groups. The most frequently mentioned code "relate effort to the complexity and turnover of the customer/supplier" was mentioned by eleven interviewees and was also categorized in "organizational and product aspects" and "complexity" and is explained later. Concerning the effort organizations want to spend on EDI implementation, four interviewees of the case company prefer to and/or advise to "start with easy implementation" (Intern 4, 5, 7, and 8). Intern 7 stated: "that in doing so, you also develop a learning curve for yourself and then slowly start connecting suppliers that are more difficult" (Intern 7, p. 6). Complexity is the last category from effort expectancy possibly affecting the behavioral intention to implement EDI. The most frequently mentioned code was "relate effort to the complexity and turnover of the customer/supplier". This complexity focuses e.g. on the complexity of type of products and processes and is further explained in the "organizational and product aspects" category. Related to complexity, three employees of the case company stated that the "EDI connection must be simple", intern 7 stated: "I think, that the connection itself should be simple, ... that the intelligence is in the systems and not so much in, in the connection" (Intern 7, p. 11). To conclude "complexity", the codes "EDI implementation is not difficult" and "EDI is a simple technology" are also related to "complexity" but these will be further explained later on in the code group "innovation characteristics and standard format acceptance and diffusion".

Table 12: Effort expectancy factors and codes ((#) is total quotes)

Effort expectancy					
Code	**Supplier**	**Case**	**Total**	**Interviewee Supplier**	**Interviewee Intern**
Perceived ease of use and implementation					
Relate effort to the complexity and turnover of the customer/supplier	7	4	11 (20)	1, 2, 3, 4, 7, 8, 9	1, 2, 6, 7
Start with easy implementation	0	4	4 (4)	-	4, 5, 7, 8
Start with high turnover and easy implementation	1	2	3 (3)	7	3, 7
Complexity					
EDI connection must be simple	0	3	3 (4)	-	6, 7, 8
EDI implementation is not difficult	1	1	2 (6)	6	4

4.2.2 Relational and product and organizational factors seem to moderate the intention to implement EDI as number of order lines and a good relationship are intention strengthening factors

The data revealed moderating factors on the behavioral intention to implement EDI. During coding it became clear that "organizational aspects" was too specific as there might also be product aspects possibly influencing the intention. Therefore this category was renamed to "organizational and product aspects". As visible in Table 13, the "volume of orders/order lines" and "turnover/size of customer/supplier" were mentioned the most frequent. Nine out of ten suppliers pointed out that these factors play a moderating role in their intention to implement EDI with a customer. An example of a supplier mentioning these two codes is supplier 6: "Well, first I'm going to look at how many orders, how many order lines are ordered. Is the customer large? Does it involve a lot of sales? That's the first step anyway" (Supplier 6, p. 2). Suppliers state that implementing EDI among other factors depends on the turnover or number of order lines of a customer as the investment should be profitable which differs per customer. This motivation was also powered by the fact that implementing EDI with the biggest suppliers delivers the biggest results and corresponding benefits. On the contrary, one case company employee advises to start with small suppliers to ensure a smooth implementation (Intern 8, p. 6). The second potential moderating category is "relational aspects". These codes were mentioned less often than "organizational and product aspects" by the interviewees. Half of the interviewees stated that "collaboration and relationship decisive in EDI implementation". Reasons for this are trust and a good partnership before the EDI implementation. Supplier 8 stated about this: "it also indicates something about the partnership you have with each other as a company, et cetera. You do

bind to each other ... the commitment you make to each other also speaks for continuity in the future" (Supplier 8, p. 13). Besides the current relationship, improving the relationship with the supplier or customer might also increase intention. This investment in the relationship might make it more difficult to switch to another supplier (Supplier 1, p. 8; intern 3, p. 5). Further, the "importance of customer" could play a role, which tends towards preferred customer status (Table 14). Preferred customer status is closely related to relational aspects. In some interviews the definition or importance of preferred customer status was emphasized. Five interviewees gave some kind of definition of preferred customer status stating that they e.g. give them better resources. One supplier stated that their intention to implement EDI might be customer relation specific as he stated: "we offer that to certain customers … You're going to use your classification and that ranking of course" (Supplier 3, p. 7). Concluding, preferred customer status is not of an influence for two suppliers whereas the most suppliers did not clarify a specific effect of preferred customer status on their intention to implement EDI.

Table 13: Organizational and product aspects codes ((#) is total quotes)

Moderating variables					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
Organizational and product aspects					
Volume of orders/order lines	9	5	14 (34)	1, 2, 3, 5, 6, 7, 8, 9, 10	1, 3, 6, 7, 8
Turnover/size of customer/supplier	9	5	14 (33)	1, 2, 3, 4, 6, 7, 8, 9, 10	1, 2, 3, 6, 7
Type of product	4	2	6 (6)	1, 4, 9, 10	3, 7
Relational aspects					
Collaboration and relationship decisive in EDI implementation	5	4	9 (11)	2, 3, 5, 8, 10	1, 2, 3, 6
Increase/improve customer/supplier relationship	4	2	6 (10)	1, 3, 5, 10	1, 3
Importance of customer	4	2	6 (7)	1, 2, 3, 7	1, 2
Supplier reliability	2	4	6 (7)	6, 8	3, 6, 7, 8

Table 14: Preferred customer status codes

Preferred customer status					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Preferred customer status meaning	5	0	5 (5)	2, 3, 5, 8, 9	-
Preferred customer status	2	2	4 (4)	1, 3	1, 2
Preferred customer status no influence on EDI decision-making	2	0	2 (2)	2, 5	-

4.2.3 RPA is seen as a valuable addition to EDI as it could be implemented together to create a higher effectivity and improve back-office processes

During the interviews questions were asked about RPA and its effect on EDI implementation (intention). Multiple interviewees were not familiar with RPA and although a small introduction about RPA was given, the majority of interviewees had difficulties answering the questions about RPA. This led to a small number of quotations compared to the other categories. Table 15 shows the code groups and codes related to RPA. Most of the interviewees stated that RPA could be seen as an addition to EDI, which can be shaped into multiple ways. First, RPA could be an addition in the P2P process to process data with organizations which are not capable of or do not support EDI. A case company employee described this situation: "It could be an addition. Yes, you sometimes have sources that you do want to pass through to suppliers via EDI, but they don't support it themselves" (Intern 4, p. 10). Second, RPA could be an addition to EDI in preparing the data which is send via EDI. Intern 5 explained this as follows: "have certain actions automatically handled that are internal, preparing the data for forwarding" (Intern 5, p. 7). As RPA was seen as an addition, multiple interviewees said that RPA and EDI could be implemented together to create higher effectivity. Intern 6 gave the following motivation for this: "for greater effectiveness that when implementing both that you make greater steps" (Intern 6, p. 8). However, intern 4 stated: "I would set up that EDI connection first and only then get the RPA involved. Then the existing link is already set up and working, and then you could add RPA to do the same for other sources" (Intern 4, p. 10). In this way, RPA could be seen as an alternative. The interviewees were almost equally divided over the role of RPA as an EDI substitute as the code "RPA as a substitute" applied for five interviewees and the code "RPA not as a substitute" applied for six interviewees. Supplier 2 saw RPA as a substitute for EDI: "then that could very well be the case as well. What convenience offers, I have an interest in orders and (case company) has an interest in convenience (Supplier 2, p. 10). On the opposite, intern 4 stated about the possibility of substituting: "That would be more cumbersome right" (Intern 4, p. 10), therefore indicating that RPA would be not necessary and not a possible substitution.

Continuing on the effect of RPA on EDI implementation, some interviewees familiar with RPA mentioned specific benefits of RPA. These benefits were similar to EDI as this led to the codes "RPA leads to a higher speed/time reduction", "RPA leads to better

information", and "RPA leads to error reduction". Intern 3 stated that RPA could improve their process by keeping the data of good quality: "I think it's an addition to automatic data, which is an important prerequisite, to keep your data good" (Intern 3, p. 9). Further, almost half of the interviewees described that RPA has no impact on EDI and see the implementation of RPA and EDI as separate things, as supplier 6 stated: "I really see those as separate at the moment" (Supplier 6, p. 12). Another supplier stated that, although RPA is a newer technology, he would skip RPA and implement EDI: "we prefer to skip RPA and go straight to EDI" (Supplier 5, p. 11).

Table 15: RPA code groups and codes ((#) is total quotes)

Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
RPA as addition to EDI					
RPA as an addition	5	7	12 (18)	1, 2, 4, 8, 10	1, 3, 4, 5, 6, 7, 8
RPA and EDI together for higher effectivity	3	4	7 (7)	1, 2, 6	1, 3, 5, 6
RPA as EDI alternative					
RPA is an alternative	3	0	3 (4)	3, 6, 8	-
RPA can do repetitive tasks (not suited for EDI)	2	1	3 (3)	7, 10	7
RPA as EDI substitute					
RPA not as a substitute	1	4	5 (6)	8	1, 2, 4, 5
RPA as a substitute	4	1	5 (5)	1, 2, 3, 9	2
RPA benefits					
RPA leads to better information	1	2	3 (3)	4	3, 6
RPA leads to a higher speed/time reduction	0	2	2 (4)	-	6, 8
RPA leads to error reduction	1	1	1 (1)	4	6
RPA impact on EDI					
RPA no impact on EDI	6	2	8 (11)	1, 4, 5, 6, 7, 10	2, 8
RPA other technology than EDI	3	1	4 (5)	6, 7, 8	7
RPA other					
RPA not necessary	2	1	3 (3)	5, 7	4

4.2.4 Technological and organizational facilitators both influence implementation success as organizations should possess certain factors to be able to implement EDI successfully

After there is intention to implement EDI, the implementation phase starts and for this, interviewees were asked to mention aspects which are necessary or facilitating or inhibiting EDI implementation. These facilitators and inhibitors were divided into two

overarching groups, organizational facilitators and technological facilitators. Within these groups multiple code groups or categories were identified with subsequent codes. Changes were made in the names of different code groups as some codes would fit better in another group. This led to e.g. the deletion of code group "lack of IT drivers" which was included into "(IT) knowledge, competence, capacity and drivers". Table 16 shows the organizational facilitators factors and most important codes.

The first category within organizational facilitators is "(IT) knowledge, competence, capacity and drivers", composed of sixteen unique codes. With fifteen interviewees, including all suppliers, emphasizing on the point "IT capability of customer/supplier", the importance is underlined. Examples of this IT capability can be the right expertise in IT and the abilities of communication. Supplier 4 explained this IT capability as follows: "The customer who, who has to be able to handle it for us, that's one of the most important conditions. He has to be able to handle … a means of communication, ... and must be able to send an order format" (Supplier 4, p. 5). When there is no right IT capability in one or both companies it could inhibit EDI implementation. Closely connected to "IT capability of customer/supplier" is the "IT knowledge of customer/supplier". Besides the capability, the availability of IT knowledge within an organization could play a role in implementation. Intern 7 explained this IT knowledge as follows: "to what extent the people are at the supplier, who can support in connecting that, representing IT knowledge" (Intern 7, p. 11). Surprisingly, this knowledge does not always have to be inside the company as it can also be taken from outside the company as intern 7 stated: "there we do not need to bring knowledge, can also collect knowledge" (Intern 7, p. 11). Another factor possibly facilitating or inhibiting EDI implementation is the "security (of the EDI connection)". Companies should be capable of building a secure EDI connection. The code "security (of the EDI connection)" is further explained in the "technical infrastructure" code group as this code was categorized in multiple groups. Half of the interviewees stated "experience with EDI connections" could be facilitating when implementing EDI. This experience could be inside or outside the organization. By having experience, they stated this would make implementation easier as certain knowledge or capability would be available. This experience in connecting was underlined by supplier 1: "Well, what does matter is the ability and experiences one has in terms of linking to EDI" (Supplier 1, p. 9).

Table 16: Organizational facilitators factors and codes ((#) is total quotes)

Organizational facilitators					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
(IT) knowledge, competence, capacity and drivers					
IT capability of customer/supplier	10	5	15 (39)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 4, 5, 7
IT knowledge of customer/supplier	7	3	10 (21)	2, 3, 4, 5, 6, 7, 10	2, 3, 7
Experience with EDI connections	6	4	10 (19)	1, 2, 3, 5, 6, 10	2, 3, 5, 7
Security (of the EDI connection)	2	5	7 (21)	2, 10	2, 4, 5, 6, 7
IT capacity of customer/supplier	4	3	7 (12)	1, 3, 4, 7	1, 3, 7
Change skills, commitment, and support or resistance					
Support/resistance within the organization	2	7	9 (14)	1, 9	1, 2, 3, 4, 5, 6, 7
Willingness in organization or suppliers	4	5	9 (13)	1, 2, 4, 10	1, 2, 3, 5, 6
Willingness improves implementation	5	3	8 (9)	1, 2, 3, 6, 9	1, 3, 6
To get everybody on the same page	3	4	7 (8)	1, 2, 8	1, 4, 5, 8
Organizational communication and agreements					
Make clear agreements	9	5	14 (35)	1, 2, 3, 4, 5, 6, 7, 8, 10	2, 4, 5, 7
Define and match expectations and goals	6	5	11 (18)	1, 2, 4, 6, 8, 10	1, 2, 3, 4, 5
Type of messages send	6	3	9 (23)	1, 3, 6, 7, 8, 10	2, 6, 7
Communication between supplier and customer	6	3	9 (17)	1, 4 ,6, 7, 8, 10	1, 2, 3
Management support					
Management support	1	3	4 (7)	4	1, 2, 4
Management initiating EDI projects	0	1	1 (1)	-	4
Financial resources and organizational size					
Availability of (the right) people	3	3	6 (7)	1, 3, 6	1, 3, 7
Organizational resources	1	2	3 (7)	3	1, 7
Organizational size	1	2	3 (5)	2	1, 2
Innovative needs					
-	-	-	-	-	-

The second code group "Change skills, commitment, and support or resistance" is composed of 18 unique codes. Codes in this category were predominantly counted at case company interviewees. Two codes frequently mentioned in the interviews were the "support/resistance within the organization" and "to get everybody on the same page". Interviewees emphasized that it is vital for the implementation of innovations as EDI that people in the organization support it and everybody is on the same page. When these factors are lacking they could inhibit the implementation of EDI as resistance towards an innovation makes implementation more difficult. This support needs to be in the organization but more important, from the people who have to work with it: "the people who have to work with it, think that's important. Yeah, sure, that you're on the same page there" (Supplier 1, p. 4). That

everybody is on the same page is strongly connected with the goal of implementation according to intern 1, as he stated: "you have to make sure that the noses are in the same direction and that the goal is clear to everyone" (Intern 1, p. 10). These goals can be used as a guide for everyone to work towards those goals and achieve success. Almost half of the interviewees underlined that "willingness improves implementation". Intern 1 explained this the best, he stated: "the internal willingness just has to be good. If that is good and everyone sees the added value and everyone wants to implement EDI, everyone will do their best to make it a success" (Intern 1, p. 12). Therefore, stating that when everyone is willing to make that change and implement a new technology this improves the implementation.

The third organizational facilitators code group is "Organizational communication and agreements", which includes eleven unique codes. Part of this category is the code "make clear agreements", being counted among nine supplier and five case company interviewees. These agreements can be applied on a broad array of aspects as these can focus on e.g. the implementation itself, the data exchange, or the information send in the data. Examples of agreements were, among others, given by supplier 2 and intern 2: "but with order intake, there is always the need for an agreement on a delivery date. So you have to be able to make good agreements about that" (Supplier 2, p. 11), "you need to make clear agreements about the data that will be carried" (Intern 2, p. 3). Also, agreements need to be made on factors regarding changes in the process between buyer and supplier, as supplier 8 stated: "in particular, the message volume must be agreed in advance. It may be that due to an EDI implementation, the message volume will deviate from the original" (Supplier 8, p. 16).

Besides the importance of making clear agreements, the majority of interviewees stated that it is important to "define and match expectations and goals". These expectations and goals are related to e.g. the message flow, type of message, and service level. All these things need to be defined and agreed on before the implementation to facilitate the implementation project. Supplier 8 clarified these factors to be defined as follows: "actually do, align the message flow in advance so when do you order? How do you order et cetera, things like that. So particularly the time of ordering, and then per message type" (Supplier 8, p. 16). Intern 2 advised to make a project description beforehand in which goals and actions are defined: "it's wise to do anyway to do some kind of project description

beforehand and just map it out clearly. What are your goals, just a project plan" (Intern 2, p. 14). Another code frequently mentioned is the "type of messages send", counted at half of the interviewees. This is a point of which clear agreements need to be made and goals need to be set. Supplier 6 summarized this as: "that we have a good communication about yes what we want to achieve, what documents we will eventually exchange with each other and actually take the win together" (Supplier 6, p. 13). These types of messages are the messages send between the organizations and can be e.g. the purchase order, order confirmation and invoice. During the implementation phase, good communication between the supplier can facilitate the implementation according to half of the interviewees. Supplier 7 summarized this as: "Communication is very important, that you really say, okay, we are going to implement it now, in between we will have contact moments, and well coordinate with each other when we will do what" (Supplier 7, p. 12).

The last three organizational facilitating and inhibiting categories are "management support", "financial resources and organizational size", and "innovative needs". All codes in these code groups were not mentioned by more than one third of all interviewees. For "innovative needs" no codes were identified in the interviews and for "management support", two codes were identified. Intern 2 stated: "I think, support from management is of course the most important thing in it" (Intern 2, p. 11). One case company employee did go even further and stated that management should be the initiator or pacemaker of innovations therefore facilitating implementation (Intern 4, p. 12). "Financial resources and organizational size" is composed of three codes. The first, and most frequently mentioned code, is "availability of (the right) people" which was also mentioned in the "technical infrastructure" code group and intern 1 stated: "yes and sure you need people, you need time from the people who are involved in that" (Intern 1, p. 10). "Organizational resources" are tightly connected with e.g. the availability of people, IT capacity. As organizations need these resources to successfully implement EDI (Supplier 3 and intern 1 and 7). This organizational size is also connected to the organizational resources, as supplier 2 stated: "and that you have a lot of small companies, there is of course no digitalization knowledge there either, it always has to come from outside" (Supplier 2, p. 5). Meaning that small companies do not have the knowledge or capacity to implement technologies as EDI therefore stating that size could play a facilitating or inhibiting role in EDI implementation.

Table 17: Technological facilitators factors and codes ((#) is total quotes)

Technological facilitators					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Innovation characteristics and standard format acceptance and diffusion					
Use of an EDI standard/format	6	4	10 (20)	2, 3, 6, 7, 8, 10	2, 4, 5, 7
EDI standard/format capability	3	2	5 (13)	6, 7, 8	4, 7
EDI is a robust, proven technology	2	2	4 (6)	7, 8	4, 7
Technology training					
Train and guide employees	0	4	4 (6)	-	1, 2, 5, 8
Technical infrastructure					
ERP capability of customer/supplier	5	4	9 (19)	1, 4, 5, 6, 8	1, 4, 6, 7
Availability of (the right) people	3	3	6 (7)	1, 3, 6	1, 3, 7

Besides organizational factors, technological factors might have an effect on EDI implementation. Within this overarching category, three code groups or categories exist, which Table 17 shows. For "innovation characteristics and standard format acceptance and diffusion", the most frequently mentioned code was "use of an EDI standard/format", mentioned in ten different interviews, highlighting this as an important prerequisite and facilitating factor. Supplier 7 stated on this: "if you meet the standard well and the customer meets the standard well, then implementation is also very easy" (Supplier 7, p. 11). This was also underlined by a case company employee who took it even one step further. He stated that when implementing EDI with small suppliers, use of a format should be enforced as customization on each connection is unfeasible: "as you move forward with smaller suppliers, you actually have to enforce some sort of a format on suppliers that they meet in order to connect them, because you can't provide customization there" (Intern 7, p. 2). Related to this use of an EDI standard/format is the "EDI standard/format capability". In total five interviewees stated that both organizations should be capable of working with the standard or format. One supplier even stated: "the most important prerequisite is, especially the standards we can handle. To the incoming message and the outgoing message" (Supplier 8, p. 4).

The second technological facilitators and inhibitors code group is "technology training" consisting of only one code: "train and guide employees". This code was not mentioned by suppliers at all but half of the case company interviewees stated they think it is important to train and guide employees to be able to work with the EDI technology and changed processes. Intern 8 saw this as one of the most important starting points to be able to implement EDI successfully: "I expect that anyway: suppose it is implemented. Yeah,

sure, they have to have some kind of course anyway. ... certainly, that's where it starts" (Intern 8, p. 5). The last category is "technical infrastructure", composed of five codes with two codes being mentioned frequently. "security (of the EDI connection)" was also categorized in the "(IT) knowledge, competence, capacity and drivers" code group as the organization should have the knowledge, competence, and capacity to build a secure EDI connection. In the interviews the security is not described as a facilitator but as an inhibitor. Because bad security of the EDI connection could inhibit the implementation and some interviewees see this as a top priority. The security of the EDI connection was predominantly emphasized in case company interviews. Intern 7 explained this as follows: "the security has to be good, because you're going to be making connections to the outside. They just have to be super secure. That should also really be a special topic" (Intern 7, p. 4). Another factor focusing on the technical infrastructure was the "ERP capability of customer/supplier". Half of the interviewees stated that the ERP systems of the organizations should be capable of connecting via EDI. There is also an equal division among the supplier and case company interviewees as at both groups half of the interviewees see the ERP capability as a facilitating or inhibiting factor.

4.2.5   Investment, data, and necessity can be marked as important additional findings missing in the literature review

In the previous sections the results were presented according to certain categories or code groups predefined from the literature. The interviews revealed additional findings which could have an influence on intention or implementation leading to the composition of additional categories (Table 18). The first category "investment" was composed of 24 codes related to the investment companies have to make for implementing EDI. These investments can be monetary as well as time and effort. The first code "weighing costs and benefits" was mentioned by more than two third of the interviewees and mentioned earlier as an important factor on behavioral intention. This is not an outcome expectation of EDI implementation, but this was deemed as a decisive factor in intention. Some mentioned this as one of the most important qualifiers: "of course it costs money to for both parties and then the number of orders you do with each other must be interesting enough to get that benefit from it" (Supplier 1, p. 3). This cost/benefit analysis is also performed on a customer-specific basis as other factors might also play a role in the decision. This was further explained by supplier 4: "in any case, we are going to examine this on a customer-specific basis. What I already

indicated is that you have to set costs and benefits against each other" (Supplier 4, p. 4). Almost all suppliers stated this was one of their main decision points when a customer wants an EDI connection. Besides the monetary investment, time investment was seen as an important facilitator by the interviewees as sufficient time is necessary to make the connection successful. Intern 3 expected it will take quite some time while on the other hand some thought it is only a matter of days. Related to investment was the willingness to make an investment as a "customer/supplier should be willing to make an investment", closely relating to the intention to implement EDI. Several interviewees stated that this is necessary as they do not want to start an implementation project with another organization if it is not 100% committed.

Continuing on factors possibly influencing the intention to implement EDI, the category "necessity" was created. Three interviewees stated they or their supplier/customer had not implemented EDI yet due to a lack of necessity. Supplier 7, who was very pleased with EDI for their company, stated: "because I think they, a lot of customers I don't think they see the necessity of it" (Supplier 7, p. 4). As explained earlier, factors as performance expectancy, environmental factors, and effort expectancy could influence the intention to implement EDI. Adding on this, some interviewees stated necessity could increase intention. This could be closely related to environmental factors as e.g. competitors might have EDI with their customers creating necessity for a company. This necessity was underlined by intern 7 in a way of trying to better: "we are always looking for how things can be better and faster. That's where EDI can just have a significant contribution, we've recognized that. It simply has to happen" (Intern 7, p. 6). Two codes related to necessity possibly leading to a higher intention or better implementation are "higher necessity leads to better implementation" and "customer should be aware of necessity". This necessity was deemed vital by some interviewees as otherwise the motivation to implement will be lower. These two codes were summarized by supplier 7: "the customer must see the necessity of it, … we have no intention of convincing the customer to switch to EDI, … that should already be a decided thing … then the implementation and the effort of the customer is then also easier" (Supplier 7, p. 4).

Some interviewees also emphasized prerequisites and requirements the supplier, customer, or EDI connection should have. One frequently mentioned code is "data quality",

mentioned by half of the interviewees. As the EDI connection is about sending data between organizations this was emphasized as an important prerequisite together with the code "datasets of customer and supplier should be the same". Half of the interviewees emphasized that the datasets between the organizations should be the same to prevent errors. Intern 7 emphasized this as follows: "our quality of data ... because if your own data is not correct, then you're going to order very strange things" (Intern 7, p. 4). An example of this data quality and equality within systems was given by supplier 8:

> if you are ordering pieces it is quite easy. But if you order meters, it has to be done in a proper way. If you order one piece of an article, which is delivered to us as a package with three in it, then this also has to be done in a proper way (Supplier 8, p. 11).

He emphasized that as there is a connection between the companies no interpretation or translation can be done by the systems, so data needs to be good to prevent wrong orders. Continuing on the datasets which should be the same, multiple interviewees underlined this as an important prerequisite. Further examples given by the interviewees are correct e.g. items numbers and prices: "that the first prerequisite is that everything that (case company) orders from (name company) is also set up with item numbers, customer item numbers, prices, eh, so that should all be set up correctly" (Supplier 9, p. 2). Intern 3 stated that this is such an important prerequisite, if this is not present, the implementation will fail. Besides certain prerequisites, there might also be barriers when implementing EDI between organizations. But, as emphasized earlier, multiple interviewees already stated they are "willing to change habits/remove barriers". These barriers and challenges are further emphasized in the Appendix as they do not directly fit into the research model.

Another additional category was "country and (organizational) culture", consisting of five codes. Sometimes interviewees, predominantly case company interviewees, mentioned differences in country of origin or culture regarding the intention and implementation of EDI. These codes were mentioned very infrequently therefore being emphasized in the Appendix further.

The last additional code group is "data". All codes from this group were also categorized in other code groups, overlapping the most with "prerequisites and requirements for implementation". As almost all codes were explained at earlier sections, only the code "other way to share data with suppliers" is explained. Interviewees emphasizing on this point stated e.g. that it might be difficult to send additional data as drawings or models between organizations via EDI (Intern 7, p. 3). Therefore, an additional system or functionality might be needed to share such data with suppliers or customers.

Table 18: Additional findings top codes ((#) is total quotes)

Additional findings					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Investment					
Time investment	5	3	8 (15)	1, 3, 5, 6, 9	3, 5, 8
Investment	3	4	7 (12)	1, 3, 6	1, 2, 5, 7
Customer/supplier should be willing to make an investment	3	2	5 (8)	3, 4, 5	1, 6
Necessity					
(Not implemented because of) lack of necessity	2	1	3 (4)	3, 7	8
Higher necessity leads to better implementation	1	2	3 (3)	7	2, 5
Necessity increasing intention	1	2	3 (3)	10	1, 7
Organizational demands					
Company policy to connect customers with EDI	2	0	2 (2)	5, 6	-
Country and (organizational) culture					
German suppliers have older IT systems/difficulties with automation	0	3	3 (3)	-	1, 2, 3
Dutch companies are more willing to implement EDI	0	1	1 (1)	-	3
Prerequisites and requirements for implementation					
Data quality	3	6	9 (33)	1, 6, 8	1, 2, 3, 5, 6, 7
Datasets of customer and supplier should be the same	5	4	9 (27)	1, 4, 5, 6, 9	1, 3, 5, 7
Data or system reliability	0	5	5 (8)	-	1, 2, 6, 7, 8
Implementation barriers and challenges					
Willing to change habits/remove barriers	1	4	5 (8)	2	1, 3, 7, 8
There are no/not much barriers when implementing	1	2	3 (3)	5	4, 7
Data					
Other way to share data with suppliers	2	1	3 (4)	2, 3	7
Poor data quality leading to problems	2	0	2 (2)	1, 9	-

4.3   Results of the secondary data

Secondary data about the company and its suppliers was gathered to complement the empirical research. As many interviewees stated that the number of order lines is an important factor in EDI implementation intention this data was gathered. Table 7 visualizes the secondary data about the suppliers. The "years business partners" was asked in the interviews and the "number of order lines" and "annual purchase value (2021)" were extrapolated from data of 2021. To calculate these numbers, the data until July was taken and multiplied with 1,8. This would give a precise picture for the expected total number of order lines and purchase value for 2021. It was possible to use company data of 2020 but this data was inaccurate due to Covid-19. There were big differences regarding the number of order lines as one supplier is expected to deliver 113 order lines and another 19336. Further, the supplier with the most order lines is not the supplier with the highest purchase value making it difficult to see a relationship or influence between these numbers. As almost all suppliers stated that they think it is important to have sufficient order lines or turnover to set up an EDI connection, however it turns out that this is very company specific. As supplier 10 stated e.g. that the case company has sufficient order lines to set up an connection 113 order lines would probably be to less for (many) other suppliers. Finally, the length of the relationship could also be influential, as explained earlier. Just as with turnover, it is difficult to state that the length of a relationship influences intention.

4.4   Summarization of the main findings of the research suggest that perceived usefulness and outcome expectations together with organizational and products aspects influence behavioral intention the most

Summarizing the findings of the research, the most frequently mentioned codes are emphasized in this section. The tables regarding the summarization can be found in Appendix E. Regarding the behavioral intention, Table 37 shows the top 10 codes. The most frequently mentioned codes were the "higher speed" and "reduction of errors". These two aspects seem to drive the intention to implement EDI the most. Related to that benefit is the possible efficiency improvement mentioned by eleven interviewees. Further, other benefits as "spend time on value-adding or important activities", "time reduction", "reduction of labor", "no/less manual interference", and "insight and transparency" were all mentioned by (almost) half or more than half of the interviewees. As visible in Table 37, almost all top codes were from the performance expectancy variable. Only "weighing costs and benefits"

and "time investment" were codes not related to the performance expectancy of EDI. Thirteen interviewees see weighing costs and benefits as an important step before implementation as they first want to examine if the benefits outweigh the costs.

Summarizing the intention moderators, which Table 38 shows, only three codes were mentioned by more than half of the interviewees. The most important moderators were "volume of orders/order lines" and "turnover/size of customer/supplier". Companies were more willing to implement EDI with another organization if that other organization has sufficient orders or turnover. Meaning that more order lines or a higher turnover increase the intention to implement EDI. Related to turnover is the complexity and the effort an implementing organization wants to put into an implementation project. Eleven out of eighteen interviewees stated they will "relate effort to the complexity and turnover of the customer/supplier". This code was closely connected to "weighing costs and benefits" as companies weigh these costs and benefits specifically per organization they intend to connect. The majority of moderating factors was from the "relational aspects" code group. Interviewees were divided regarding the effect of the relationship between buyer and supplier as multiple top codes underline the importance of relationship. Half of the interviewees stated that collaboration and relationship are decisive in EDI implementation, underlining the importance. On the contrary, one of the top 10 codes is that relational aspects do not play a role in intention to implement EDI. Further, supplier reliability and the importance of a customer could increase or decrease intention as well.

Finally, there were certain factors which could facilitate or inhibit the implementation of EDI between and in organizations. These factors, shown in Table 39 were divided over two overarching groups and during coding the group "data" was added. The majority of the most frequently mentioned codes were organizational facilitators. According to the interviewees, the "IT capability of customer/supplier" is an important factor affecting EDI implementation success, being mentioned by fifteen interviewees. Another frequently mentioned code was "make clear arguments", mentioned by fourteen interviewees. Regarding the other facilitating or inhibiting factors, multiple factors were mentioned by half or more than half of the interviewees. Meaning there are multiple important factors to pay attention to. Also, the importance of data was underlined as data should be of sufficient quality and datasets should be the same in both organizations. When these factors are

insufficient, this could inhibit the implementation. Other important factors which could facilitate or inhibit the implementation were support or resistance and the willingness in the organization.

4.5 New framework constructed with the addition new variables and factors

In the literature review, the UTAUT and TOE frameworks were combined leading to the theoretical framework for this research shown in Figure 4. The empirical research led to new findings changing and adding variables and categories leading to a more comprehensive model which is Figure 5. Two types of lines are shown in the model. Arrows mean they influence the dependent variable. Dotted lines mean they could influence the dependent variable but outcomes from this research were not significant to state they have an influence. Further, changes made after the empirical research are highlighted in green and constructs not found in the empirical research are highlighted in orange. To show the importance among factors, factors within variables are ranked from most important to less important. Further, a S or C is added to show if the case company interviewees or the suppliers rated this as important. Meaning that for a factor with a S in front, suppliers rated this factor higher than case company interviewees.
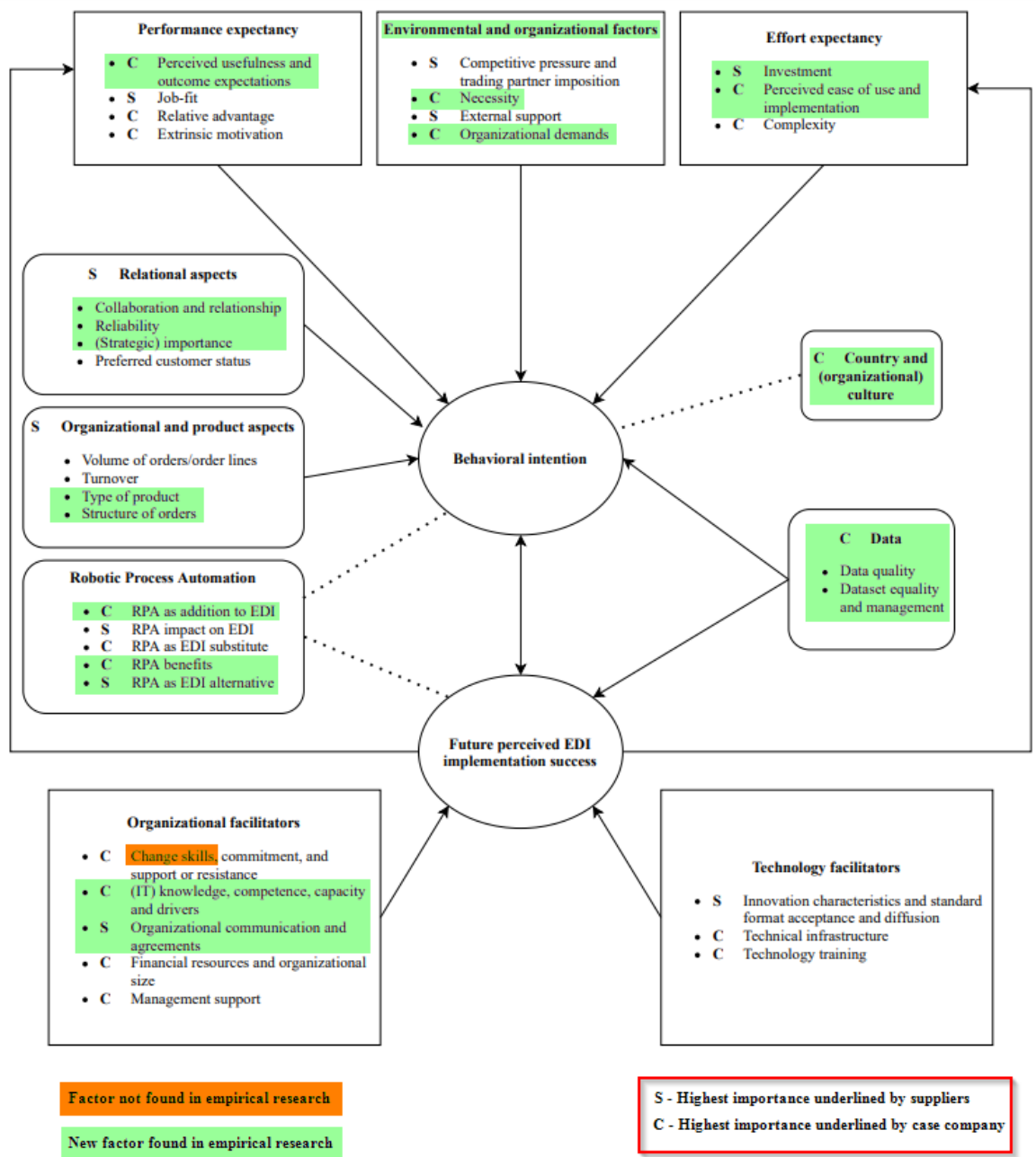
Figure 5: New framework after research

5 Discussion of the findings and new framework constructed after the empirical research

In this chapter, the literature review will be compared to the results of the empirical research. During the empirical research it became clear that there is much overlap between the literature and the sample. Additionally, new factors which were not found in the literature were added to the model after the empirical research. In the following sections all independent variables on behavioral intention and future perceived EDI implementation success will be discussed.

5.1 Performance expectancy of the UTAUT are mainly benefits motivating companies to implement EDI

In the literature review the frameworks of Venkatesh et al. (2003, p. 447) and Tornatzky and Fleischer (1990, p. 153) were introduced and combined into one theoretical framework for this research. According to Venkatesh et al. (2003, p. 447), performance expectancy, effort expectancy, and social influence influence the behavioral intention to implement a new technology. The performance expectancy variable in the UTAUT is composed of five constructs which were all identified in the interviews. These constructs all relate to benefits earlier mentioned in the literature. As the most important performance expectancy codes are e.g. "efficiency", "reduction of errors", "higher speed", and "time reduction". E.g. the avoidance of errors, is mentioned by Jardini et al. (2016, p. 3); Jiménez and Muñoz (2006, p. 2206); Lummus (1997, p. 81); Lummus and Duclos (1995, p. 43); Vrbová et al. (2018, p. 188). The reduction of labor is closely related to the reduction of administrative personnel and avoidance of repetitive administrative procedures which were mentioned in ten papers. But interviewees stated that this reduction of labor would not directly lead to job cuts but to changes of functions or tasks as EDI would offer the possibility to "spend time on value-adding or important activities". This repetitive work was seen as a burden and by implementing EDI employees could perform e.g. more commercially oriented tasks instead of administrative oriented.

Paper savings frequently appeared in the literature but did not appear in the interviews what might have been caused by the substitution of paper by e.g. e-mail before the introduction of EDI. Further, the literature review highlighted the benefit "avoiding production stoppages resulting from lack of material" and was not mentioned by the

interviewees as a motivation to set up an EDI connection. Also, the reduction of the P2P cycle, frequently cited in the literature, was not mentioned by the interviewees and one interviewee even stated that the P2P would not be reduced. On the contrary, EDI might lead to "higher speed" and "time reduction" which can be related to the reduction of the P2P cycle. It might be that these benefits were not mentioned in relation to P2P cycle reduction but more in an universal way.

The interviewees also underlined some strategic benefits as increasing business relationships and improving the quality and quantity of information. Strategic benefits as gaining new business contacts using EDI and reducing the number of business contacts by concentrating on those that use EDU were not mentioned by the interviewees. Regarding the performance expectancy constructs from the theory, "perceived usefulness and outcome expectations" seemed to be the most important category. "Extrinsic motivation" was not mentioned frequently but could play a role as some companies would consider an EDI connection. Concluding on the benefits and performance expectancy, the results indicate overlap with the theory and expected performance benefits of EDI might motivate companies to invest in an EDI connection.

5.2 Effort expectancy seems less important than performance expectancy and investment is the most important factor regarding effort

On the contrary to performance expectancy is the variable effort expectancy according to Venkatesh et al. (2003, pp. 446-447). Effort expectancy is defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). This variable consisted of multiple constructs, namely perceived ease of use, complexity, and ease of use. As the theory only emphasized the use and complexity of the innovation were of importance regarding the behavioral intention the additional construct or category "investment" was added. Results from the empirical research indicate companies do not only look at implementation and use effort but put more weight on balancing costs and benefits, or weighing effort expectancy and performance expectancy. Meaning the effort they want to put in can be very high as long as those efforts outweigh the possible benefits of EDI implementation. Also, high costs or effort are accepted as long as it is profitable or the benefits outweigh the costs. The added category "investment" gave extra insight in the necessary or intention defining factors. As mentioned earlier, costs are important but also

the time investment should be acceptable. These investment costs also led to some barriers not identified in the literature review. One factor emphasized by the interviewees was the license or subscription costs to the EDI provider. These influence their intention a lot as multiple suppliers stated they do not intend to pay such costs. A standard format could be beneficial for this which will be explained later. Some suppliers stated high costs are not necessary or that higher costs than savings are acceptable. On the contrary there are interviewees which stated that costs are high and they play a big role in their EDI implementation decision. Concluding on effort expectancy, this seems to be of less importance in determining the intention to implement EDI whereas the most important factor within effort expectancy is "investment".

5.3 Environmental and organizational factors were of influence according to the literature and results with competitive pressure being the most important

In the UTAUT from Venkatesh et al. (2003) the factor social influence also influences the behavioral intention to implement a new technology. In the literature review this variable was reconstructed to environmental factors with three constructs "competitive pressure and trading partner imposition", "consumer readiness and support", and "innovative needs". These constructs were created according to the TOE framework. Competitive pressure was underlined by multiple scholars in the literature review (Baker, 2012, p. 235; Iacovou et al., 1995, p. 465; King & Teo, 1996, p. 50; Zhu et al., 2003, p. 251; 2006, p. 1557). Seven interviewees mentioned the code "environmental pressure", however this was mostly in a way that they do not experience environmental pressure to implement EDI. As explained in the results section, interviewees were divided over the effect of environmental factors as they stated there is but also that there is no environmental pressure. Customer pressure did also not seem to play a big role in EDI intention. One form of pressure which might become normal is the normalization of electronic ordering. Then the use of EDI becomes an obligation, but this does not influence intention as it is obligatory. This obligation shows similarities with the imposition by trading partners mentioned by Iacovou et al. (1995, p. 470). Premkumar et al. (1997, p. 116) showed that customer support could have a facilitating function in EDI implementation. Some interviewees stated they sometimes give advice or help other organizations to implement EDI in order to increase their intention to implement EDI. This is done to achieve benefits together. However, in the literature, this external support was not mentioned as often as in the interviews but might be

of an importance for some firms with limited size or resources having doubt about the implementation as Premkumar et al. (1997, p. 116) stated small firms sometimes seek for external support.

Besides the two mentioned constructs, there are two internal constructs related to this variable being "necessity", and "organizational demands". These two constructs were relatively small constructs as they were not mentioned by more than three interviewees. But this does not mean it could not influence the behavioral intention as e.g. some suppliers stated it is a company policy to connect customers with EDI. This company policy relates to the obligation towards customers. Furthermore, necessity might play a role in the intention as some interviewees stated they had not implemented EDI yet, because of a lack of necessity. This necessity also seemed to have an influence on implementation success as necessity could lead to better implementation which can be seen in relationship with an increased willingness and commitment.

5.4 Turnover, order lines and relationship seem to be the most influencing moderating variables

In the original UTAUT model several intention moderating variables were discussed. As these moderating variables were directed towards individuals and not towards organizations the variables were changed. Leading to the moderators "relational aspects" and "organizational aspects". During the empirical data collection and analysis another possible moderating factor, not mentioned in the literature review too, was found. Some interviewees stated the differences in country and (organizational) culture could have an influence on the intention or decision to implement EDI. As German suppliers are more inflexible and Dutch companies are more willing to implement EDI. But these aspects were all mentioned so little that it is difficult to generalize and draw a conclusion on this.

The results indicate that relational aspects seem to moderate or strengthen the intention as half of the interviewees stated collaboration and relationship are decisive in EDI implementation. On the contrary, five suppliers stated that relational aspects do not influence their intention to implement EDI with a customer. Taking these two things into account from a supplier perspective, relationships with customers matter but this differs per organization and how it sees it customers. Case company interviewees stated they think it is important to

have a good relationship with a supplier possibly caused by some form of dependency as the case company has many suppliers but most of them supply specific goods. Furthermore, supplier reliability possibly plays a moderating role as interviewees stated when they have to choose between different suppliers they would opt for the most reliable supplier. As EDI leads to less manual interference in the process, it is recommended to choose a supplier which does not require much manual interference yet to prevent problems. From a supplier perspective, the importance of the customer could influence the intention to implement EDI. This closely relates to preferred customer status which was sometimes mentioned as an aspect. But this preferred customer status was also often associated with the size of the case company. Some suppliers stated the case company is of such size that they would always prefer them. Connected to customer importance is customer potential or the ability to be supplier of a (prestigious) customer. When a customer has high potential or this customer has a good image in the market this possibly strengthens the intention to implement EDI. In the research model, the effect of the length of the business relationship was included but interviewees did not emphasize the influence of this. However, they stated that the future business relationship length is of importance. Yunitarini et al. (2018, Abstract) stated that businesses are adopting EDI to develop closer relationships with their business partners. This was acknowledged by one third of the interviewees. So, this makes the relationship moderating variable quite ambiguous as interviewees stated that relationship is a decisive factor but that they also might choose EDI to improve a relationship with a supplier or customer.

Finally, the other category moderating the behavioral intention was "organizational and product aspects". The majority of interviewees stated the volume of orders or order lines, and turnover are important factors to take into account when possibly setting up an EDI connection in order to make the costs outweigh the benefits. As was emphasized in the interviews, EDI connections mostly require one initial investment to set up the connection independent of the size of the connecting organizations. Therefore benefits will increase when the number of order lines is bigger as each order line normally takes some manual steps. Further, product type possibly has a strengthening or moderating effect on intention as some stated they would be more eager to implement EDI with an organization which buys or supplies catalogue products as non-catalogue items would require more data to be send. When more data needs to be send, more comprehensive formats and more agreements have

to be made taking additional time and money. This type of product is connected to order structure, as some suppliers stated they prefer to connect customers with simple orders which do not require much effort to process. Relating to some suppliers stating they prefer customers with a repetitive order flow as this might simplify implementation and brings down the initial investment.

5.5 Literature and results underline the potential of RPA to improve processes

In the literature review RPA was introduced as another technology which could replace a manual process with an automated process (Huang & Vasarhelyi, 2019, p. 3). The literature did not emphasize the connection between EDI and RPA and its possibilities and was researched in the interviews. RPA was proposed in two ways it could potentially have an influence on EDI intention or implementation. First, RPA was proposed as an addition to EDI as RPA offers the possibility to accelerate and improve back-office by processing data by robots (Aguirre & Rodriguez, 2017, p. 65). In this way, RPA could process the data before or after an EDI message is send. This possibility was acknowledged by interviewees as two third stated RPA could be an addition in the P2P process. This addition could be in two ways as RPA can be added to process data and second RPA can be used as an alternative for companies who are not capable of implementing or handling EDI (messages). As RPA could be an addition according to more than half of the interviewees, multiple interviewees stated they would possibly implement RPA and EDI together to create higher effectivity and increased benefits.

Second, RPA was proposed as an EDI substitute. In this way RPA would substitute an EDI connection for ordering goods at a supplier. This other option was not mentioned by the interviewees themselves. After this solution was proposed by the interviewer, six interviewees stated they do not see RPA as a substitute of EDI as it is cumbersome or leads to more work. Some mentioned it could be a substitute if it is easier to implement or more convenient and some gave no opinion. It is difficult to draw a conclusion on this as the interviewees were divided and did not have sufficient knowledge about the substitution role of RPA. Almost half of the interviewees stated RPA has no impact on EDI implementation. Stating they see these technology implementations as two different topics or that their intention to implement EDI would not be influenced by RPA.

Concluding, the results indicate RPA could be an addition to EDI which is in line with the literature review. If RPA should be implemented together with EDI and the impact that RPA has on EDI is unknown in this research, as interviewees were lacking knowledge on RPA or could not imagine such a project. Regarding the substitution of EDI by RPA it is also difficult to draw a conclusion as the interviewees were divided on this topic. Almost the majority of the interviewees stated RPA has no impact on EDI implementation and only a small part stated it has an impact. Further, interviewees stated they see the added value of RPA to speed up back-office processes, but it is not clear if RPA increases the intention to implement EDI. Interviewees however said they would probably implement both technologies together to create higher effectivity. Further research on RPA in specific should examine the influence that RPA has on EDI.

5.6 The TOE framework is extended by adding identifying extra technological and organizational facilitators and inhibitors

In the literature review, multiple constructs of the TOE framework were combined leading to a total of seven organizational facilitator and inhibitor categories of which five categories were found in the empirical research. The literature saw management support as a vital part of EDI implementation as there is no reason to try to force EDI into an organization and it would be difficult to obtain the adequate resources (Premkumar et al., 1997, p. 117; C. Watts et al., 1998, p. 13). It turned out that management support might be of less importance as it was emphasized by only four interviewees. Possibly caused by the fact that multiple organizations already had EDI connections so they were already supported by management and therefore neglecting this point. In the literature there was debate about the effect of size and financial resources of an organization. Chang et al. (2004, p. 636) stated that EDI is not an appropriate investment for smaller organizations as it is too expensive and lacks flexibility. Just as that Yunitarini et al. (2018, p. 122) stated that small companies are reluctant to implement EDI as the costs are greater than the benefits. On the contrary, C. Watts et al. (1998, p. 13) found that financial hurdles are not a barrier, or inhibitor, to implement EDI. In the interviews it became not clear if size and resources could play a role. Although it was argued in the theory that bigger size could be of an advantage, some interviewees stated size could be a disadvantage. To add on resources, the theory was the availability of (the right) people was underlined by interviewees but was not mentioned in specific in the theory.

Iacovou et al. (1995, p. 465) stated that the lack of technological skills within an organization could be an inhibitor of EDI implementation. This view was shared by the interviewees as most interviewees mentioned the importance of having have the right IT capability and having the right IT knowledge. This IT capability was even emphasized by all suppliers, therefore making it one of the most important facilitators or inhibitors of EDI implementation. This IT knowledge shows overlap with the organizational readiness mentioned by Iacovou et al. (1995, p. 465). Furthermore, experience with EDI connections could also facilitate the implementation which closely relates to technological skills as experience might show the skills are present. As presented in the literature review, a company should have sufficient change management skills to handle the implementation. Pare and Jutras (2004, p. 669) stated that the deficit of those skills can be an inhibitor as many professionals lack sufficient knowledge in the planning, execution and evaluation of change management. These change skills were not explicitly emphasized by the interviews as they only focused on experience with EDI connections in this relationship. Further, factors as organizational support or resistance were mentioned in the literature by e.g. C. Watts et al. (1998, p. 13) who mentioned organizational support or resistance as an important facilitator or inhibitor for the effective use of high technology which was underlined by half of the interviewees. This resistance within organizations can come from employees preferring old habits and therefore not willing to change. To overcome this, it is possible to show employees the possibilities and real benefits. Further, S.-J. Lee (2001, p. 28) stated the commitment to change works facilitating regarding EDI implementation and was emphasized by some interviewees as commitment. Some interviewees stated willingness improves implementation, emphasizing this even better. So the willingness to change processes can be seen as some kind of commitment benefiting the implementation.

One factor not mentioned in the theory was the involvement of all stakeholders. Four interviewees emphasized this as important as they stated all people should be involved in the implementation process. Possibly leading to increased support and willingness and a decrease of resistance. Closely connected to this is another factor not specifically mentioned in the theory as eight interviewees stated that everybody should be on the same page. When everyone is committed and works towards the same goal this could have a facilitating effect. To increase commitment and support and improve EDI implementation, communication could play an important role. Baker (2012, p. 234) stated communication processes within

the company can have a facilitating or inhibiting effect. This was not underlined by the interviewees as they mentioned communication between organizations as an important factor. Half of the interviewees stated that communication between buyer and supplier before, during, and after the implementation is essential. Within this communication it is important to make clear agreements about e.g. the implementation, documents, and data which was underlined by fourteen interviewees. In the literature review C. Watts et al. (1998, p. 13) stated that publishing positive outcomes of other firms' experience with EDI might facilitate EDI adoption. Interviewees stated that it is important to share success stories and share used cases in order to persuade employees and organizations or to improve the implementation commitment. Concluding on the organizational facilitators and inhibitors, it stands out that most factors were mentioned only one or two times in the literature review but were mentioned comprehensively by interviewees. Summarizing important facilitators and inhibitors, according to the theory and results it is important to have the right (IT) capabilities, experience, organizational support and commitment, clear agreements, and matching goals and expectations.

The literature revealed four different technology related categories. Most of these facilitating or inhibiting factors came from relatively old theory but the interviews underlined the actuality and importance. According to the literature, one of the most important factors was the use or ability to use a standard EDI format. The importance of this was also emphasized by the interviewees as more than half of them mentioned the use of a standard. The literature described different technological facilitators and inhibitors short. But the interviews revealed that those factors can be broad and include different aspects. The "Innovation characteristics and standard format acceptance and diffusion" code category also included certain characteristics about EDI as interviewees stated that EDI is a simple, robust, and proven technology. This was not directly found in the literature which might be caused by the age of the literature as a big part of the literature was from the beginning of EDI technology. As these factors focused on the characteristics of EDI technology, technical infrastructure seemed very important too. This factor was only little described in the literature as C. Watts et al. (1998, p. 12) stated that firms that use EDI consider technical infrastructure to be important facilitators or inhibitors. Half of the interviewees stated that e.g. the ERP system of the companies should be capable of handling an EDI connection, showing the importance. Another aspect deemed important by the interviewees was the

security (of the EDI connection). This factor was not found during the literature review but almost half of the interviewees emphasized the importance of it. Some stated that recent worldwide security problems led to a higher importance of IT security. Concluding, technical facilitators were off less importance in the literature, but the results revealed that some factors, as the use of an EDI standard, ERP capability, and security are important facilitating or inhibiting factors in EDI implementation.

5.7 Data was not mentioned in the literature but seems to have an effect on EDI intention and implementation

In the literature data was not mentioned as a factor influencing EDI intention or implementation. The results showed that data could have an influence on both the intention to implement EDI as well as on EDI implementation. First, regarding the intention, data quality was mentioned by half of the interviewees as an important benefit of EDI. The benefit of higher data quality in the process was a factor which motivated some interviewees as better data could lead to process improvement and an increased reliability of suppliers, customers, or the process. This data quality was also mentioned as a facilitating or inhibiting factor as poor data quality in one or both implementing companies could lead to problems. It was argued that the data to be send in the EDI connection should be good otherwise errors will occur in both organizations. Further, data could play a role in the intention to implement EDI as EDI might offer the possibility to centralize processes and systems. Finally, related to data quality, half of the interviewees stated that the datasets of customer and supplier should be the same in order to prevent errors and make sure that the process runs smooth with the right information making it an important facilitator or inhibitor for EDI implementation. Concluding on the data, it was found that it can both have an influence on intention as well as on the implementation. This is predominantly caused by the data quality which must be good for EDI and can be improved with EDI.

6 Conclusion and recommendations

6.1 EDI benefits motivate companies to implement EDI when turnover and relationship are good, companies should take into account facilitators and inhibitors when implementing and RPA could be added for higher effectivity

The aim of this paper was to find out what motivates companies to implement EDI and what should be done or necessary to make this EDI implementation successful. Further, the aim was to research what influence RPA could have on EDI implementation. Therefore the following research question was formulated:

"What motivates companies to implement an EDI connection with suppliers or customers and how could a company select and implement a new EDI connection with a supplier to improve the P2P process and what role could RPA play in improving data interchange?"

To answer this research question, qualitative research on EDI and RPA was conducted with case company and its suppliers. The results from the interviews show that performance expectancy, effort expectancy, and environmental and organizational factors influence the behavioral intention to implement EDI. But these variables can be moderated by environmental and organizational and product factors. Additionally, country and (organizational) culture could potentially moderate the intention but not enough evidence was found for this. It can be concluded that performance expectancy is the variable influencing the behavioral intention the most as this was mentioned by the most interviewees.

RPA could enhance back-office processes as a valuable addition to EDI. The research showed that the majority of the interviewees see the added value of RPA and that RPA can be implemented together with EDI to create higher effectivity. If this increases the intention to implement EDI is unknown, as insufficient answers were given on this. It remains unknown if RPA could be a substitute for EDI as the interviewees were divided over this point. Additional research on RPA and EDI in a bigger sample might give more clarity on this.

This research gave insight in facilitators and inhibitors and showed necessary factors and prerequisites of EDI implementation. It was found that both organizational and technological facilitators influence EDI implementation which was also found in the theory. But it is unclear which category of facilitators and inhibitors has the most influence. Further, data as an additional facilitating factor was found possibly influencing the intention to implement EDI as well as the implementation.

Summarizing, companies are predominantly motivated by the benefits EDI has to offer. The environment might play a role in their intention, however the role is smaller than that of the benefits. The effort an organization needs to put in implementing EDI influences the intention too but this predominantly focuses on weighing the costs to the earlier mentioned benefits. Further, relational and organizational and product aspects might moderate the motivation to implement EDI. RPA could be a valuable addition to speed up back-office processes and could lead to additional benefits and higher effectivity with EDI. When the intention is there to implement EDI, companies can select partners according to factors mentioned as facilitators and inhibitors. Companies should take these into account when starting to or implementing EDI with another organization.

6.2 Practical recommendations for companies considering an EDI connection

Besides theoretical contributions, this research has practical contributions in multiple ways. After the literature review and empirical research, a new research model was created. This research model can be applied to companies having the intention to implement EDI with another organization. The variables regarding the intention to implement EDI are less relevant to companies as they are not possible for application but focus on behavior. However, there can be points of attention e.g. when an organization wants to persuade another organization to set up an EDI connection, as this research showed what influences the intention of organizations to implement EDI. This could e.g. be done by showing the benefits, related to the performance expectancy, and showing the investment, or effort expectancy, related to EDI. Next, organizations must carefully consider the moderating variables as one of the most important moderating variables is the amount of order lines. So, when one company has the intention to implement EDI, it should pay attention to the amount of order lines as most organizations are not very eager to set up an EDI connection with a small customer. Further, they should put attention to the relationship with another

organization as a good relationship and collaboration can be decisive when it comes to EDI implementation projects. Therefore companies should not engage in EDI implementation projects with organizations they have a bad relationship with.

Regarding RPA, this research shows that companies might benefit from the addition of RPA to their back-office processes. Although there is not sufficient evidence, companies might benefit of implementing RPA together with EDI, but this is not directly necessary as these are two separate technologies. RPA can however be implemented to automate processes with suppliers or customers not capable of connecting via EDI. As there is a substantial amount of companies which do not have the financial resources to connect other companies via EDI, RPA might be a cheaper option in order to optimize purchasing processes. This research underlined that RPA will possibly be implemented more in the future and that companies should consider this as an option to improve their back-office processes. However, to be able to implement RPA in the future, the awareness in companies about new technologies as RPA should be higher. It became clear that facilitators and inhibitors for RPA implementation show overlap with facilitators and inhibitors for EDI implementation.

The last part of the model, related to EDI implementation success, might be the most important practical contribution. As this research gave insight into factors which are necessary or can facilitate or inhibit EDI implementation. Companies should carefully look at data and technological and organizational facilitators when implementing EDI with another organization. Different aspects as e.g. (IT) knowledge, competence, capacity, support, communication, commitment, format acceptance, data quality, and technical infrastructure are essential when implementing EDI. Before companies engage in an EDI implementation project, they should check if they comply to the factors found in this research as the absence of one or more of them could inhibit the implementation leading to an unsuccessful implementation. Of course, there is difference between the importance of factors, but it is e.g. impossible to set up an EDI connection without the right IT knowledge and capabilities. Before and during the implementation it is important to gain organizational support and commitment as it could otherwise slack the implementation. Furthermore, it is important to make clear agreements and define goals and expectations before the implementation within the organization and with the other organization. During the

implementation it is important to communicate with the implementation partner to make sure the implementation process runs smooth.

Concluding on the practical recommendations, companies can use the model to see what influences companies' intention to implement EDI. Further, companies should consider RPA as a valuable addition to improve their back-office processes. More important, companies can use this research and model to see which factors can facilitate or inhibit EDI implementation. Therefore the outcomes of this research can be used to make some kind of list of prerequisites and recommendations to set up an EDI connection with another organization.

6.3 Limitations of the research: Bigger, randomly selected sample and quantitative research could be add on or improve the research

There are some limitations regarding this research providing possibilities for future research. First, quite some old papers were used in the literature review section as EDI is not a new technology anymore and research has been conducted on it from around 1990 until now. Therefore, a significant part of EDI theoretical research was coming from older papers and might therefore be outdated. Regarding the RPA literature review, this literature was mostly reviewed in a uniform view on RPA instead of a specific view of RPA in the P2P process. This was partly caused by the fact that RPA is relatively new compared to EDI which led to a lower availability of the right literature.

Regarding the empirical research, there are some limitations which might have led to a limited or biased outcome of the research. First, not all interviewees had sufficient knowledge about RPA to answer questions about RPA in relation to EDI. To prevent this, an objective introduction into RPA was given before the interviews but this did not seem to help that much. In the future, it might be helpful to give each interviewee some literature to let them prepare themselves for the interview. Second, there is a limitation to the individual interview approach as participants' responses might be biased. As interviewees might want to portray themselves or their company in a different, better, light (Boyce & Neale, 2006, p. 3). This might have happened in the interviews as suppliers from the case company were interviewed with the possibility to set up an EDI connection with them. They might have wanted to portray themselves better to gain an advantage compared to other suppliers when

it comes to who is connected first. Exemplary for this is when the question was asked how important the case company is for them, all interviewees gave the grade of an eight or higher. Some suppliers even gave a ten to the case company possibly trying to please or favor the case company. Continuing on the individual interview approach, interviews always contain a certain degree of bias as it is possible to influence the responses by how the interviewer asks the questions. This might have led to a certain mismatch between questions and answers as e.g. sometimes when the top three of implementation facilitators was asked two times, two different answers were given. The interviewer can also bias the research with how the interviews and findings are interpreted by him or her. In the future, this can be prevented by letting multiple persons code the interview transcriptions.

Fourth, regarding the sample of the interviews, all interviewees from outside the case company are suppliers from the case company. Therefore these interviewees were not independent making it more difficult to generalize from the findings. In the future this can be prevented by interviewing additional, other, companies not connected to the case company as these interviewees are not biased by the relationship they have with the case company. Closely connected to this is the fifth point as all interviewees were selected non-random based on certain characteristics. For the case company interviews employees were selected with knowledge about EDI, of course leading to better answers related to EDI. For the supplier interviews, suppliers where selected on size, relationship and expertise on the subject EDI. This could have impacted the findings by giving a biased, more positive view towards the case company or EDI. In the future, this can be prevented by taking a random sample. However, this might also lead to answers from a lower quality as there might be interviewees with no or little knowledge about the subject.

Further, as there were ten supplier interviews, the sample size was adequate but might have been bigger as the case company has over 300 suppliers. These suppliers also vary a lot in size so the suppliers interviewed were all of a sufficient size to be of importance. Of course, a bigger sample would have given more reliable answers possibly making the outcome of this study more reliable. Continuing on the sample, all suppliers were from certain industries, e.g. steel or related industries, making the research biased. By including companies from e.g. the food or retail industry the outcome might have been different but this research focused on companies in this steel industry therefore making this point of less

importance. Finally, regarding the outcome of the interviews and this research. It would be beneficial to test the research findings. As the interviews led to certain factors which affect intention and implementation it is not known how and to what extent these factors affect the intention and implementation of EDI. As this research was qualitative, quantitative research could be added to investigate the influence of the factors they have on each other and on the variables.

6.4 Acknowledgement

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Appendix

Appendix A: Theoretical background on SCM and purchasing processes

The benefits of EDI could have a big impact on purchasing and supply chain management (SCM) as EDI has an important role in improving organizational communication among the supply chain (Lou et al., 2015, p. 24). The importance of the implementation of IOS's is underlined by K. M. Hwang and Lee (2016), as they state that "Nowadays, the success of a firm increasingly depends on working efficiently and effectively with others in the supply chain." (p. 13). This efficiency and effectiveness can be increased by electronically-enabled supply chains (ESC), which have the potential to improve organization and supply-chain performance (Yao, Palmer, & Dresner, 2007, p. 884). These ESCs change the quantity and speed of information flowing among supply chain partners. Supply chain processes can be enhanced and efficiencies in the flow of materials, goods and services can be created by information technologies like EDI in ESCs (Mukhopadhyay & Kekre, 2002, p. 1305; Srinivasan, Kekre, & Mukhopadhyay, 1994, p. 1303; Yunitarini et al., 2018, p. 123). EDI networks between business partners represent the first phase of B2B electronic commerce technology (Seungchang Lee, Pak, & Lee, 2003, p. 360).

One process within purchasing and SCM is the purchase/procure-to-pay (P2P) process. P2P is the transactional purchasing process which covers the process of purchase order (PO) handling from the need for a product or service until the delivery and payment (Brem, 2015, p. 3). According to Baader and Krcmar (2018, p. 4), the P2P process basically consists of six steps. The process starts with the identification of a need and a purchase requisition is created. Second is the vendor selection in which the purchasing department selects a supplier for the need. After the supplier is selected, a PO is send to the supplier. Fourth, the goods or services are received from the supplier and these are recorded in the system with the corresponding PO. Then the invoice with the costs of the goods or services is received. Also the invoice is recorded in the system with the corresponding PO and goods receipt. The final step is the payment of the invoice. Trkman and McCormack (2010, pp. 338-339) also describe the P2P in six steps. These steps are slightly different than the process from Baader and Krcmar (2018, p. 4). Trkman and McCormack (2010, pp. 338-339) P2P starts with a forecast plan and coordination. A schematic overview of these P2P processes is

given in figure 6. The six steps are ordered chronologically and the two processes are compared above each other.

Within a P2P process, multiple company departments are involved, which means the P2P process is cross-functional. The main departments, as mentioned earlier, are purchasing and accounts payable, but also e.g. warehousing, logistics, administration and of course, the end users are involved (Ash & Burn, 2006, p. 8). An important difference between PPM and P2P models is the absence of payment and financial transactions in the PPM. As P2P handles the entire process from need to payment, a PPM only includes actions taken at the purchasing department. This means, that in a P2P model there also financial side of the SCM. Thus, efficiency can be reached at both departments, and according to Murphy (2012, p. 2), this can be reached with electronic document management (EDM) solution. An example of this being invoice processing with EDI. Technologies, e.g. EDI, could automate the P2P process and then reduce transaction costs which increases the firms' competitiveness (Chang et al., 2004, p. 636; Trkman & McCormack, 2010, p. 338). Therefore, the P2P process is labelled is as highly important within a company, as an efficient P2P process could reduce costs, minimize inventory, increase quality and stabilize supply (Ash & Burn, 2006, p. 12; Palmer & Gupta, 2011, p. 66). It is possible for companies to gain a competitive advantage with the P2P process when performing these activities better than competitors (Monczka et al., 2016, p. 51).
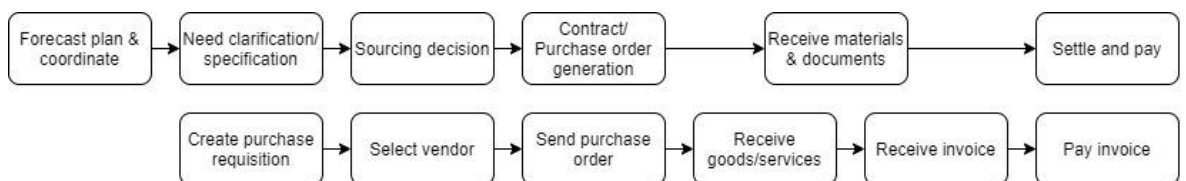
Figure 6: P2P process, modified from Baader and Krcmar (2018, p. 4) and Trkman and McCormack (2010, p. 339)

The flow of a good or service in a company also means a flow of money in the financial supply. Every time a good or service moves in a supply chain, there is a corresponding flow of data and money (Gupta & Dutta, 2011, p. 47; Sugirin, 2009, p. 237) (Figure 7). In the area of SCM, most of the research done focuses on the flow of goods or services. There is little attention for the upstream flow of data and money (Fairchild, 2005, p. 244; Gupta & Dutta, 2011, p. 47). Within SCM, financial supply chain management

concentrates on the flow of money within the supply chain (Sugirin, 2009, p. 237; Vanjoki, 2013, p. 17). This financial flow of money needs to be managed effectively as modern supply chains involve a network of supply chain partners and it could provide significant insights about the financial health of the supply chain (Leng & Zailani, 2012, p. 307).
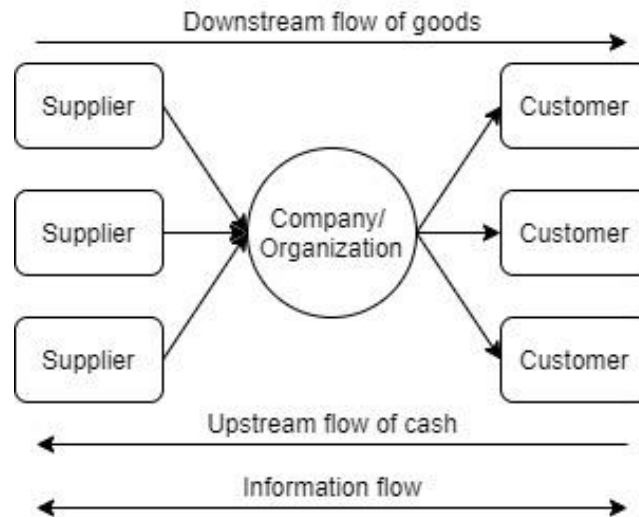
Figure 7: model with the downstream and upstream flows in SCM, modified from Gupta and Dutta (2011, p. 48)

In the P2P process, the tasks are divided between two departments: purchasing and accounts payable. Purchasing has the task of executing and processing orders initiated elsewhere in the organization and accounts payable processes the payments to suppliers for these orders (Palmer & Gupta, 2011, p. 65). This means automating the whole P2P process requires automation at the purchasing department and the accounts payable department (Kim & Shunk, 2004, p. 155). Automated P2P solutions aim towards end-to-end automation, the transitions with the longest lead times usually comprise from manual steps where human intervention is required (Vanjoki, 2013, p. 35). One of those steps is preparing and managing the proper purchasing documents, which is a time-consuming process. Firms can streamline the document flow to reduce paperwork and handling required for a purchase (Monczka et al., 2016, p. 52). One of the key elements to enable straight through processing in the P2P process is matching the workflow. Matching invoices to existing contracts and POs is believed to shorten the cycle time and minimize human intervention, as approving the invoice is mostly the highest labor-intensive step (Vanjoki, 2013, p. 51). Normally AP departments should exercise a three-way match, in which they connect the PO, delivery, and invoice. This can be automated in systems using EDI to transfer these documents.

Many companies have been automating their business processes with e-business solutions, e.g. EDI, to reduce transaction costs within the acquisition cycle (Jung, Kim, & Kang, 2006, p. 321; Palmer & Gupta, 2011, p. 66). This process automation improves organizations productivity and responsiveness (Jung et al., 2006, p. 321). One example of the application of automation in the purchase process is the creation, transfer and processing of POs. Approved POs can flow to the supplier via EDI which processes the order (Kim & Shunk, 2004, pp. 160-161). The absence of order and contract numbers could slow down the process. These maverick purchases impede the process of ordering and invoicing as manual human intervention is required. To prevent this, companies should engage in close collaborations with key suppliers. Faster processing of POs and invoices could also increase the change the suppliers is paid in time (Vanjoki, 2013, p. 65). These close collaborations in a supply chain mean that two or more companies work together to plan and execute supply chain operations towards common goals to create a competitive advantage (Cao & Zhang, 2011, p. 163; Simatupang & Sridharan, 2005, pp. 258-259). The supply chain collaborations could lead to several benefits including process efficiencies and cost savings (Cao & Zhang, 2011, pp. 165-167).

Purchasing is concercend with obtaining all goods, services, capabilities, and knowledge necessary for running, maintaining, and managing the company's activities (van Weele, 2002). The major objectives of a purchasing organization are supply assurance, managing the sourcing process efficiently and effective, supplier performance management, developing aligned goals with internal stakeholders, and developing integrated supply strategies that support business goals and objectives (Monczka et al., 2016, pp. 42-45). The processes concerned with purchasing can be visiualized in a purchasing process model (PPM), which is a visual representation of all activities within purchasing and SCM in the process (Bäckstrand, Suurmond, van Raaij, & Chen, 2019, p. 1). Plenty of research is performed on PPMs and the purchasing process. With all researchers identifying and recognizing similar steps taken in the process. One of the first PPMs was introduced by Webster (1965, p. 371). He identified four elements in an industrial buying process: problem recognition, organizational assignment of buying responsibility and authority, search procedures for identifying product offerings and for establishing selection criteria, and choice procedures for evaluating and selecting among alternatives. Later on, PPM's became more elaborate when further research was conducted. These models all include similar

elements as need recognition/identification, decision criteria or technical specification, supplier search and selection, (alternative) evaluation, and purchase or contracting (de Boer, Labro, & Morlacchie, 2001, pp. 77-79; Kakouris, Polychronopoulos, & Binioris, 2006, pp. 709-711; Pop-Sitar, 2011, p. 688; Samaniego, Ana, & Cabezudo, 2006, p. 165; Scharl, Gebauer, & Bauer, 2001, pp. 194-195; van Weele, 2018). From these models, the model of de Boer et al. (2001, pp. 77-79), which focusses on supplier selection, is the least comprehensive, as their model spans from setting the specifications till negotiating and has only four steps.

The model of van Weele (2018) is the most comprehensive as the purchasing process is divided into six steps plus comprehensive phases (Figure 8). These comprehensive phases or steps are part of the model and span across different process steps. The biggest span is procurement, this phase spans from the internal customer to the end, the supplier. Part of procurement is the purchasing function is split into tactical and operational purchasing. The first three steps, determining specificiation, selecting supplier, and contracting are part of the tactical function. The last three steps, ordering, expediting and evaluation, and follow-up and evaluation are part of the operational function. Within procurement, there are two phases called sourcing, and supply. These two phases are the same as the tactical and operational steps. Finally, there is a part of the process which is called buying, this spans from selecting till the last step, follow-up and evaluation.
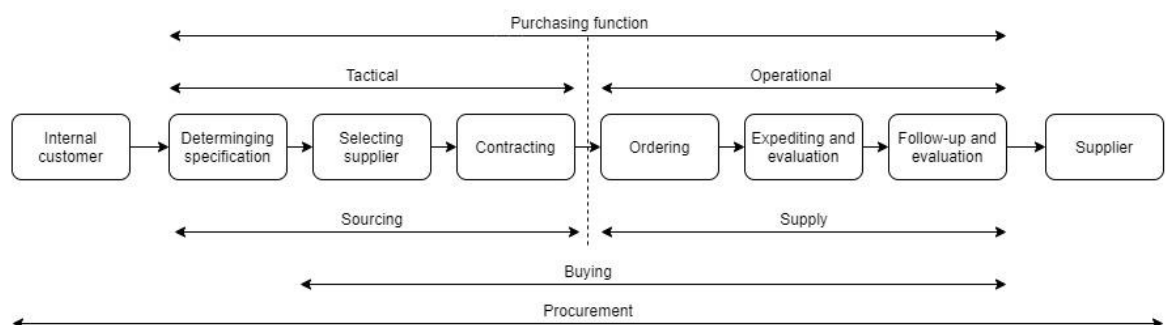
Figure 8: PPM modified from van Weele (2018).

The purchasing process starts with recognizing and defining a need or problem within an organization. A good or service is needed and for that the specifications are set (Baader & Krcmar, 2018, p. 4; Kakouris et al., 2006, p. 710; Samaniego et al., 2006, p. 165; Scharl et al., 2001, p. 194; van Weele, 2018; Webster, 1965, p. 375). This phase is called the

initiation phase by Kakouris et al. (2006, p. 710) as the process starts here. Good internal communication is required as the flow of information among the interested parties can be very extensive. Also, it is required to conduct a feasibility study on benefits, costs and risks (Kakouris et al., 2006, p. 710). The second step, according to van Weele (2018), is the selection of a supplier, which then results in setting up a contract with a supplier (van Weele, 2018). Between these two steps, Kakouris et al. (2006, p. 711) place the qualification phase. In this phase, a pool of potential suppliers is screened against the choice criteria established at the planning stage. This with the goal to reduce the set of "all" suppliers to a smaller set of acceptable suppliers (de Boer et al., 2001, p. 80). After the qualification phase, the contract is awarded in the winning phase (Kakouris et al., 2006, p. 711). Setting up a contract with the supplier is the last step of the tactical process, then the operational process or order function starts with ordering the good or service (van Weele, 2018). In this step the PO is created and send to the supplier (Murphy, 2012, p. 2). After the good has been ordered, the expediting and evaluation step starts which is followed by the follow-up and evaluation step (van Weele, 2018). The follow-up and evaluation step is part of the monitoring and review phase from Kakouris et al. (2006, p. 711). In this phase purchasers must review the performance of suppliers against agreed levels. This could build strong and efficient long-term relationships with suppliers (Kakouris et al., 2006, p. 711). In these models, only the roles of purchasing are outlined, but it should be considered that successful purchasing processes require cross-functional collaboration. People from different processes and departments should be involved in the purchasing process, e.g. from product development or logistics (Chang et al., 2004, p. 637). The accounts payable department also plays an important role within the purchasing process. The P2P process is the purchasing process which includes this department, this is explained in the next chapter.

Appendix B: Interview guide for the semi-structured interviews

Introductie

1. Wat leveren jullie aan (Naam bedrijf)? **(Supplier)**

2. Hoe lang zijn jullie business partners? **(Supplier)**

3. Wat is je functie bij (Naam bedrijf)? Onder welke afdeling valt dit?

4. Hoeveel jaar werkervaring heb je in deze functie?

Interview

1. Wanneer u denkt aan de intentie om EDI te implementeren, wat zijn de eerste dingen die naar boven komen?

   a. Welke factoren beïnvloeden u/uw bedrijfs intentie om EDI te implementeren

2. Wat zijn motieven voor u om EDI te implementeren met een leverancier of klant?

   i. Hoe beïnvloeden kosten en investering uw intentie om EDI te implementeren?

3. Wat zijn belangrijke voorwaarden voor het implementeren van EDI?

4. Welke barrières bent u bereid te overwinnen bij het implementeren van EDI?

5. Wat zij uw verwachtingen van EDI?

6. Hoe verandert uw organisatie wanneer EDI geïmplementeerd wordt?

7. Wat voor invloed heeft de implementatie van EDI op uw baan/functie?

8. Zijn er andere, indirecte aspecten, die de gedragsintentie om EDI te implementeren matigen of versterken?

   a. Op welke manier zijn relationele aspecten van belang bij het bepalen van de keuze welke leverancier verbonden wordt met EDI?

   b. Hebben deze relationele aspecten invloed op uw besluitvormingsproces over EDI implementatie?

      i. Wat betekent preferred customer status voor u?

      ii. Speelt preferred customer status een rol bij de intentie om EDI te implementeren? (leverancier specifieke vraag)

      iii. Is (naam bedrijf) een preferred customer? Hoe belangrijk zijn zij op een schaal van 1 tot 10? (Leverancier specifieke vraag)

      iv. Speelt de lengte van een relatie met een leverancier of klant een rol in het starten van een EDI implementatie project?

   c. Op welke manier zijn organisatorische aspecten van belang bij het bepalen van de keuze welke leverancier of klant met EDI verbonden zal worden?

   d. Hebben deze organisatorische aspecten invloed op het besluitvormingsproces van EDI implementatie?

   e. Zijn marktinvloeden, zoals druk van concurrenten en klanten, van invloed op uw intentie om EDI te implementeren en hoe beïnvloedt dit uw voornemen?

9. Concluderend op de factoren die u noemde, wat zijn de 3 belangrijkste factoren die uw gedragsintentie bepalen om EDI te implementeren met een leverancier of klant?

10. Kunt u technologieën noemen die als vervanger of alternatief van EDI gebruikt kunnen worden?

11. Op welke manier zou RPA een impact kunnen hebben op EDI implementatie?

    a. Ziet u RPA als een vervanger van EDI?

    b. Denkt u dat de implementatie van RPA een effect zal hebben op de intentie om EDI te implementeren?

12. Bent u bekend met facilitators en inhibitors van EDI implementatie?

13. Wat zijn kritieke factoren voor succesvolle EDI implementatie?

14. Wat is belangrijk voor uw afdeling/bedrijf bij het implementeren/tijdens de implementatie van EDI met een andere organisatie?

15. Welke afdeling heeft de meeste inspraak bij het implementeren van de EDI verbinding in het P2P proces? (Afdeling specifieke vraag)

16. Concluderend over de door u genoemde succesfactoren, welke drie basisfactoren zijn het meest noodzakelijk voor EDI-implementatie?

17. Na deze drie noodzakelijke factoren, welke drie factoren maken de EDI implementatie succesvoller?

Appendix C: Interview protocol

English script for the interview:

First of all, thank you for your participation in the interview for the research. As explained earlier, I am researching EDI connections in the buyer-supplier relationship. The goal of the research is to measure the willingness and motivations of suppliers to start up an EDI connection and to map the necessary success factors at buyers and suppliers.

The interview will last approximately 45 minutes. The interview is divided into 4 parts which all relate to different factors related to EDI implementation To preserve the anonymity, your name and company name will be omitted. Also, you answers will be handled with confidentiality. If you agree, your company name will be displayed as S1 (supplier 1) until S10 (supplier 10) or your name as C1 (case company 1) until C8 (case company 8). Finally, please know that you can stop the interview at any time.

Do you agree with recording the interview?

Yes   /   No

Do you have any questions related to the interview or the content of the interview?

[Discuss questions]

During the interview, it is possible to ask questions, e.g. when something is not clear. This is a semi-structured interview, which means there is a possibility to ask probing question when further information is needed. For your info, during the interview 2 technologies will be discussed, Electronic Data Interchange and Robotic Process Automation. EDI is a technology which transmits business documents between the enterprises in a standard format with electronic methods. RPA is a software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in software systems. RPA can e.g. read data on your computer and put this into another system. E.g. the reading of data in Excel to thereafter put this in independently in another program.

Dutch script for the interview:

Allereerst, bedankt voor uw medewerking aan het interview voor het onderzoek. Zoals eerder uitgelegd, doe ik onderzoek naar EDI koppelingen in de buyer-supplier relatie. Het doel van het onderzoek is om de bereidheid en motivaties te meten van leveranciers om een EDI koppeling aan te gaan en om de hiervoor benodigde succesfactoren in kaart te brengen bij buyers en suppliers.

Het interview zal ongeveer 45 minuten duren. Het interview is opgedeeld in 4 delen welke allemaal betrekking hebben op verschillende factoren die gerelateerd zijn aan EDI implementatie. Om de anonimiteit te waarborgen zullen uw naam en bedrijfsnaam weg gelaten worden. Daarnaast wordt er vertrouwelijk met de gegeven informatie omgegaan. Als u er mee akkoord gaat wordt uw bedrijfsnaam weergegeven als S1 (supplier 1) tot en met S10 (supplier 10) of uw naam als C1 (case company 1) tot en met C8 (case company 8). Ten slotte, het interview kan door u op elk moment gestopt worden.

Gaat u er mee akkoord dat het interview opgenomen wordt?

Ja   /   Nee

Heeft u nog vragen over het interview of over de inhoud van het interview?

[Vragen bespreken]

Tijdens het interview is het mogelijk om vragen te stellen, bijvoorbeeld wanneer iets niet duidelijk is. Dit is een semigestructureerd interview wat betekent dat er ruimte is voor verdere vragen wanneer meer informatie nodig is. Ter info, tijdens het interview zullen 2 technologieën behandeld worden, Electronic Data Interchange en Robotic Process Automation. EDI is een technologie die documenten elektronisch verstuurt tussen organisaties in een standaard format. RPA is een software die werkt volgens bedrijfsregels en gedefinieerde activiteiten om zelfstandig processen, activiteiten, transacties en taken uit te voeren in software systems. Zo kan RPA bijvoorbeeld op uw computer data lezen en invoeren in een systeem. Bijvoorbeeld het lezen van data in Excel en dit vervolgens zelfstandig in een ander programma kan invoeren.

Appendix D: Elaboration on the results

Besides the results presented in chapter 4, the results found in this research can be explained more elaborate. As in chapter 4 only the most important variables were mentioned, a more complete overview is given in this Appendix. This elaboration on the results is structured the same as chapter 4. As first the variables on the behavioral intention to implement EDI will be explained, continued with the moderating variables and finalizing with the facilitators and inhibitors and additional findings of the research.

First, regarding "perceived usefulness and outcome expectations", benefits as efficiency, speed, reduction of errors ultimately lead to saving money or lower costs. Two interviewees of the case company extended on these benefits by stating that it could even improve their competitive position: "I would imagine so, partly because you should be able to work more efficiently. Less error prone, yes, that could strengthen your position" (Intern 4, p. 6). Most codes were mentioned by both supplier as case company interviewees. Exceptions on this are e.g. "trust in the information" and "data or system reliability" which were mentioned only by case company interviewees. Intern 1 expected implementing EDI leads to better data quality as EDI requires good data, indicating reciprocity in this: "Yes, your data will just be improved a lot … to do EDI you need good data. Because that is such an important condition you are also going to spend more time making sure you have good data" (Intern 1, p. 4). Other important factors determining behavioral intention are e.g. "increase/improve customer/supplier relationship" and "supplier reliability" with respectively ten and seven quotations. Supplier 1 pointed out that the implementation of EDI might even make it more difficult for a customer to switch to another supplier, increasing dependency in the relationship: "That very thing can improve or also tighten a relationship. Once we have a connection, then the reason to switch might also become extra difficult" (Supplier 1, p. 8.). This "supplier reliability" is also associated with other codes as e.g. supplier 6 pointed out that benefits as time reduction, error reduction, and higher speed increase the reliability of supplier. Therefore EDI can be implemented to achieve a higher supplier reliability making it a factor affecting implementation intention. Other remarkable codes related which were mentioned are "improve tactical buying", "improve Configure To Order", and "convenience" but these were mentioned less often than the previously mentioned factors. Further codes regarding "perceived usefulness and outcome expectations" are shown by Table 19.

Table 19: perceived usefulness and outcome expectations top codes ((#) is total quotes)

Perceived usefulness and outcome expectations					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
Reduction of errors	7	7	14 (34)	2, 3, 7, 8, 10	1, 2, 3, 4, 6, 7
Higher speed	7	7	14 (19)	1, 2, 4, 5, 6, 8, 10	1, 2, 3, 4, 5, 6, 7
Weighing costs and benefits	8	5	13 (35)	1, 3, 4, 5, 7, 8, 9, 10	1, 3, 4, 5, 7
Efficiency	5	6	11 (36)	2, 3, 7, 8, 10	1, 2, 3, 4, 6, 7
Spend time on value-adding or important activities	7	5	11 (16)	1, 3, 4, 5, 6, 7, 9	1, 2, 4, 5, 7
Saving money/lower costs	5	6	11 (13)	3, 4, 5, 6, 9	1, 2, 3, 5, 6, 7
Time reduction	7	3	10 (18)	1, 2, 5, 6, 7, 9, 10	1, 2, 5
No/less manual interference	6	3	9 (12)	1, 2, 3, 4, 6, 8, 9	2, 3, 7
Reduction of labor	6	3	9 (13)	1, 3, 5, 6, 7, 10	1, 2, 4
Insight and transparency	3	5	8 (12)	2, 3, 8	1, 2, 3, 6, 7

Continuing, extrinsic motivation could also play a role in EDI behavioral intention. Another possible extrinsic motivation, adding on chapter 4, was the possibility to create a positive technological image of the company. As supplier 7 stated: "if you also go along with the times and make sure that your activities go along with the technology, then that is also a kind of image for a customer … a kind of image or a something of marketing" (Supplier 7, pp. 5-6). Further, "organizational growth" was mentioned as intern 7 defined this organizational growth as a goal: "we just have a growth ambition and from that perspective we also invest" (Intern 7, p. 5). As the benefits of EDI offer them the possibility to increase their purchasing volume without investing in extra capacity. Further codes on extrinsic motivation are shown by Table 20.

Table 20: Extrinsic motivation codes ((#) is total quotes)

Extrinsic motivation					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
More output with less/same employees	1	1	2 (5)	6	7
Increase in sales	2	0	2 (4)	3, 8	-
Technological image or marketing towards customers	2	0	2 (2)	7, 10	-
Improve competitive position	0	2	2 (2)	-	5
Organizational growth	1	1	2 (2)	1	7
Loss of importance or job	0	1	1 (2)	-	1, 4
More customers	0	1	1 (1)	-	5

As stated earlier, the codes for "job-fit" were also mentioned in other factors regarding performance expectancy. Elaborating on chapter 4, Intern 1 stated the benefits of EDI offer him the possibility to enhance his job performance: "I can occupy myself with things I want to occupy myself with" (Intern 1, p. 2). Supplier 1 gave an example of these activities: "I can then let them be more consultative or more involved in the pursuit of offers. So I will be able to give a different direction to the people in order to be able to be more commercially active" (Supplier 1, p. 8). Table 21 shows the top codes for "job-fit".

Table 21: Job-fit codes ((#) is total quotes)

Job-fit					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
Reduction of errors	7	7	14 (34)	2, 3, 7, 8, 10	1, 2, 3, 4, 6, 7
Higher speed	7	7	14 (19)	1, 2, 4, 5, 6, 8, 10	1, 2, 3, 4, 5, 6, 7
Spend time on value-adding or important activities	7	5	11 (16)	1, 3, 4, 5, 6, 7, 9	1, 2, 4, 5, 7
Time reduction	7	3	10 (18)	1, 2, 5, 6, 7, 9, 10	1, 2, 5
No/less manual interference	6	3	9 (13)	1, 2, 3, 4, 6, 8, 9	2, 3, 7
Increased processing speed	3	4	7 (12)	2, 5, 6	3, 6, 7, 8
Increased reliability	3	3	6 (14)	3, 4, 6	1, 2, 3
Clear communication (based on facts)	2	2	4 (6)	1, 4	2, 6
Take time for postponed work	2	1	3 (4)	4, 9	6

The last performance expectancy factor is "relative advantage". In this factor the advantage the new technology offers is compared to the old technology. One factor mentioned by interviewees was the increase in insight and transparency. This increase in insight and transparency is related to the data quality which creates a higher reliability as intern 3 stated: "as long as your data is right. Then you get a very fast efficient and reliable process" (intern 3, p. 2). Frustration or dissatisfaction about the current process or connection were also factors influencing the behavioral intention to implement EDI via the "relative advantage". Examples of these codes are the "frustration about current process", "errors in current automation software solutions", and "current platform is limited/not optimal". Supplier 9 explained that data quality problems in the current process lead to frustration therefore increasing his intention to implement EDI possibly leading to better data quality. Explaining the following: "those orders actually come back every time, because then the

customer item is not correct at all, then the price is not correct, then the product is unknown"
(Supplier 9, p. 2). Table 22 shows the top 10 codes for the "relative advantage" factor.

Table 22: Relative advantage top 10 codes ((#) is total quotes)

Relative advantage					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
Reduction of labor	6	3	9 (13)	1, 3, 5, 6, 7, 10	1, 2, 4
No/less manual interference	6	3	9 (13)	1, 3, 5, 6, 7, 10	1, 2, 4
Insight and transparency	3	5	8 (12)	2, 3, 8	1, 2, 3, 6, 7
Manual order processing leads to errors	3	4	7 (8)	4, 5, 7	1, 3, 5, 6
Increased reliability	3	3	6 (14)	3, 4, 6	1, 2, 3
Manual order processing is time consuming	3	3	6 (6)	5, 7, 9	2, 7, 8
Clear communication (based on facts)	2	2	4 (6)	1, 4	2, 6
Reduction of manual steps leads to time reduction	3	1	4 (4)	1, 4, 5	8
Work is postponed due to time constraints	1	3	4 (4)	9	2, 6, 8
Convenience	2	1	3 (4)	1, 2	3

The next variable possibly affecting behavioral intention is "environmental and organizational factors". In chapter 4, among others, the code "help supplier/customer implement EDI" was emphasized and closely to this are the codes "act as consultant to help customer automate" and "give advice to customer about EDI". These are two examples of how an organization could help another organization with EDI implementation. Supplier 7 explained this as follows: "we can still if a client can't, … we can still, … act as consultants" (Supplier 7, p. 3). Supplier 5 said they try to persuade customers to connect with EDI by offering to share the savings, what they did when they had the intention to connect the case company via EDI: "we also said at the time, in order to persuade (case company), that we were also going to share that savings with (case company)" (Supplier 5, p. 2). Table 23 shows the external support codes.

Table 23: External support codes ((#) is total quotes)

External support					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Help supplier/customer implement EDI	1	2	3 (3)	6	2, 7
Share savings with customer	1	0	1 (3)	5	-
Act as consultant to help customer automate	1	0	1 (2)	7	-
Give advice to customer about EDI	1	0	1 (1)	6	-

Further, competitive pressure and trading partner imposition could play a role. Interviewees were divided over competitor pressure as the majority did not give information on competitor pressure. The ones clarifying competitor pressure stated that there is "competitor pressure to a lesser extent" or "competitor pressure is always present". Supplier 8 stated on this: "We do feel pressure, … of course we are not the only one in the market. Ehm what we always proclaim is that we can actually handle any kind of digital messaging" (Supplier 8, p. 11). They always feel competitor pressure and therefore they try to be the pressing company by being able to handle all forms of digital messaging. Some interviewees expected that there will come a "normalization of electronic ordering" or a "fee or discount depending on type of data transfer". They expected that traditional means of communication will gradually disappear and that organizational systems will be linked more frequently: "it is becoming more and more common that you link systems and that orders come in via electronic means" (Supplier 1, p. 7). To pace this, one even expected that there is a possibility of paying a fee depending on the type of communication used for submitting an order: "in the future, I do see that one day there will be a surcharge on a mail order. I'm not saying we're going to do that, but I can imagine that" (Supplier 6, p. 10). The top 10 codes related to "competitive pressure and trading partner imposition" are shown by Table 24.

Table 24: Competitive pressure and trading partner imposition top 10 codes ((#) is total quotes)

Competitive pressure and trading partner imposition					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Case
Environmental pressure	4	3	7 (7)	2, 4, 8, 9	1, 3, 5
Demands from supplier/customer	1	2	3 (3)	7	4, 7
Customer pressure	3	0	3 (3)	1, 5, 10	-
Competitor pressure to a lesser extent	1	2	3 (3)	5	1, 2
Competitor pressure is always present	2	1	3 (3)	8, 10	6
Competitive pressure	1	1	2 (2)	3	4
Supplier pressure/pushing customers to connect	1	1	2 (2)	5	7
Normalization of electronic ordering	2	0	2 (2)	1, 6	-
Ability to be supplier of a (prestigious) customer	2	0	2 (2)	1, 7	-

The two factors of effort expectancy are related to each other, these are the factors "perceived ease of use and implementation" and "complexity". The most mentioned codes of the first factor were already explained in chapter 4. Further, the final, once quoted code,

is "EDI is a simple technology". Supplier 7 stated: "but I think it's also a pretty simple technology, which does allow it to just run stable" (Supplier 7, p. 4). This characteristic of EDI could make it a technology easy to implement and therefore increasing the intention to implement EDI. "EDI is a simple technology" is further explained at the "Innovation characteristics and standard format acceptance and diffusion" section as this is an innovation characteristic. All codes related to "perceived ease of use and implementation" and "complexity" can be found in Table 16 and 17.

Table 25: Perceived ease of use and implementation codes ((#) is total quotes)

Perceived ease of use and implementation					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Relate effort to the complexity and turnover of the customer/supplier	7	4	11 (20)	1, 2, 3, 4, 7, 8, 9	1, 2, 6, 7
Start with easy implementation	0	4	4 (4)	-	4, 5, 7, 8
Start with high turnover and easy implementation	1	2	3 (3)	7	3, 7
Ease of connecting	2	0	2 (2)	2, 7	-
EDI is a simple technology	1	0	1 (1)	7	-

Table 26: Complexity codes ((#) is total quotes)

Complexity					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
Relate effort to the complexity and turnover of the customer/supplier	7	4	11 (20)	1, 2, 3, 4, 7, 8, 9	1, 2, 6, 7
EDI implementation is not difficult	1	1	2 (6)	6	4
EDI connection must be simple	0	3	3 (4)	-	6, 7, 8
EDI is a simple technology	1	0	1 (1)	7	-

In chapter 4, it was explained that the most important moderating variables were the volume of orders or order lines and the turnover or size of the supplier. Further, interviewees mentioned that it is important to relate the effort to the complexity and turnover of the customer or supplier. As implementing EDI among others depends on the turnover or number of order lines of a customer as the investment should be profitable which differs per customer. Supplier 4 explained this as follows: "because there is also a cost factor, of course. If you do 1000 euro turnover with someone and you have to pay 300 euro in EDI costs per year then money has to be added" (Supplier 4, p. 3). Five case company interviewees mentioned this code and interestingly, these codes were not mentioned by employees of the IT department. One employee stated: "Great motive is that, big suppliers who just deliver to

us by default, ... especially also because you have a lot of contact with them, I would go for such big suppliers. Then you take away the biggest part" (Intern 6, p. 2).

Closely related to "volume of orders/order lines" and "turnover/size of customer/supplier" is the code "relate effort to the complexity and turnover of the customer/supplier". Supplier 8 summarized this as: "does that pay off relative to the rest of the customer's revenue? That's one of the business questions we always do" (Supplier 8, p. 2). Concluding on "relate effort to the complexity and turnover of the customer/supplier", interviewees tend to relate their effort they put into implementation to the complexity and turnover of the customer/supplier. This means they would e.g. implement EDI earlier with an organization with high turnover and low complexity compared to the opposite. Other codes mentioned in "organizational and products aspects" which could potentially moderate the intention are e.g. "type of product", "structure of orders", and "distributors have priority". But, these were all mentioned less often than codes related to the volume of order lines or turnover. The codes from the "organizational and product aspects" moderating variable are shown by Table 27.

Table 27: Organizational and product aspects codes ((#) is total quotes)

Organizational and product aspects					
Code	Supplier	Intern	Total	Interviewee Supplier	Interviewee Intern
Volume of orders/order lines	9	5	14 (34)	1, 2, 3, 5, 6, 7, 8, 9, 10	1, 3, 6, 7, 8
Turnover/size of customer/supplier	9	5	14 (33)	1, 2, 3, 4, 6, 7, 8, 9, 10	1, 2, 3, 6, 7
Relate effort to the complexity and turnover of the customer/supplier	7	4	11 (20)	1, 2, 3, 4, 7, 8, 9	1, 2, 6, 7
Type of product	4	2	6 (6)	1, 4, 9, 10	3, 7
Standard products easy to automate	3	1	4 (5)	1, 4, 10	7
Use other technology depending on order size and customer	3	0	3 (5)	4, 8, 9	-
Start with high turnover and easy implementation	1	2	3 (3)	7	3, 7
Structure of orders	2	0	2 (4)	3, 8	-
Distributors have priority	1	1	2 (3)	8	1
Turnover of customer in value	2	0	2 (2)	5, 7	-
Customers with repetitive order flow	2	0	2 (2)	2, 5	-
Complexity of the customer	1	0	1 (2)	7	-
Big supplier with much order lines see necessity and have better IT infrastructure	0	1	1 (1)	-	3
Start with small supplier	0	1	1 (1)	-	8

Besides aspects as turnover or order lines, the buyer-supplier relationship was also emphasized as a possible moderating variable. In chapter 4 it was mentioned that collaboration and relationship are decisive in EDI implementation. Further, customer importance might also play a role. This importance of the customer is often mentioned in connection with customer turnover. On the contrary, supplier 4 stated that all customers are of equal importance: "(Name company) always has the focus of every customer being equally important. Where of course, … we always have to balance cost and benefits" (Supplier 4, p. 8). Besides the importance of relationship and collaboration underlined by some interviewees, there are also suppliers which state that relationship plays a role in EDI implementation intention. "I don't think there is anything there why based on relationship is chosen to do or not to do" (Supplier 9, p. 7). Other relational aspects which could play a role are "strategic importance of customer", "ability to be supplier of a (prestigious) customer", and "customer with high potential". The top 10 codes related to relational aspects are shown in Table 28.

Table 28: Relational aspects top 10 codes ((#) is total quotes)

Relational aspects					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Collaboration and relationship decisive in EDI implementation	5	4	9 (11)	2, 3, 5, 8, 10	1, 2, 3, 6
Increase/improve customer/supplier relationship	4	2	6 (10)	1, 3, 5, 10	1, 3
Importance of customer	4	2	6 (7)	1, 2, 3, 7	1, 2
Supplier reliability	2	4	6 (7)	6, 8	3, 6, 7, 8
Relationship	2	3	5 (5)	3, 9	1, 3, 6
No relational aspects	5	0	5 (5)	2, 4, 6, 7, 9	-
Collaboration during EDI implementation	1	2	3 (3)	2	2, 3
Strategic importance of customer	2	0	2 (5)	3, 7	-
Ability to be supplier of a (prestigious) customer	2	0	2 (2)	1, 7	-
Partnership between supplier and customer	2	0	2 (2)	5, 8	-
Relationship improves the collaboration	0	2	2 (2)	-	1, 6
Customer with high potential	2	0	2 (2)	1, 3	-

After the variables and moderating variables defining behavioral intention, the facilitators and inhibitors were emphasized in chapter 4. First, the factor "(IT) knowledge, competence, capacity and drivers" was explained. The most important factors being IT capability and knowledge of the customer and supplier and experience with EDI

connections. Further explanations for this IT capability were given by supplier 10 and intern 3: "I still think a good IT department for both sides" (Supplier 10, p. 18), "and the right expertise ... of IT personnel" (Intern 3, p. 10). Summarizing the "IT capability of customer/supplier", this factor was mentioned as an important facilitating or inhibiting factor. Related to IT capability and knowledge is the involvement of specialists. These codes, "specialists involved in implementation" and "customer has contact person with (IT) knowledge" were mentioned less frequently than the other codes but the presence possibly facilitates EDI implementation. Supplier 8 emphasized the involvement of specialists: "then you need the specialists. In conclusion, you can say: the use of specialists, who know what they are talking about, ... people who also understand each other on both sides" (Supplier 5, p. 14). Organizational maturity was also underlined by some interviewees as a facilitating or inhibiting factor. Interviewee supplier 3 stated this was an important prerequisite for EDI implementation: "So they need to have a certain maturity, maturity, I would say, to be able to deal with that" (Supplier 3, p. 5). Further, less frequently mentioned codes which could possibly facilitate or inhibit EDI implementation are e.g. "technical requirements of EDI connection", and "capability to keep up with IT innovations" but these codes were all mentioned by respectively one or two interviewees each. The top 10 codes from ""(IT) knowledge, competence, capacity and drivers" are shown by Table 29.

Table 29: (IT) knowledge, competence, capacity and drivers top 10 codes ((#) is total quotes)

Organizational facilitators					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
(IT) knowledge, competence, capacity and drivers					
IT capability of customer/supplier	10	5	15 (39)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 4, 5, 7
IT knowledge of customer/supplier	7	3	10 (21)	2, 3, 4, 5, 6, 7, 10	2, 3, 7
Experience with EDI connections	6	4	10 (19)	1, 2, 3, 5, 6, 10	2, 3, 5, 7
Security (of the EDI connection)	2	5	7 (21)	2, 10	2, 4, 5, 6, 7
IT capacity of customer/supplier	4	3	7 (12)	1, 3, 4, 7	1, 3, 7
Process description and process knowledge	0	4	4 (12)	-	1, 2, 3, 7
Customer has contact person with (IT) knowledge	4	0	4 (4)	1, 5, 7, 8	-
Maturity of supplier/customer	2	2	4 (4)	2, 3	3, 7
Employee should understand the process	0	3	3 (4)	-	1, 2, 7
Specialists involved in implementation	2	0	2 (2)	1, 5	-

The next factor is "Change skills, commitment, and support or resistance" of which the most important factors were explained in chapter 4. The most important codes regarding this factor are shown in Table 30. "experience with EDI connections" was counted the most frequent in this code group and was already explained in the "(IT) knowledge, competence, capacity and drivers" category. Experience with EDI connections is related to change skills as companies can have experience with the organizational change the implementation of EDI brings. In chapter 4, an emphasis was put on the support and willingness within the organization. Further it was stated that it is important to get everybody on the same page. Continuing on getting everybody on the same page, the involvement of all stakeholders might work facilitating at EDI implementation. The involvement of all stakeholders is important as all stakeholders can state what their demands and expectations are possibly leading to organizational support. Intern 1 described this as follows: "if we are going to digitalize the P2P process, … then you will also have to involve all the stakeholders in that P2P process in what we are doing and what it will look like in the future" (Intern 1, p. 10). When there is resistance in the organization this might inhibit EDI implementation. One thing possibly helping to overcome resistance could be to "create insight in the real benefits", as intern 1 explained: "giving insight into what it's going to deliver, I think that's a good one. Not taking it for granted but the yes that you can really demonstrate that" (Intern 1, p. 12).

Organizational resistance could also come from employees which have a "preference for old habits" or a "distrust for new technology and digitalization". Supplier 2 sees this as an important implementation inhibitor: "the most difficult barrier is in the people. They are used to working in a certain way, and in this sector they also tend to be a little suspicious of new technology" (Supplier 2, p. 4). On the contrary, there were also employees who perceived this problem but noted that they are "willing to change habits/remove barriers". How this works was explained by intern 8: "you've been doing that all these years and it's always like that, you're used to this, but that doesn't mean that that's the way we have to keep working" (Intern 8, p. 10). Other codes in this code group, not frequently counted, were "commitment", "dedication and energy", and "employees are used to working with digital technologies".

Table 30: Change skills, commitment, and support or resistance top 10 codes ((#) is total quotes)

Organizational facilitators					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Change skills, commitment, and support or resistance					
Experience with EDI connections	6	4	10 (19)	1, 2, 3, 5, 6, 10	2, 3, 5, 7
Support/resistance within the organization	2	7	9 (14)	1, 9	1, 2, 3, 4, 5, 6, 7
Willingness in organization or suppliers	4	5	9 (13)	1, 2, 4, 10	1, 2, 3, 5, 6
Willingness improves implementation	5	3	8 (9)	1, 2, 3, 6, 9	1, 3, 6
To get everybody on the same page	3	4	7 (8)	1, 2, 8	1, 4, 5, 8
Create insight in the real benefits	2	4	6 (7)	2, 6	1, 3, 4 ,6
Preference for old habits	2	3	5 (9)	2, 4	4, 5, 8
Willing to change habits/remove barriers	1	4	5 (8)	2	1, 3, 7, 8
Process description and process knowledge	0	4	4 (12)	-	1, 2, 3, 7
Involvement of all stakeholders	0	4	4 (7)	-	1, 2, 4, 8

Further, communication was emphasized as essential when connecting two organizational systems. Companies need to communicate about the progress of the implementation as well as the earlier explained goals and expectations. Intern 3 stated that, to improve communication and implementation, it might be beneficial to have a project leader: "that you have the right people from all parties, and yes, that that is also well coordinated, clearly, well, have a project leader or so, who coordinates and communicates everything" (Intern 3, p. 12). Also, a small number of interviewees highlighted to "create insight in the real benefits" as was explained earlier in the "Change skills, commitment, and support or resistance" category. One way to create insight and persuade organizations or employees is the sharing of success stories. Intern 5 explained the importance of this on the basis of his own past experiences: "I have experienced one time that used cases. So with customer X that worked so well and we get all excited about it. Then you're already so pre-minded. Such a mindset of this is going to be fun" (Intern 5, p. 11). Further, less mentioned, codes in this code group are "different types of messages in various implementation stages", "implementation partner", and "SLA with EDI provider". Table 31 shows the codes related to the factor "organizational communication and agreements".

Table 31: Organizational communication and agreements codes ((#) is total quotes)

Organizational facilitators					
Code	**Supplier**	**Intern**	**Total**	**Interviewee Supplier**	**Interviewee Intern**
Organizational communication and agreements					
Make clear agreements	9	5	14 (35)	1, 2, 3, 4, 5, 6, 7, 8, 10	2, 4, 5, 7
Define and match expectations and goals	6	5	11 (18)	1, 2, 4, 6, 8, 10	1, 2, 3, 4, 5
Type of messages send	6	3	9 (23)	1, 3, 6, 7, 8, 10	2, 6, 7
Communication between supplier and customer	6	3	9 (17)	1, 4 ,6, 7, 8, 10	1, 2, 3
Create insight in the real benefits	2	4	6 (7)	2, 6	1, 3, 4 ,6
Define the scope in advance	2	2	4 (5)	7, 10	3, 7
Share success stories	0	3	3 (4)	-	3, 4, 5, 8
Different types of messages in various implementation stages	2	0	2 (2)	7, 8	-
Implementation partner	1	1	2 (2)	1	7
SLA with EDI provider	0	1	1 (1)	-	5

After the organizational facilitators, technological facilitators were discussed in chapter 4. Continuing on the use of a standard and the standard capability, a possible inhibitor of implementation might be the investment in new standards. As multiple interviewees mentioned this as an important inhibitor due to the costs (Supplier 6, 7, 8 and 10). Other characteristics of EDI technology which could facilitate the implementation were that "EDI is a robust, proven technology", "EDI is a simple technology", and that "EDI can run stable". These were characteristics mentioned only a few times by both supplier as case company interviewees. Two interviewees even stated: "EDI implementation is not difficult" due to the mentioned characteristics: "those messages are standardized and agreed upon and that works. Yes, then that connection is not shocking at all" (Intern 4, p. 4). The complete overview of technological facilitators and inhibitors is given by Table 32.

Table 32: Innovation characteristics and standard format acceptance and diffusion, technology training, and technical infrastructure codes ((#) is total quotes)

Technological facilitators					
Code	**Supplier**	**Case**	**Total**	**Interviewee Supplier**	**Interviewee Intern**
Innovation characteristics and standard format acceptance and diffusion					
Use of an EDI standard/format	6	4	10 (20)	2, 3, 6, 7, 8, 10	2, 4, 5, 7
EDI standard/format capability	3	2	5 (13)	6, 7, 8	4, 7
EDI is a robust, proven technology	2	2	4 (6)	7, 8	4, 7
Automate what is possible	1	2	3 (3)	1	4, 7
EDI implementation is not difficult	1	1	2 (6)	6	4
Invest in new standards	2	0	2 (3)	6, 8	-

Creation of new standard is expensive	2	0	2 (2)	7, 10	-
Connection hick-up causing errors	1	0	1 (1)	7	-
EDI is a simple technology	1	0	1 (1)	7	-
EDI can run stable	1	0	1 (1)	7	-
Technology training					
Train and guide employees	0	4	4 (6)	-	1, 2, 5, 8
Technical infrastructure					
ERP capability of customer/supplier	5	4	9 (19)	1, 4, 5, 6, 8	1, 4, 6, 7
Security (of the EDI connection)	2	5	7 (21)	2, 10	2, 4, 5, 6, 7
Availability of (the right) people	3	3	6 (7)	1, 3, 6	1, 3, 7
Costs to be able to connect with ERP	0	2	2 (3)	-	1, 3
German suppliers have older IT systems/difficulties with automation	0	3	3 (3)	-	1, 2, 3

As all there were additional findings in the empirical research, the part after the facilitators and inhibitors covered the additional findings. The first additional finding which might influence the behavioral intention is investment. Of this factor the most important factors were already covered in chapter 4. Further, the possibility of connecting to an EDI platform was mentioned by interviewees, which was also seen as an investment related barrier. As some suppliers stated they do not intend to connect with such a platform as this is one of many solutions leading to a bunch of different connections and solutions. Some suppliers do not want to invest in so many different connection solutions and was emphasized by supplier 2: "I could consider taking out a contract on (EDI platform) as well, but then we would have other customers who work with a different system. And before you know it, you'll have a whole batch of subscriptions" (Supplier 2, p. 3). .Supplier 4, 9, and 10 even stated that "costs do/did not keep them away from implementing". To increase the intention among customers, supplier 6 tries to make the connection accessible by investing in different standards and connections related to EDI. This to achieve the available benefits together with their customers: "we really try to make it very accessible to the customer, just to get those benefits" (Supplier 6, p. 5). Other codes, less frequently mentioned, related to the "investment" are e.g. "higher cost than savings acceptable", "no implementation costs", and "no connection when not profitable". The most important codes regarding the "investment" factor are shown by Table 33.

Table 33: Investment top 9 codes ((#) is total quotes)

Investment					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Weighing costs and benefits	8	5	13 (35)	1, 3, 4, 5, 7, 8, 9, 10	1, 3, 4, 5, 7
Time investment	5	3	8 (15)	1, 3, 5, 6, 9	3, 5, 8
Investment	3	4	7 (12)	1, 3, 6	1, 2, 5, 7
Customer/supplier should be willing to make an investment	3	2	5 (8)	3, 4, 5	1, 6
Subscription/license costs to EDI provider	4	1	5 (7)	1, 2, 5, 6	5
Platform or EDI connection is one of many for supplier/customer	3	1	4 (6)	1, 3, 9	7
If benefits can be obtained, costs are acceptable	2	2	4 (5)	4, 6	2, 7
Costs do/did not keep them away from implementing	3	0	3 (3)	4, 9, 10	-
Cost related	0	3	3 (7)	-	2, 5, 7

As investment focused directly on the influence on behavioral intention. "Country and (organizational) culture" was found as a possible moderating variable (Table 34). One country mentioned a few times in specific was Germany, as intern 1 stated: "those big German manufacturers have a certain unwieldiness that prevents them from linking EDI directly to OEMs like us. ... That has just purely to do with their organization that they're so gigantic and unwieldy. The flexibility is lost" (Intern 1, p. 6). This was underlined by more interviewees as they stated that German suppliers are inflexible and/or have older IT systems relating to IT or ERP capability of a supplier. On the contrary, one interviewee stated that Dutch suppliers are more willing to implement EDI and mostly have all the requirements: "but in the Netherlands things are pretty well organized. And you see that companies are in the lead when it comes to data and system maturity .... There is often more willingness there, but the costs are more important" (Intern 3, p. 3). Organizational culture might also play a role as one interviewee mentioned a specific facilitator of the case company: "one facilitator is that we work with a lot of young people who are very used to working with digital tools" (Intern 7, p. 11). Other codes mentioned in this category, but also less frequent, were "cultural differences", and "customer country of origin".

Table 34: Country and (organizational) culture codes ((#) is total quotes)

Country and (organizational) culture					
Code	**Supplier**	**Case**	**Total**	**Interviewee Supplier**	**Interviewee Intern**
German suppliers have older IT systems/difficulties with automation	0	3	3 (3)	-	1, 2, 3
Dutch companies are more willing to implement EDI	0	1	1 (1)	-	3
Cultural differences	1	0	1 (1)	8	-
Employees are used to working with digital technologies	0	1	1 (1)	-	7
Customer country of origin	1	0	1 (1)	4	-

Finally, there were additional findings which do not fit into to the model but might be a valuable addition for companies when implementing EDI. These deal with certain prerequisites and requirements for implementation and barriers and challenges for implementation (Table 35 and 36). The most important prerequisites were covered in chapter 4. One prerequisite, not linked to the EDI connection itself, was that some suppliers demand the customers connects to their supplier platform. This platform can e.g. be a web shop or shopping cart system: "we link all customers to our shopping cart system, the industry mall" (Supplier 8, pp. 3-4). Further, one employee from the warehouse department of the case company stated he thinks it is very important to have clear information about documents and goods. This to prevent making the process a puzzle which could lead to more errors. He stated the following: "we really just need to know clearly what kind of package is it, what packing slip belongs to that in SAP at that time" (Intern 8, p. 3). Further prerequisites and requirements mentioned by the interviewees, but less frequent, were e.g. "segregation of duties and information", "quality in planning of production process", "EDI connection should be maintenance-friendly", and "rounding or packaging policy".

> yes look it's a prerequisite that your data is good. And by data I mean, eh, material data that it is clear what we need that is well specified. And filling the master data into the system in terms of price, supplier, all that sort of thing. ... That is a joint task. Because when we have our master data right but the supplier is not linked, it still won't work (Intern 3, p. 2).

Table 35: Prerequisites and requirements for implementation top 5 codes ((#) is total quotes)

Prerequisites and requirements for implementation					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Data quality	3	6	9 (33)	1, 6, 8	1, 2, 3, 5, 6, 7
Datasets of customer and supplier should be the same	5	4	9 (27)	1, 4, 5, 6, 9	1, 3, 5, 7
Data or system reliability	0	5	5 (8)	-	1, 2, 6, 7, 8
Supplier platform connection	3	1	4 (6)	3, 7, 8	1
Clear information about documents and goods	1	1	2 (3)	8	8

Continuing on the implementation barriers and challenges, a big part said they are willing to change habits or remove barrier. Possibly even more positive, some stated "there are no/not much barriers when implementing", which was emphasized by intern 4: "may I also say that I see no barriers" (Intern 4, p. 3). On the contrary, he also stated that security barriers will not be overcome: "I don't see a barrier in that. It's purely a technical solution for us. Well actually security wise we are not prepared to overcome or remove a barrier" (Intern 4, p. 3). The importance of good security was emphasized in an earlier section. One supplier stated the "EDI platform is a barrier". As the case company now uses an EDI platform standing between the organizations. This supplier stated it is a huge barrier as a result of the additional costs while their own EDI format acceptance is very broad: "(Name EDI platform). That's a barrier for us. Very clearly. Because there are additional costs involved, so you pay per order and per order line, from that we say: that is not EDI … we don't actually do that" (Supplier 6, p. 6). Concluding on "implementation barriers and challenges", multiple codes were mentioned less frequently, e.g. "connection hick-up causing errors", "lack of investments in current IT", and "dependency of third party".

Table 36: Implementation barriers and challenges codes ((#) is total quotes)

Implementation barriers and challenges					
Code	Supplier	Case	Total	Interviewee Supplier	Interviewee Intern
Willing to change habits/remove barriers	1	4	5 (8)	2	1, 3, 7, 8
There are no/not much barriers when implementing	1	2	3 (3)	5	4, 7
For us not possible (in much cases)	1	0	1 (2)	4	-
Security barriers will not be conquered	0	1	1 (2)	-	4
EDI platform is a barrier	1	0	1 (2)	6	-
Connection hick-up causing errors	1	0	1 (1)	7	-
Bill of materials was a barrier to implement	1	0	1 (1)	5	-
Lack of investments in current IT	1	0	1 (1)	4	-
Challenges to persuade suppliers	0	1	1 (1)	-	2
Distrust for new technology and digitalization	1	0	1 (1)	2	-
Dependency of third party	0	1	1 (1)	-	7

Appendix E: Main findings of the research

Table 37: Main findings behavioral intention ((#) is total quotes)

Main findings behavioral intention		
Code	**Total**	**Code group**
Reduction of errors	14 (34)	Job-fit / Perceived usefulness and outcome expectations
Higher speed	14 (19)	Job-fit / Perceived usefulness and outcome expectations
Weighing costs and benefits	13 (35)	Perceived usefulness and outcome expectations / Investment
Efficiency	11 (36)	Perceived usefulness and outcome expectations
Spend time on value-adding or important activities	11 (16)	Job-fit / Perceived usefulness and outcome expectations
Saving money/lower costs	11 (13)	Perceived usefulness and outcome expectations

Table 38: Main findings behavioral intention moderators ((#) is total quotes)

Main findings behavioral intention moderators		
Code	**Total**	**Code group**
Volume of orders/order lines	14 (34)	Organizational and product aspects
Turnover/size of customer/supplier	14 (33)	Organizational and product aspects
Relate effort to the complexity and turnover of the customer/supplier	11 (20)	Organizational and product aspects / Complexity / Perceived ease of use and implementation
Collaboration and relationship decisive in EDI implementation	9 (11)	Relational aspects
Increase/improve customer/supplier relationship	6 (10)	Relational aspects

Table 39: Main findings on implementation facilitators and inhibitors ((#) is total quotes)

Main findings on EDI implementation facilitators and inhibitors		
Code	**Total**	**Code group**
IT capability of customer/supplier	15 (39)	(IT) knowledge, competence, capacity and drivers
Make clear agreements	14 (35)	Organizational communication and agreements
Define and match expectations and goals	11 (18)	Organizational communication and agreements
IT knowledge of customer/supplier	10 (21)	(IT) knowledge, competence, capacity and drivers
Use of an EDI standard/format	10 (20)	Innovation characteristics and standard format acceptance and diffusion
Experience with EDI connections	10 (19)	(IT) knowledge, competence, capacity and drivers / Change skills, commitment, and support or resistance

Appendix F: Coding scheme

Table 40: Coding scheme

Code	Grounded	Code Groups
(Not implemented because of) lack of necessity	4	Necessity
Ability to be supplier of a (prestigious) customer	2	Competitive pressure and trading partner imposition Relational aspects
Accepts multiple forms of orders	1	Company characteristics
Act as consultant to help customer automate	2	External support
Advantage of platform is only for customer	2	Current automation solution
Answering questions from customer	1	Organizational or process changes
API	2	Other technologies
Automate what is possible	3	Innovation characteristics and standard format acceptance and diffusion Organizational or process changes
Automatically updated data	8	Perceived usefulness and outcome expectations
Availability of (the right) people	7	Organizational resources and size Technical infrastructure
Big supplier with much order lines see necessity and have better IT infrastructure	1	Organizational and product aspects Necessity
Bill of materials at the supplier must be good	1	Prerequisites and requirements for implementation
Bill of materials was a barrier to implement	1	Implementation barriers and challenges
Capability to keep up with IT innovations	1	(IT) knowledge, competence, capacity and drivers
Centralization of processes and systems	2	Data Prerequisites and requirements for implementation
Challenges to persuade suppliers	1	Implementation barriers and challenges
Change in working process/tasks	17	Organizational or process changes
Change of functions among employees	3	Organizational or process changes
Clear communication (based on facts)	6	Perceived usefulness and outcome expectations Job-fit Relative advantage

Clear information about documents and goods	3	Prerequisites and requirements for implementation Points of attention after EDI implementation
Collaboration and relationship decisive in EDI implementation	11	Relational aspects
Collaboration during EDI implementation	3	Relational aspects Implementation phase
Commitment	6	Change skills, commitment, and support or resistance
Communication between supplier and customer	17	Organizational communication and agreements
Communication in the EDI platform	2	Current automation solution
Company policy to connect customers with EDI	2	Organizational demands
Competitive pressure	2	Competitive pressure and trading partner imposition
Competitor pressure is always present	3	Competitive pressure and trading partner imposition
Competitor pressure to a lesser extent	3	Competitive pressure and trading partner imposition
Complexity of the customer	2	Organizational and product aspects
Computer processes the order or invoice	8	Organizational or process changes
Computer replacing employee	3	Organizational or process changes
Connect all customers	1	Customer or supplier wish
Connection hick-up causing errors	1	Innovation characteristics and standard format acceptance and diffusion Implementation barriers and challenges
Connection solution which is applicable to multiple customers and suppliers	7	Disadvantage of EDI
Controlling instead of executing	14	Organizational or process changes
Convenience	4	Perceived usefulness and outcome expectations Relative advantage
Corporate changes	1	Organizational or process changes
Corporate culture affecting EDI implementation	3	Change skills, commitment, and support or resistance
Correctness in information	5	Perceived usefulness and outcome expectations
Cost related	7	Investment
Costs are high	1	Investment

Costs do/did not keep them away from implementing	3	Investment
Costs to be able to connect with ERP	3	Technical infrastructure Investment
Covid-19	1	Customer or supplier wish
Create insight in the real benefits	7	Change skills, commitment, and support or resistance Organizational communication and agreements
Creation of new standard is expensive	2	Innovation characteristics and standard format acceptance and diffusion
Cultural differences	1	Country and (organizational) culture
Current platform is limited/not optimal	2	Relative advantage
Customer country of origin	1	Country and (organizational) culture
Customer demand to connect via EDI	2	Competitive pressure and trading partner imposition
Customer has contact person with (IT) knowledge	4	(IT) knowledge, competence, capacity and drivers
Customer pressure	3	Competitive pressure and trading partner imposition
Customer should be aware of necessity	1	Necessity
Customer with high potential	2	Relational aspects
Customer/supplier should be willing to make an investment	8	Investment
Customers with repetitive order flow	2	Organizational and product aspects
Data management	1	Data Points of attention after EDI implementation
Data or system reliability	8	Perceived usefulness and outcome expectations Prerequisites and requirements for implementation
Data quality	33	Data Prerequisites and requirements for implementation
Datasets of customer and supplier should be the same	27	Data Prerequisites and requirements for implementation
Decrease of workload	6	Perceived usefulness and outcome expectations
Dedication and energy	1	Change skills, commitment, and support or resistance

Define and match expectations and goals	18	Organizational communication and agreements
Define the scope in advance	5	Organizational communication and agreements
Degree of automation at customer	6	(IT) knowledge, competence, capacity and drivers
Delete EDI messages after usage	1	Points of attention after EDI implementation
Demand for good and quick information	1	Organizational demands
Demands from supplier/customer	3	Competitive pressure and trading partner imposition
Demands on same level	1	Prerequisites and requirements for implementation
Dependency between buyer and supplier	1	Relational aspects
Dependency of third party	1	Implementation barriers and challenges
Development partner important qualifier for EDI connection	1	Relational aspects
Difference in monitoring the orders after EDI implementation	12	Organizational or process changes
Different types of messages in various implementation stages	2	Organizational communication and agreements Implementation phase
Digitalization is lacking in this industry	1	Industry characteristics
Direct EDI connection is cheaper than platform	2	Relative advantage Investment
Distributors have priority	3	Organizational and product aspects
Distrust for new technology and digitalization	1	Change skills, commitment, and support or resistance Implementation barriers and challenges Industry characteristics
Do not spend time on iterative, non-value adding tasks	2	Perceived usefulness and outcome expectations Organizational or process changes
Documentation of actions and EDI connection	3	Organizational or process changes Points of attention after EDI implementation
Dutch companies are more willing to implement EDI	1	Country and (organizational) culture
Each customer of equal importance	3	Relational aspects
Ease of connecting	2	Perceived ease of use and implementation

EDI can run stable	1	Innovation characteristics and standard format acceptance and diffusion
EDI connection must be simple	4	Complexity
EDI connection should be maintenance-friendly	1	Prerequisites and requirements for implementation
EDI implementation is not difficult	6	Innovation characteristics and standard format acceptance and diffusion Complexity
EDI implementation no influence product quality	1	Perceived usefulness and outcome expectations
EDI is a robust, proven technology	6	Innovation characteristics and standard format acceptance and diffusion
EDI is a simple technology	1	Innovation characteristics and standard format acceptance and diffusion Perceived ease of use and implementation Complexity
EDI is the future	1	Future expectations
EDI platform is a barrier	2	Implementation barriers and challenges
EDI platform leads to a lot of work for supplier	1	Relative advantage
EDI standard/format capability	13	Innovation characteristics and standard format acceptance and diffusion
Effectivity	1	Perceived usefulness and outcome expectations
Efficiency	36	Perceived usefulness and outcome expectations
Electronic documents leading to more work or a puzzle	5	Other consequences of EDI implementation
Eliminate repetitive work	2	Perceived usefulness and outcome expectations Organizational or process changes
Employee should understand the process	4	(IT) knowledge, competence, capacity and drivers Organizational or process changes
Employees are used to working with digital technologies	1	Change skills, commitment, and support or resistance Country and (organizational) culture
Environmental pressure	7	Competitive pressure and trading partner imposition
ERP capability of customer/supplier	19	Technical infrastructure
Errors in current automation software solutions	2	Relative advantage

Exclusive contracts leading to less competition	1	Competitive pressure and trading partner imposition
Expect to connect more customers/suppliers	2	Future expectations
Experience with EDI connections	19	Change skills, commitment, and support or resistance (IT) knowledge, competence, capacity and drivers
Fee or discount depending on type of data transfer	2	Competitive pressure and trading partner imposition
Finance department	1	Department
Find a suitable and affordable clearing partner	1	Investment Implementation phase
First EDI, then RPA	2	RPA as addition to EDI
Focus on direct connections between systems instead of RPA	1	Perceived usefulness and outcome expectations
For us not possible (in much cases)	2	Implementation barriers and challenges
Frustration about current process	1	Relative advantage
FTP server	1	Other technologies
Functionality within the EDI connection	2	Prerequisites and requirements for implementation
German suppliers have older IT systems/difficulties with automation	3	Technical infrastructure Country and (organizational) culture
Give advice to customer about EDI	1	External support
Help supplier/customer implement EDI	3	External support
Hesitation when customer has no long term view on relationship with supplier	1	Relational aspects
High costs are not necessary	1	Investment
Higher availability	1	Perceived usefulness and outcome expectations
Higher cost than savings acceptable	2	Investment
Higher costs for the same task would be difficult	2	Investment
Higher intensity of IT within the purchasing department	1	Organizational or process changes
Higher necessity leads to better implementation	3	Change skills, commitment, and support or resistance Necessity
Higher speed	19	Perceived usefulness and outcome expectations Job-fit
Human interpretation	1	Relative advantage
If benefits can be obtained, costs are acceptable	5	Investment
Implementation partner	2	Organizational communication and agreements (IT) knowledge, competence, capacity and drivers

Implementation time	5	Implementation phase
Importance of customer	7	Relational aspects
Improve competitive position	2	Perceived usefulness and outcome expectations Extrinsic motivation
Improve Configure To Order	1	Perceived usefulness and outcome expectations Relative advantage
Improve process after a while	1	Relational aspects
Improve tactical buying	1	Perceived usefulness and outcome expectations Organizational or process changes
Increase in sales	4	Perceived usefulness and outcome expectations Extrinsic motivation
Increase in workload after EDI	4	Organizational or process changes
Increase/improve customer/supplier relationship	10	Perceived usefulness and outcome expectations Relational aspects
Increased processing speed	12	Perceived usefulness and outcome expectations Job-fit
Increased reliability	14	Perceived usefulness and outcome expectations Job-fit Relative advantage
Increasing amount of small orders	3	Other consequences of EDI implementation
Indirect influences of environment	2	Competitive pressure and trading partner imposition
Industry 4.0	1	Other technologies
Innovative	3	Company characteristics
Insight and transparency	12	Perceived usefulness and outcome expectations Relative advantage
Invest in new standards	3	Innovation characteristics and standard format acceptance and diffusion
Investment	12	Investment
Involvement of all stakeholders	7	Change skills, commitment, and support or resistance
IT capability of customer/supplier	39	(IT) knowledge, competence, capacity and drivers
IT capacity of customer/supplier	12	(IT) knowledge, competence, capacity and drivers
IT department most important	1	Department

IT knowledge of customer/supplier	21	(IT) knowledge, competence, capacity and drivers
Lack of investments in current IT	1	(IT) knowledge, competence, capacity and drivers Implementation barriers and challenges
Loss of grip on the process	2	Organizational or process changes Disadvantage of EDI
Loss of importance or job	2	Extrinsic motivation
Lower inventory levels	2	Perceived usefulness and outcome expectations
Make clear agreements	35	Organizational communication and agreements
Make clear agreements about RPA	1	Organizational communication and agreements RPA other
Make the connection/investment accessible	3	Investment
Management initiating EDI projects	1	Management support
Management support	7	Management support
Manual order processing is time consuming	6	Relative advantage
Manual order processing leads to errors	8	Relative advantage
Maturity of supplier/customer	4	(IT) knowledge, competence, capacity and drivers
Money is important	1	Investment
Monitoring EDI connection after implementation	6	Points of attention after EDI implementation
More added value than only P2P process	1	Perceived usefulness and outcome expectations Organizational or process changes Data
More customers	1	Extrinsic motivation
More output with less/same employees	5	Perceived usefulness and outcome expectations Extrinsic motivation Relative advantage Organizational or process changes
Multidisciplinary team	1	Implementation phase
Multiple benefits in operations	2	Perceived usefulness and outcome expectations
Necessity increasing intention	3	Necessity
No change of functions among employees	5	Organizational or process changes
No connection when not profitable	1	Investment
No customer pressure	1	Competitive pressure and trading partner imposition

No idea of change of functions	2	Organizational or process changes
No implementation costs	1	Investment
No reduction of P2P cycle	1	Perceived usefulness and outcome expectations Organizational or process changes
No relational aspects	5	Relational aspects
No structural changes in organization	4	Organizational or process changes
No/less manual interference	13	Perceived usefulness and outcome expectations Job-fit Relative advantage
Normalization of electronic ordering	2	Competitive pressure and trading partner imposition Future expectations
Obligation to use EDI	2	Competitive pressure and trading partner imposition
OCI connection	4	Other technologies
OCR technology	3	Other technologies
Often customers already have EDI	1	Competitive pressure and trading partner imposition
Often supplier takes initiative	1	Customer or supplier wish
Operational investment with multiple departments	3	Investment Department
Organization and employees evolve with technology change	1	Organizational or process changes
Organizational growth	2	Perceived usefulness and outcome expectations Extrinsic motivation
Organizational resources	7	Organizational resources and size
Organizational size	5	Organizational resources and size
Organizational structure was ready for EDI implementation	1	Organizational or process changes
Other departments can benefit	1	Department
Other type of employees/skills are required at order administration	2	Organizational or process changes
Other way to share data with suppliers	4	Other technologies Data Implementation phase
Partnership between supplier and customer	2	Relational aspects
Past EDI implementation success	1	Relational aspects
Persuade employees and show the new possibilities	2	Change skills, commitment, and support or resistance
Platform or EDI connection is one of many for supplier/customer	6	Investment

Poor data quality leading to problems	2	Relative advantage Data
Possibility to connect and maintain EDI connection	2	(IT) knowledge, competence, capacity and drivers Investment
Possibility to connect with suppliers	1	Perceived usefulness and outcome expectations Relative advantage
Preference for old habits	9	Change skills, commitment, and support or resistance
Preferred customer status	4	Preferred customer status
Preferred customer status meaning	7	Preferred customer status
Preferred customer status no influence on EDI decision-making	2	Preferred customer status
Process description and process knowledge	12	Change skills, commitment, and support or resistance (IT) knowledge, competence, capacity and drivers
Process improvement	13	Perceived usefulness and outcome expectations Organizational or process changes
Project-based/plan	8	Implementation phase
Purchase costs not the sole decision factor	1	Points of attention after EDI implementation
Purchasing department most important	7	Department
Purchasing gives input to IT	1	Department
Quality in planning of production process	1	Prerequisites and requirements for implementation
Rate customers according to importance	1	Relational aspects
Reduction of errors	34	Perceived usefulness and outcome expectations Job-fit
Reduction of labor	13	Perceived usefulness and outcome expectations Relative advantage
Reduction of manual steps leads to time reduction	4	Relative advantage
Relate effort to the complexity and turnover of the customer/supplier	20	Perceived ease of use and implementation Complexity Organizational and product aspects
Relationship	5	Relational aspects
Relationship improves the collaboration	2	Relational aspects Implementation phase
Reserve time to be able to implement EDI	2	Change skills, commitment, and support or resistance Investment

Responsibilities after EDI implementation	2	Points of attention after EDI implementation
Robotization	1	Other technologies
Rounding or packaging policy	1	Prerequisites and requirements for implementation
RPA and EDI together for higher effectivity	7	RPA as addition to EDI
RPA as a substitute	5	RPA as EDI substitute
RPA as an addition	18	RPA as addition to EDI
RPA can do repetitive tasks (not suited for EDI)	3	RPA as EDI alternative
RPA increases complexity	1	RPA other
RPA is an alternative	4	RPA as EDI alternative
RPA leads to a higher speed/time reduction	4	RPA benefits
RPA leads to better information	3	RPA benefits
RPA leads to error reduction	2	RPA benefits
RPA no impact on EDI	11	RPA impact on EDI
RPA not as a substitute	6	RPA as EDI substitute
RPA not necessary	3	RPA other
RPA other technology than EDI	5	RPA impact on EDI
RPA overlaps with EDI	1	RPA impact on EDI
RPA weakens EDI	1	RPA impact on EDI
Saving money/lower costs	13	Perceived usefulness and outcome expectations
Security (of the EDI connection)	21	(IT) knowledge, competence, capacity and drivers Technical infrastructure
Security barriers will not be conquered	2	Implementation barriers and challenges
Segregation of duties and information	2	Prerequisites and requirements for implementation
Send an EDI questionnaire to judge customer	1	Prerequisites and requirements for implementation
Share savings with customer	3	External support Investment
Share success stories	4	Organizational communication and agreements
SLA with EDI provider	1	Organizational communication and agreements
Smart connected supplier network	6	Other technologies
Solving problems	2	Organizational or process changes
Specialists involved in implementation	2	(IT) knowledge, competence, capacity and drivers
Speed is not very important	1	Organizational demands

Spend time on value-adding or important activities	16	Perceived usefulness and outcome expectations Job-fit
Stable network for EDI connection	1	Prerequisites and requirements for implementation
Staffing	1	Perceived usefulness and outcome expectations Organizational or process changes
Standard products easy to automate	5	Organizational and product aspects
Start with easy implementation	4	Perceived ease of use and implementation Implementation phase
Start with high turnover and easy implementation	3	Perceived ease of use and implementation Organizational and product aspects
Start with small supplier	1	Organizational and product aspects
Stay ahead of competition	1	Competitive pressure and trading partner imposition
Strategic importance of customer	5	Relational aspects
Structural change in organization	1	Organizational or process changes
Structure of orders	4	Organizational and product aspects
Subscription/license costs to EDI provider	7	Investment
Supplier and customer satisfaction	1	Points of attention after EDI implementation
Supplier intake and selection	1	Prerequisites and requirements for implementation
Supplier platform connection	6	Prerequisites and requirements for implementation
Supplier pressure/pushing customers to connect	2	Competitive pressure and trading partner imposition
Supplier reliability	7	Perceived usefulness and outcome expectations Relational aspects
Support/resistance within the organization	14	Change skills, commitment, and support or resistance
Take time for postponed work	4	Perceived usefulness and outcome expectations Job-fit
Technical requirements of EDI connection	2	(IT) knowledge, competence, capacity and drivers
Technological image or marketing towards customers	2	Extrinsic motivation

Testing the EDI connection	4	Implementation phase
There are no/not much barriers when implementing	3	Implementation barriers and challenges
Time investment	15	Investment
Time reduction	18	Perceived usefulness and outcome expectations Job-fit
To get everybody on the same page	8	Change skills, commitment, and support or resistance
Together owner of the process	1	Implementation phase
Tradecloud	1	Other technologies
Train and guide employees	6	Technology training
Troubleshooting instead of administrative actions	1	Organizational or process changes
Trust and experience between buyer and customer	1	Relational aspects
Trust in the information	8	Perceived usefulness and outcome expectations
Turnover of customer in value	2	Organizational and product aspects
Turnover/size of customer/supplier	33	Organizational and product aspects
Type of messages send	23	Organizational communication and agreements
Type of product	6	Organizational and product aspects
Unknown programme leading to less willingness among suppliers	1	Other consequences of EDI implementation
Update data	1	Data Prerequisites and requirements for implementation
Use of an EDI standard/format	20	Innovation characteristics and standard format acceptance and diffusion
Use other technology depending on order size and customer	5	Other technologies Organizational and product aspects
Volume of orders/order lines	34	Organizational and product aspects
Webshop	2	Other technologies
Weighing costs and benefits	35	Perceived usefulness and outcome expectations Investment
Willing to change habits/remove barriers	8	Change skills, commitment, and support or resistance Implementation barriers and challenges
Willingness improves implementation	9	Change skills, commitment, and support or resistance

Willingness in organization or suppliers	13	Change skills, commitment, and support or resistance
Win win situation	11	Perceived usefulness and outcome expectations
Wish of the customer	13	Customer or supplier wish
Wish/unwillingness of the supplier	2	Customer or supplier wish
Work is postponed due to time constraints	4	Relative advantage