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How structural and process characteristics influence the digitalization in buyer-supplier relationships: an AAR2 perspective

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Abstract

This study focuses on the digitalization in buyer-supplier relationships. The goal of this study is to find out how companies can differ in their degree of digitalization in buyer-supplier relationships while being exposed to the same internal and external factors. This is done by analyzing different factors and contingencies which have an influence on the degree of digitalization in buyer-supplier relationships. Whereafter, a new theoretical framework is developed. At the start of this study, an extensive literature review is done to map out the relevant factors and contingencies. After that, fifteen suppliers from eight different industries were interviewed. The qualitative data is coded via open, axial and selective coding. By analyzing the data different results were found. First of all, the degree of digitalization in buyer-supplier relationships can be measured by the degree to which different ICT systems are integrated within both sides of the buyer and supplier. Secondly, the literature review found that every company must meet five factors in order to digitalize their buyer-supplier relationships. However this study adds that there is a sixth factor that companies must meet in order to digitalize their buyer-supplier relationships namely Human Resources. The last major result had to do with the eight contingencies that can strengthen or weaken the process of digitalization in buyer-supplier relationships. After analyzing the data it became prevalent that social interaction had no effect on the process of digitalization in buyer-supplier relationships. With the result that there are seven important contingencies in relation to the digitalization in buyer-supplier relationships instead of eight. At the end of this study a discussion was started by comparing the results to the existing literature. Followed by the limitations, future research and managerial recommendations of this study.

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Index of abbreviations

DSC	Digital Supply Chain
SCM	Supply Chain Management
e.g.	for example
Fig.	figure
H	hypothesis
AAR	Actors, Activities and Resources theory

1. Introduction: A shift from normal supply chains towards digital supply chains and the importance of the buyer-supplier relationship

In today's supply chain management the transformation to digital supply chains has an important role. A common definition for a supply chain is a collaborative network of entities through which different materials flow (Lummus & Alber, 1997). Those entities could be for example suppliers, retailers and manufactures. Companies tried to influence supply chains by making use of supply chain management (SCM), which is the coordination of activities, within and between different companies, with the purpose to serve the end customer (Larson & Rogers, 1998). In recent years, SCM has been considered as one of the key factors for companies to gain a competitive advantage and increase efficiency (Ataseven & Nair, 2017).

However, focusing on supply chains also comes with several challenges, such as extra costs, complexity, vulnerability and uncertainty (Abdel-Basset, 2018). In order to overcome these challenges, supply chains have to be managed in a smarter way (Abdel-Basset, 2018). This can be done by undergoing a digital transformation in the supply chain (Ghobakhloo, 2019). The digitalization of a supply chain comes with a set of digital technologies that involve connected customers and intelligent supply chains (Gilchrist, 2016). Some of the first digital technologies that were used in supply chains were Enterprise Resource Planning (ERP), Computer Aided Design (CAD) or even online communication tools (Y. Lu, 2017). Later, more advanced digital technologies became prevalent such as Big Data Analytics, Internet of Things (IoT) and Cloud Computing. A common definition that is given for the digitalization of supply chains is the use and adaptation of different digital technologies by companies, in order to improve their operational and strategic performance (Hennelly, Srari, Graham, & Fosso Wamba, 2020).

Research about the digitalization of supply chains often focused on certain industries and companies. Some industries that got attention in the literature were the steel industry (Salo, Tan, & Makkonen, 2021), fashion industry (Braglia, Marrazzini, Padellini, & Rinaldi, 2021) and construction industry (Dallasega, Rauch, & Linder, 2018). Something else that was found is that small and medium sized companies often lack the skilled employees and financial resources in order to successfully implement digital technologies (Horváth & Szabó, 2019). The opposite is true for multinationals who often have an advantage due to their financial resources. The digitalization of supply chains is one of the central areas of research in industrial marketing (Hussain, Jing, Junaid, Shi, & Baig, 2020). What appeared in the literature is that 90% of all transactions are already digital and 70% of the companies used some form of digital technologies in their supply chain (Burger, Kessler, & Arlinghaus, 2021).

Building upon this, the focus in this study will be on the digitalization of the buyer-supplier relationships more specifically the perspective of suppliers. The choice for this specification is made because in relationships there is often a chance of human mistakes. An advantage of the digitalization of buyer-supplier relationships is that procedures and interaction between humans can be automated (Kamalaldin, Linde, Sjödin, & Parida, 2020) resulting in less mistakes that are happening in the buyer-supplier relationships. To give a better understanding on what digitalization is in buyer-supplier relationships some practical examples are mentioned. First of all, companies can digitalize their buyer-supplier relationships by making use of different digital systems such as ERP, EDI and information systems. Secondly, there are also more well-known examples such as Microsoft Teams or Skype. Lastly, there are new digital transformations ongoing in buyer-supplier relationships such as the use of Big Data or 3D models.

Most companies are in the beginning or starting phase to digitalize their buyer-supplier relationships (Fröhlich & Steinbiß, 2020). However, the literature found that there is often a difference in the degree of digitalization between companies which have the same factors for digitalization of the buyer-supplier relationships. Examples of these factors in the digitalization of buyer-supplier relationships are investment budget, ICT technology, implementation knowledge, content of the data and need for digitalization (Wessel, Baiyere, Ologeanu-Taddei, Cha, & Blegind Jensen, 2020). Some studies argue that this difference in digitalization is purely based on the presence of factors such as investment budget and ICT technology. However, the effect of relationship characteristics has not yet been studied in coherence with the factors that have an effect on the digitization of buyer and supplier relationships. Therefore this study tries to add a new perspective to explain this difference with the use of a theory called the ‘AAR2’ theory (Håkansson & Snehota, 1995). In the literature it is found that in other domains the AAR2 theory explained the variety in innovation by certain suppliers because certain characteristics were contingencies for innovations (Tikkanen & Alajoutsijärvi, 2002). The AAR2 theory focuses on buyer-supplier relationships and has four structural characteristics and four process characteristics. This theory is based on the principle that a network has no clear boundaries, nor any center or apex. A relationship can be seen as an ‘organization’ that has an influence on different Activities, Actors and Resources, in other words AAR.

The prevailing study adds a new theoretical contribution to the existing body of literature. As mentioned before there is often a difference in the degree of digitalization. Even when companies are exposed to the same internal and external factors (Wessel et al., 2020). This

indicates that there is something else – some contingencies - which have an influence on the degree of digitalization in buyer-supplier relationships. The goal of this study is to research the effect that the contingencies (structural and process characteristics) could have on the digitalization of the buyer-supplier relationships. As indicated by Veile, Schmidt, Müller and Voigt (2021) future research is needed with regards to the digitalization of certain relationships and their effects on firm performance (Veile, Schmidt, Müller, & Voigt, 2021). This study intends to investigate this specifically for the digitalization of buyer-supplier relationships, with a focus on the contingencies namely the structural and process characteristics. These contingencies are insufficiently investigated in the context of digitalization in the buyer-supplier relationships. Which is also the main intended theoretical contribution of this study. With all these arguments in mind, the following central research question was derived: *What is the influence of the factors on the degree of digitalization in buyer-supplier relationships and how is this relationship influenced by contingencies?*

This study adds contributions to different research streams. First of all, the digital era is still new and all kinds of research streams need further investigation (Scuotto, Caputo, Villasalero, & Del Giudice, 2017). To be more specific, the contingency effect of the structural and process characteristics will be researched in relation to the digitalization of buyer-supplier relationships. Different studies argue that there is more research needed to find out why certain companies differ in their degree of digitalization (Wessel et al., 2020). Something that is new in this study is that the effect of contingencies is researched in relation to the factors that are needed for the digitalization in buyer-supplier relationships. Another contribution of this study is to check the application of the AAR2 theory in a digitalization perspective. During this study the strength of the AAR2 theory is measured by looking how these eight contingencies have an effect on the digitalization in buyer-supplier relationships. The strength and importance is measured of each contingency individually. As mentioned by other papers there is more research needed in regards to the contingencies and factors that help companies with the digitalization of buyer-supplier relationships (Kamalaldin et al., 2020).

The structure of this study is organized as follows: first, the literature review will start with an introduction about the degree of digitalization of buyer-supplier relationships. After that, the factors of the digitalization of buyer-supplier relationships are explained. Next, different theories are described leading to the main theory that is used in this article, namely the AAR2 theory. All the contingencies of the AAR2 theory will be explained and a theoretical framework is developed at the end of part 2. Afterwards the methodology in part 3 shows how the data is

collected and analyzed. Part 4 includes the result section which covers the degree of digitalization, factors influencing digitalization and the eight contingencies. Finally a discussion is held in part 5 which includes limitations, future research and managerial recommendations.

2. Literature review: Factors of the degree of digitalization in buyer-supplier relationships and the influence of contingencies

2.1 The description and measurement of the degree of digitalization in buyer-supplier relationships

What can be concluded out of the introduction is that a key topic within this study is the degree of digitalization in buyer-supplier relationships. A common definition for the degree of digitalization in buyer-supplier relationships is the degree to which companies have digitalized their relationships in regards to communication channels, data streams and transactions resulting in higher levels of automation (Obal & Lancioni, 2013) (Veile et al., 2021). Later in this study, it will also be necessary to measure the degree of digitalization in buyer-supplier relationships. This will be done by asking suppliers to which extent they have digitalized their communication channels, data streams and transactions of their buyer-supplier relationships. There are different methods used within the literature to measure the degree of digitalization in buyer-supplier relationships. For example scorecards (Bernhard, Norström, Snis, Gråsjö, & Gellerstedt, 2018), models (Sezer, Thunberg, & Wernicke, 2021) but the one that was most applicable to this study used interviews (Bogner, Voelklein, Schroedel, & Franke, 2016). The part above focused more on the practical side of the degree of digitalization in buyer-supplier relationships. However, this study also tries to investigate scientifically why some suppliers succeed in their digitalization process and other suppliers have more difficulty with this process. During the literature review different concepts and theories are explored that lead towards a new theoretical framework made in part 2.6

Table 1. The degree of digitalization in the buyer-supplier relationship

Element	Definition
Degree of digitalization in buyer-supplier relationships	The degree to which companies have digitalized their relationships in regards to communication channels, data streams and transactions resulting in higher levels of automation (Obal & Lancioni, 2013) (Veile et al., 2021).

2.2 The five factors that influence the digitalization process of buyer-supplier relationships

This research focused on the digitalization of buyer-supplier relationships. In more specificity the digitalization between relationships of suppliers and buyers is researched. There are different factors or so called 'harder' elements that influence the digitalization process in buyer-supplier relationships. In the literature different systematic literature reviews are done that focused on the factors that had an influence on the digitalization process of buyer-supplier relationships. First of all, it was found that papers focused on the investments, capabilities and knowledge that are necessary for the efficient digitalization of buyer-supplier relationships (Li, Su, Zhang, & Mao, 2018) (Henriette, Feki, & Boughzala, 2015). Other papers argued for the presence of technologies and the content of data (Shen, Zhang, & Liu) (Sanders & Ganeshan, 2018). However, it was also found that the need for a digital transformation is also an factor for the digitalization of buyer-supplier relationships (Agrawal & Narain, 2018).

There are different streams of literature that argue for the importance of factors in the digitalization process of buyer-supplier relationships. First of all, it is argued that there are four critical success factors in the digitalization process namely analytics, digital technologies, businesses and customers (Sahu, Deng, & Mollah, 2018). Especially the first and second critical success factors are related towards the factors in the digitalization process of buyer-supplier relationships. A second stream of literature argues that due to the increasing competitiveness of markets and rise of social, mobile, analytics and cloud computing (SMAC) technologies companies are forced to digitalize their buyer-supplier relationships (Legner et al., 2017). Lastly, it is argued that a digital transformation of the buyer-supplier relationship needs a certain level of investment in knowledge and money in order to be successful (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017). All these factors are decisive in the degree of digitalization that a company can acquire in their buyer-supplier relationships. By taking this all into account, five factors were often prevalent in different systematic literature reviews and were related towards the digitalization of buyer-supplier relationships: *investment budget, ICT technology, implementation knowledge, content of the data and need for digitalization*. These factors map out a set of antecedents that are contributing to the digitalization of buyer-supplier relationships. For these factors the focus is primarily on money, data and technology instead of the relationship itself (Rodríguez, Svensson, & Mehl, 2020).

2.2.1 Explanation of the different factors that influence the degree of digitalization in buyer-supplier relationships

The next section will shortly introduce the importance of the factors and afterwards explain each of these five factors individually. In recent years different studies are done which investigated the factors that influence the degree of digitalization in buyer-supplier relationships. A paper by Burger, Kessler and Arlinghaus (2021) looked at the factors, consequences and challenges of the digitalization process of buyer-supplier relationships (Burger et al., 2021). Another paper by Annarelli, Battistella, Nonino, Parida and Pessot (2021) focused more on the factors and capabilities of digitalization (Annarelli, Battistella, Nonino, Parida, & Pessot, 2021). What is new in this study is that the factors that were most dominant and important according to the literature are studied in coherence.

The first factor that has an influence on the degree of digitalization in buyer-supplier relationships is the *investment budget*. Literature argues that all digital transformations need some form of investments (Schwertner, 2017). It was found that digital transformations require financial investments as well as public spending in order to reach an adequate level of development (Mičić, 2017). Mičić also found an increase in the amount that was invested towards digital transformations by European countries. This increase in investment budget towards digital transformations of buyer-supplier relationships can be explained by the fact that companies are aware that they need to transform their relationships. If companies maintain the status quo they risk the fact of being outperformed by other, more advanced competitors in their market (Ziółkowska, 2021). To conclude, companies are almost always forced to invest in the digitalization of their buyer-supplier relationships in order to stay competitive and develop an adequate degree of digitalization. A common definition for the investment budget is the amount of money that is available or spent towards the digitalization of buyer-supplier relationships.

The second factor that influences the degree of digitalization in buyer-supplier relationships is *ICT technology*. As mentioned before companies benefit from the investments in the digitalization of buyer-supplier relationships. A large part of these investments goes to different ICT technologies that enable the digitalization of buyer-supplier relationships. Examples of such ICT technologies are digital communication tools, ERP systems, robotics, supply chain analytics and advanced forecasting (Büyüközkan & Göçer, 2018). Furthermore, it was found that ICT technologies had a positive effect on the buyer-supplier relationship performance of companies (Zhang, Pieter van Donk, & van der Vaart, 2011). However it was mentioned that it is hard to identify which specific ICT technology led to this increased buyer-supplier

relationship performance. This will be further researched within this study by asking interviewees which factors of the digitalization in buyer-supplier relationships were present in representative examples. What can be concluded is that the degree of ICT technology is directly related to company performance in their buyer-supplier relationships. A common definition for ICT technology is the degree of present ICT technologies within buyer-supplier relationships (e.g digital communication tools, ERP systems, robotics, supply chain analytics and advanced forecasting).

The third factor that has an influence on the degree of digitalization in buyer-supplier relationships is *implementation knowledge*. It is already stated that investments and ICT technologies are affecting the degree of digitalization in buyer-supplier relationships. However, companies can have lots of money and ICT technologies at their disposal but with the lack of implementation knowledge a company won't successfully digitalize their buyer-supplier relationship (Peansupap & Walker, 2006). There are different ways to accumulate knowledge about ICT within a company, think for example of traineeships and workshops (Mahmud & Ismail, 2010). This means that a company needs a certain degree of implementation knowledge about ICT technologies in order to reach an adequate level of digitalization in buyer-supplier relationships. A common definition for the implementation knowledge of a digital transformation is the degree of knowledge that is available within a buyer-supplier relationship to implement and work with different ICT technologies and systems.

The fourth factor that influences the degree of digitalization in buyer-supplier relationships is the *content of the data*. Today's supply chain professionals are inundated with lots of data. This data needs to be organized, analyzed and produced to useful output (Hazen, Boone, Ezell, & Jones-Farmer, 2014). The digital transformation within buyer-supplier relationships can help in this process. different ICT technologies such as ERP systems and supply chain analytics are useful in this process. There is a need that we value data as an asset in themselves (Phoon, Ching, & Wang, 2019). Raw data is often not that valuable, once companies start to value and work with this data, it correlates with increased company performance (Mandinach, 2012). The degree of available data and the content of this data for a company can enhance the value of digitalization within buyer-supplier relationships. A common definition that is given for the content of the data is the amount of data that is available within a buyer-supplier relationship and the degree to which a company can work efficiently with this data.

The last factor that has an influence on the degree of digitalization in buyer-supplier relationships is the *need for digitalization*. This factor is somewhat more related towards

different sectors. Between sectors there is a difference in the need for digitalization. There are innovative sectors such as the financial service sector and the tourism sector (Cziesla, 2014) (Balula et al., 2019). Without an adequate degree of digitalization in buyer-supplier relationships it would be impossible in these sectors to compete with other competitors. However there are other sectors such as the steel and the construction sector that follow a more conservative approach (Klinc & Turk, 2019). These differences could be caused due to differences in competitiveness, innovativeness and demand for digitalization of buyer-supplier relationships within sectors (Schwertner, 2017). A common definition that is given for the need for digitalization is the degree to which companies are dependent on digitalization in their buyer-supplier relationships in order to stay competitive.

Table 2. The five factors that are influencing the degree of digitalization in buyer-supplier relationships

Factors	Definitions
Investment budget	The amount of money that is available or spent towards the digitalization of buyer-supplier relationships (Schwertner, 2017) (Mićić, 2017).
ICT technology	The degree of present ICT technologies within buyer-supplier relationships (e.g digital communication tools, ERP systems, robotics, supply chain analytics and advanced forecasting) (Zhang et al., 2011) (Büyüközkan & Göçer, 2018).
Implementation knowledge	The degree of knowledge that is available within a buyer-supplier relationship to implement and work with different ICT technologies and systems (Peansupap & Walker, 2006) (Mahmud & Ismail, 2010).
Content of the data	The amount of data that is available within a buyer-supplier relationship and the degree to which a company can work efficiently with this data (Hazen et al., 2014) (Mandinach, 2012).
Need for digitalization	The degree to which companies are dependent on digitalization in their buyer-supplier relationships in order to stay competitive (Klinc & Turk, 2019) (Schwertner, 2017).

The previous section introduced five factors that influenced the degree of digitalization in buyer-supplier relationships. These were investment budget, ICT technology, implementation knowledge, content of the data and need for digitalization. Still these factors alone can't explain

the difference in digitalization in buyer-supplier relationships. Therefore the next section introduces the AAR2 theory to study the moderating effect of the eight contingencies on the digitalization of buyer-supplier relationships.

2.3 A literature review about contingencies in the digitalization of the buyer-supplier relationship

(Digital) Supply chains are known to contain multiple companies. A supply chain often starts with the supplier of raw materials and ends with the company who sells end products towards the customers (L. Lu & Swaminathan, 2015). During this process products flow through a chain of suppliers. These supply chains can become very long and include a large number of companies (Pala, Edum-Fotwe, Ruikar, Doughty, & Peters, 2014). As supply chains expand, the probability of obstacles throughout the supply chain increases (Scheibe & Blackhurst, 2018). Since more companies within a supply chain come together with an increased chance of obstacles and increased complexity for managers (Corominas, 2013). Another phenomenon is that as obstacles spread, the negative impact on firm performance is likely to become bigger (Blackhurst, Dunn, & Craighead, 2011).

There are several reasons that are already known to cause these obstacles, like post economic recoveries and natural disasters (Ivanov & Dolgui, 2021). This study focuses on the digital transformation of buyer-supplier relationships and therefore the following part will include several underlying reasons that can cause obstacles with the transition from a normal buyer-supplier relationship towards a digital buyer-supplier relationship. First of all, it was found in the literature that *trust* plays a role within the process of building digital buyer-supplier relationships. The increased complexity requires higher knowledge intensity and resource availability (Azadegan, Mellat Parast, Lucianetti, Nishant, & Blackhurst, 2020). With the consequence that companies have to focus on mutual trust in order to share the data efficiently across the buyer-supplier relationships (Kumar, Liu, & Shan, 2020). A second underlying reason is the *difference in digitalization progress* between companies in the buyer-supplier relationships. This is mainly caused by the differences in supply chain technology (Schlüter, Diedrich, & Güller, 2017) and the differences in human knowledge that employees of different companies have acquired (Bendul & Knollman, 2016). There are more underlying reasons such as the *increased dependency on relationships* among companies (Kauffman & Pointer, 2021) and the *misalignment of goals and incentives* within the buyer-supplier relationships (LaBombard, McArthur, Sankur, & Shah, 2019).

What was previously found in the literature is that there were four obstacles in buyer-supplier relationships that often happen when going from a normal buyer-supplier relationship towards a digital buyer-supplier relationship. These four obstacles were *trust*, *difference in digitalization progress*, *increased dependency on relationships* and *misalignment of goals and incentives*. The overarching theme within these obstacles were buyer-supplier relationships. This study would add no significant value if these four obstacles were researched again in relation to the digital transformation of buyer-supplier relationships. Therefore the choice was made to use a theory that partly overlaps with these four obstacles but also adds some new contingencies which are not yet studied in relation to digital transformation of buyer-supplier relationships (Salo et al., 2021). Another advantage of the chosen theory is that it allows to analyze interconnections and underlying mechanisms in the process of digitalization in buyer-supplier relationships.

2.4 Actors, Activities and Resources theory as the contingency theory to explain the difference in the degree of digitalization in buyer-supplier relationships

Section 2.2 focused on the factors that have an influence on the degree of digitalization in buyer-supplier relationships. These factors had an internal focus and are needed in the process of digitalization in every buyer-supplier relationship. However, the factors alone can't explain why certain companies with the same internal and external factors differ in their degree of digitalization in buyer-supplier relationships. This can be explained due to the fact that buyer-supplier relationships plays out in a broader context and are related to a fluid relationship, having its own internal and external dynamics that need to be captured (Whipple, Wiedmer, & K. Boyer, 2015). There are different perspectives and theories that have an external focus on buyer-supplier relationships like the four obstacles mentioned in section 2.3. However the Actors, Activities and Resources (AAR) theory has shown to help managers to improve their management of transformations. The AAR theory tries to clarify the associations between the different contingencies and dimensions that enable the information exchange and other related constructs within buyer-supplier relationships (Håkansson & Johanson, 1992). Different contingencies that are used within this theory are expectations, co-operation, trust, commitment, communication and conflict behavior (Dwyer, Schurr, & Oh, 1987). A total of six contingencies are described within the AAR theory.

However, there are some limitations to the AAR theory. The first limitation is that there are some key contingencies missing in buyer-supplier relationships. These are continuity, informality and routinization of the buyer-supplier relationship. Another limitation to the AAR theory for this study is that the focus is on the associations between the different contingencies

of a buyer-supplier relationship, instead of a focus purely on the supplier relationship contingencies. These limitations gave Håkansson a reason - the developer of the original AAR theory – to make some changes within the original AAR theory developed in 1992. Therefore he and Snehota developed a new theory which included in total eight contingencies (Håkansson & Snehota, 1995). The AAR2 theory is a relationship theory that is also applicable to analyze buyer-supplier relationships. The eight contingencies of the AAR2 theory are related to the theoretical contribution of this study. Namely to find out why certain suppliers succeed in their digitalization process and other suppliers have more difficulty with this process. This new theory has not received a specific name and therefore we use in this study the name Actors, Activities and Resource 2 theory (AAR2). Prior to the AAR2 theory, the main focus of scholars in economics and management was on the way business was done between companies. The focus was on transactions, costs and managerial behavior instead of relationship management (Hallén, Johanson, & Seyed-Mohamed, 1991). Later, this situation changed drastically and the focus shifted towards the role that relationships play between companies and suppliers. Because scholars and managers found out that there were other contingencies involved in the performance of companies like relationships and networks.

The AAR2 theory comes from Håkansson and Snehota (1995) and is often defined as a set of relationship features or contingencies that have an effect on the way firms deal with information exchange and other related aspects in interfirm relationships (Håkansson & Snehota, 1995). This theory is based on the principle that a network has no clear boundaries, nor any center or apex. The buyer-supplier relationship can be seen as an ‘organization’ that has an influence on different Activities, Actors and Resources, in other words AAR (Håkansson & Snehota, 1995). The AAR2 theory includes eight contingencies that have an effect on the buyer-supplier relationships. Including four structural characteristics that have already been researched in relation to networks (McLoughlin & Horan, 2000) and four process characteristics that have already been researched in relation to industrial buyer-seller relationships (Tikkanen, Alajoutsijärvi, & Tähtinen, 2000). The eight contingencies are also studied in coherence (Tikkanen & Alajoutsijärvi, 2002) but their relation to the digital transformation of buyer-supplier relationships has been insufficiently researched.

A power of the AAR2 theory is that they help companies to strengthen their relationships by looking at certain contingencies that can boost certain innovations, firm performances and information exchange (Håkansson & Snehota, 1995). By combining the AAR2 theory with the factors that are needed in the digitalization of buyer-supplier relationships, a new perspective

is added towards the existing literature. It will be possible to research why certain companies are succeeding with their digitalization in buyer-supplier relationships and others don't. Because every company needs certain factors such as investment budget, ICT technologies to start their digital transformation in buyer-supplier relationships. However there are certain contingencies such as the continuity and the complexity of a buyer-supplier relationship that can strengthen or weaken this digital transformation. Therefore, they have a moderating effect on the buyer-supplier relationship and the factors of digitalization in buyer-supplier relationships. The next section will create a synthesis about the four obstacles and eight contingencies that were found in part 2.3 and 2.4.

2.5 Synthesis about the obstacles in digitalization of buyer-supplier relationships and the AAR2 Theory

There is overlap between the eight contingencies and the four obstacles that were found earlier in this study. First of all, *trust* shows overlap with the process characteristic adaptations. Both are focused on the trust and development of current buyer-supplier relationships (Hallén, Seyed Mohamed, & Johanson, 1989). Secondly, there are similar characteristics between the *difference in digitalization progress* and the structural characteristic symmetry. What is important for both is that the balance of resources and capabilities are similar within buyer-supplier relationships. Thirdly, the *increased dependency on relationships* shows overlap with the structural characteristic complexity. Both are focused on the complexity and dependency of buyer-supplier relationships. Lastly the *misalignment of goals and incentives* shows overlap with the process characteristic cooperation and conflict. What is important for both is the collaboration between different buyer-supplier relationships.

Something remarkable here is that there are only two structural characteristics and two process characteristics that are overlapping with the four obstacles that were previously found in the existing literature about the digital transformation of buyer-supplier relationships. This means that the existing literature might have neglected some contingencies that are potentially relevant for the digitalization of buyer-supplier relationships. These two contingencies of both characteristics are informality and continuity of the structural characteristics and social interaction and routinization of the process characteristics. This makes it interesting to study the four contingencies that were not yet researched in relation to the transformation of normal buyer-supplier relationships towards digital buyer-supplier relationships. Another exciting insight is that the coherence of all contingencies together has never been researched in relation to the digital transformation of buyer-supplier relationships (Salo et al., 2021). Resulting in

potential new knowledge and literature that could add value for managers and researchers. The next part explains the four structural and four process characteristics in more detail.

2.6.1 Explanation of the four structural characteristics in the AAR2 theory

This part will cover the four structural characteristics of the AAR2 theory. Structural characteristics are known to identify the features of a buyer-supplier relationship that are often said to be fixed. Think for example about the age and the importance of a relationship. Something else that characterizes the structural characteristics of a buyer-supplier relationship is the fact that often all contingencies are known to outside parties like competitors and suppliers (Bozkurt, Kalkan, & Arman, 2014).

The first structural characteristic that is defined is the *continuity* in a buyer-supplier relationship. Buyer-supplier relationships often show a high degree in continuity and stability, which are created by all the transactions, deliveries, contracting and communication that has to be done in order to build a relationship (Håkansson & Snehota, 1995). The initial stages of a buyer-supplier relationship often have a low amount of continuity. When the buyer-supplier relationship matures the amount of continuity is enhanced. This can be explained by the fact that there are some indicators which show that the age of a buyer-supplier relationship is a prerequisite for the information exchange within the buyer-supplier relationship (Håkansson & Johanson, 1992). Multiple studies found that the duration of a buyer-supplier relationship is on average 10 to 20 years (Paun, 1997). A common definition which is given for the continuity of a buyer-supplier relationship is the period that a buyer-supplier relationship is lasting between a buyer and a supplier.

The second structural characteristic is the *complexity* in a buyer-supplier relationship. There are several factors that can determine the degree of complexity. Namely, the amount of personnel that is involved within a buyer-supplier relationship. Even as the type of individuals that are involved within a buyer-supplier relationship can impact the complexity. Think of how a person with a technician's background would behave differently from someone that has a purchase history. Lastly, as the amount of exchanged products and services grow between two companies the complexity of a buyer-supplier relationship increases. Different studies point out that as the buyer-supplier relationship matures the degree of complexity will likely increase (Schäfermeyer, Rosenkranz, & Holten, 2012). This ensures that there is a higher need for information exchange between the buyer and supplier. However it should be noted that long-term buyer-supplier relationships are generally better able to cope with the degree of complexity. To conclude, a general definition for the degree of complexity in a buyer-supplier

relationship is the amount of variation that is related to a buyer-supplier relationship (Aureli & Schino, 2019).

The third structural characteristic is the *symmetry* in a buyer-supplier relationship. When looking towards symmetry within a buyer-supplier relationship there is a difference between a buyer and supplier that share an established relationship and a buyer and supplier who just discovered each other on a typical consumer market. The buyer and supplier that already established a relationship tend to have resources, technologies and capabilities that are more balanced (Cuevas, Julkunen, & Gabrielsson, 2015). Having the same resources, technologies and capabilities comes with an improved information exchange between buyers and suppliers. Still it was found that the resources, financial assets and knowledge of buyers are often superior to their suppliers (Baxter, 2012). Nevertheless there was less significant difference found in the degree of controlled resources, financial assets and knowledge between buyers and suppliers. Furthermore studies showed that the amount of controlled resources is linked towards possibilities of exercising influence, taking initiative and promoting development (Gadde & Håkansson, 1993). Thus, normal buyer-supplier relationships appear symmetrical in degree of influence that can be exercised by both parties. A common definition that is given for the symmetry within a buyer-supplier relationship is the balance between a buyer and supplier in relation to (controlled) resources and influence that can be exercised on each other.

The fourth structural characteristic is the *informality* in a buyer-supplier relationship. Each buyer-supplier relationship is built on some form of formalization. Examples here are contracts, verbal agreements and rules that are made between different parties. However it is found that the roles of formal contracts, verbal agreements and rules are only limited (Macaulay, 1963). The main cause for this is that formalized buyer-supplier relationships are ineffective when taking care of crises, uncertainties and conflicts. In order for buyers and suppliers to have successful informal relationships it is necessary to first build trust and confidence between the two parties involved. With a lack of trust and confidence between two parties it is hard to develop the buyer-supplier relationship and information exchange between buyers and suppliers will be limited (Shepherd & Zacharakis, 2001). The general definition for informal buyer-supplier relationships is the degree to which agreements in buyer-supplier relationships are based on trust, confidence, sympathy and oral agreements instead of formal contracts (Dymitrowski, Fonfara, & Deszczyński, 2019).

Considering the explanation of the four structural characteristics it looks like all buyer-supplier relationships are relatively stable and have little change. Also most buyer-supplier relationships

appear to be informal, relatively balanced, long lasting and broad. These characteristics correlate with more information exchange between buyers and suppliers (Håkansson & Snehota, 1995). However, when looking at what happens within buyer-supplier relationships process characteristics also influence information exchange. Therefore the next part describes the four process characteristics.

Table 3. The four structural characteristics in the AAR2 theory

Characteristics	Contingencies	Definitions
Structural characteristics	Continuity	The period that a relationship is lasting between a buyer and a supplier (Håkansson & Snehota, 1995) (Paun, 1997).
	Complexity	The amount of variation that is related to a buyer-supplier relationship (Håkansson & Snehota, 1995) (Aureli & Schino, 2019).
	Symmetry	The balance between a buyer and supplier in relation to (controlled) resources and influence that can be exercised on each other (Håkansson & Snehota, 1995) (Cuevas et al., 2015).
	Informality	The degree to which agreements in buyer-supplier relationships are based on trust, confidence, sympathy and oral agreements instead of formal contracts (Håkansson & Snehota, 1995) (Dymitrowski et al., 2019).

In summary, the part above focused on the structural characteristics that are known to identify the features of a buyer-supplier relationship that are often said to be fixed. The four structural characteristics are continuity, complexity, symmetry and informality. Above a table is shown with the definitions of the four structural characteristics and in text (section 2.6.1.) broader explanations are given.

2.6.2 Explanation of the four process characteristics in the AAR2 theory

This part will cover the four process characteristics of the AAR2 theory. Process characteristics are known to focus on the interaction within buyer-supplier relationships. They look at how buyer-supplier relationships develop and decay, and how they affect both the buyer and supplier. Something remarkable about process characteristics is the fact that they are observable

to the buyer and supplier involved but certainly less observable for outside parties like competitors.

The first process characteristic are the *adaptations* in buyer-supplier relationships. When studies analyzed what happens within a buyer-supplier relationship they found that it is often necessary for buyers and suppliers to do mutual adaptations (Hallén et al., 1989). A reason given for this was that there are different contingencies that could change within a buyer-supplier relationship. The mutual adaptations enable a further development and continued existence of a relationship between a buyer and supplier. Adaptations are frequent and needed by both the buyer and supplier. Especially when buyers and suppliers try to modify and adapt a lot of their products and services. There are other reasons that require adaptations such as changes in routines, rules but also technical adaptations which are needed when a production process is changed. Mutual adaptations can bind different buyers and suppliers together in a relationship by increasing the information exchange and generating mutual commitment that empowers the buyer-supplier relationship (Walter & Ritter, 2003). To conclude a general definition that is given for adaptations in a buyer-supplier relationship is the process of mutual commitment to change a buyer-supplier relationship in order to increase the fit with the external and internal environment.

The second process characteristic is *cooperation and conflict* in a buyer-supplier relationship. Each buyer-supplier relationship has some form of conflict which needs cooperation between the buyer and supplier involved (Tidström, 2012). Most conflicts arise because of disagreements about the benefits of a buyer-supplier relationship. Conflicts often form a part of a healthy relationship between buyers and suppliers. However the buyer and supplier should be able to cooperate and solve most of the conflicts. Ways to do this are having a cooperative posture as a buyer and supplier and making use of good information exchange to solve conflicts. While it is normal for conflicts to occur from time to time, the buyer-supplier relationship should be based on previous commitment to direct both the buyer and supplier towards constructive solutions (Håkansson & Snehota, 1995). A general definition for cooperation and conflicts in buyer-supplier relationships is the degree of disagreement between the buyer and supplier and the extent to which they can work together to resolve these conflicts.

The third process characteristic is *social interaction* in a buyer-supplier relationship. Despite buyer-supplier relationships being essentially about business specific characteristics, other more social values also play a role (Håkansson & Snehota, 1995). Social interaction focuses on the personal relationship that buyers and suppliers and people can develop. Relationships are

not rigid procedures which only focus on task content. There is more information exchange and personal relationship development between parts of the buyers and suppliers. Social interaction between different buyers and suppliers form the basis of development between interorganizational buyer-supplier relationships. With social interaction buyers and suppliers are able to build trust among their employees and company departments (Dwyer et al., 1987). A common definition for the social interaction in buyer-supplier relationships is the amount of informal behavior between two or more buyers and suppliers.

The fourth process characteristic is the *routinization* in a buyer-supplier relationship. As described earlier, most buyer-supplier relationships tend to become more informal and complex along the way. To deal with these informal and complex relationships buyers and suppliers often try to bring routine into their relationships (Håkansson & Snehota, 1995). Especially with the more important buyer-supplier relationships that a company has with their suppliers or customers. The introduction of routines in relationships helps buyers and suppliers to deal with the costs that are involved with handling a high amount of transactions within a buyer-supplier relationship (Lee, Johnson, & Tang, 2012). They also help to avoid problems between buyers and suppliers and dealing with complex behavior and needs in a relationship. A general definition that is given for the routinization in a buyer-supplier relationship is the degree to which rituals in conduct exist within a buyer-supplier relationship.

To summarize, all the process characteristics are related to interactions within buyer-supplier relationships. They suggest that there is an ongoing organic change within buyer-supplier relationships. Now that all eight contingencies are described in the part above it can be stated that these contingencies influence the degree of information exchange within buyer-supplier relationships. The AAR2 theory has already been studied in relation to normal buyer-supplier relationships. However there is still a lack of research on how the upcoming trend of digitalization has an effect on the eight contingencies and buyer-supplier relationships.

Table 4. The four process characteristics in the AAR 2 theory

Characteristics	Contingencies	Definitions
Process characteristics	Adaptations	The process of mutual commitment to change a buyer-supplier relationship in order to increase the fit with the external and internal environment (Håkansson & Snehota, 1995) (Walter & Ritter, 2003).

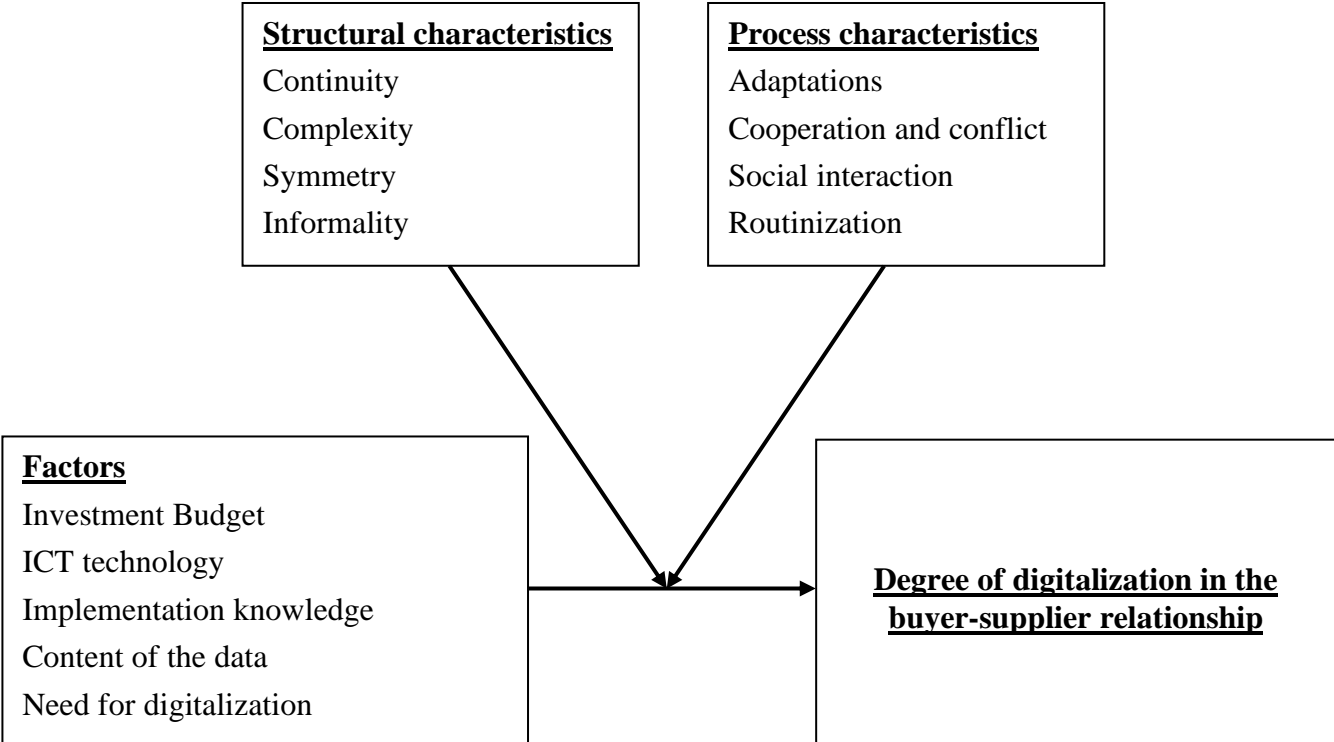
	Cooperation and conflict	The degree of disagreement between the buyer and supplier and the extent to which they can work together to resolve these conflicts (Håkansson & Snehota, 1995) (Tidström, 2012).
	Social interaction	The amount of informal behavior between two or more buyers and suppliers (Håkansson & Snehota, 1995) (Dwyer et al., 1987).
	Routinization	The degree to which rituals in conduct exist within a buyer-supplier relationship (Håkansson & Snehota, 1995) (Lee et al., 2012).

In summary, the part above focused on the process characteristics are known to focus on the interaction within buyer-supplier relationships. The four process characteristics are adaptations, cooperation and conflict, social interaction and routinization. Above a table is shown with the definitions of the four process characteristics and in text (section 2.6.2.) broader explanations are given. The next section introduces a theoretical framework about the degree of digitalization in buyer-supplier relationships by making use of the five factors and eight contingencies.

2.7 Theoretical framework about the effect of the structural and process characteristics on the influence that the factors have on the digitalization of the buyer-supplier relationship

To summarize, there are different contingencies that have an effect on the digitalization process of buyer-supplier relationships. The eight contingencies from the AAR2 theory are related towards the role that relationships between suppliers and buyers play. While the five factors are influencing the degree of digitalization of the buyer-supplier relationship. A difference between the contingencies and factors is that the contingencies have an external focus where the factors are internally focused on a buyer-supplier relationship. Another difference is that factors are directly influencing the digital transformation in buyer-supplier relationships and the eight contingencies can strengthen or weaken this digital transformation. By putting all these contingencies and factors together the following framework arises (Figure 1. see below). What this theoretical framework explains is that the factors have an influence on the degree of digitalization of the buyer-supplier relationship. However the structural and process characteristics have a moderating effect on the influence that the factors have on the degree of digitalization of the buyer-supplier relationship.

Figure 1. Theoretical framework about the effect of the structural and process characteristics on the influence that the factors have on the digitalization of the buyer-supplier relationship



Based on the literature review certain underlying mechanisms can be indicated. These underlying mechanisms refer to the way how the moderating variables interact with the relationship of the factors and the degree of digitalization of the buyer-supplier relationship. First of all, it seems logical that informality within a buyer-supplier relationship seems to complicate the process of digitalization. As described before it is helpful that most of the internal and external factors are known. With a high degree of informality the buyer-supplier relationship is based on trust, confidence, sympathy and oral agreements instead of formal contracts (Dymitrowski et al., 2019). This will make it harder to digitalize a buyer-supplier relationship because non written data is hard to use in any type of ICT technology. A second underlying mechanism within the structural characteristics is the degree of complexity within a buyer-supplier relationship. Here it is about the amount of variation that is related to a buyer-supplier relationship (Aureli & Schino, 2019). With a high degree of complexity it could be that it is harder to digitalize the buyer-supplier relationship. Because lots of factors which needed to be digitalized are unknown. Therefore it seems that some of the structural characteristics could have a negative interaction with the buyer-supplier relationship of the factors and the degree of digitalization of the buyer-supplier relationship.

A third underlying mechanism that could be argued for is the effect of adaptations on the process of digitalization in buyer-supplier relationships. The degree of adaptations in a buyer-supplier relationship is about the mutual commitment to change a relationship in order to increase the fit with external and internal environment (Walter & Ritter, 2003). This can strengthen the process of digitalization in buyer-supplier relationships. Because the supplier and buyer are mutually committed to make the digitalization a success. Another process characteristic that could have an effect on the process of digitalization in buyer-supplier relationships is routinization. Here it is about the degree to which rituals in conduct exist within a buyer-supplier relationship (Lee et al., 2012). With a high degree of rituals in conduct it is easier for suppliers and buyers to digitalize their relationship. Because most factors are known and follow a structure process. Therefore it seems that some of the process characteristics could have a positive interaction with the relationship of the factors and the degree of digitalization of the buyer-supplier relationship.

To conclude some underlying mechanisms can be argued for before this study is executed. However, for other variables such as cooperation and conflict, social interaction, continuity and symmetry it is harder to indicate certain underlying mechanisms. Therefore this study tries to find these underlying mechanisms via interviews with several suppliers in the buyer-supplier relationship.

3. The research methodology: how to gather the data for this study

3.1 Research strategy: Critical realism as research strategy

The chosen data collection method for this study are interviews. Because the goal is to find out what the effect and influence is of the eight contingencies and five factors on the digitalization of buyer-supplier relationships. A mono-method approach is chosen instead of a multi-method approach for the interviews. The goal with an interview is to gather information about the participants motives, experiences and opinions (Lambert & Loiselle, 2008). There are also other data collection methods such as focus groups which discuss a research topic in a group formation. The drawback with focus groups for this study would be that people don't want to share certain (confidential) information in a group (D.L. Morgan, 1998). Therefore the preference in this study is on individual interviews. There are different reasons that recommend the use of interviews. Namely, that it is possible to add multiple perspectives towards your interview, which helps to develop a good understanding of the research topic. Another advantage is that you can simply ask direct follow up questions to the interviewee. This helps to get a better understanding of the reasoning behind certain arguments (Watts & Ebbutt, 1987).

Furthermore, this study focuses on finding out how buyers and suppliers deal with the digital transformation that is going on in their buyer-supplier relationships. It can still be investigated by the viewpoint of buyers and suppliers. However, in this study the choice is made to only interview suppliers. Why? First of all, because buyers might have a perception but probably the perception of suppliers is much more realistic. A study by Oosterhuis, Molleman and van der Vaart (2013) indicated that the perception of suppliers is in most cases superior to the perception of buyers when talking about buyer-supplier relationships attributes (Oosterhuis, Molleman, & Vaart, 2013). A second reason to only interview suppliers was made so that all perspectives from the interviewees were the same to eliminate potential biases (Adams-Quackenbush, Horselenberg, Hubert, Vrij, & van Koppen, 2019). The kind of research philosophy that is used is the critical realism perspective, because the focus is on explaining what people experience while doing certain events (Saunders, Lewis, Thornhill, & Bristow, 2019). Those events that people experience shape the reality in which we live (O'Mahoney, 2016). As mentioned before, the reality in this study is the degree to which buyers and suppliers deal with the digital transformation of their buyer-supplier relationships. The digitalization of buyer-supplier relationships affects the way in which suppliers and buyers exchange information with each other. To facilitate this research strategy it is helpful to choose the right research approach. The focus in this study is partly based on deductive reasoning because the contingencies of the theoretical framework about the digitalization of buyer-supplier relationships are applied in this study (Zalaghi & Khazaei). Nevertheless, the AAR2 theory has never been researched in relation to the digitalization of buyer-supplier relationships. Which means that a part in this study is inductive because the influence of the contingencies in the context of digitalization in buyer-supplier relationships is contributed to the existing body of knowledge. Furthermore this study is qualitative in nature, since it focuses on collecting and analyzing non-numerical data (Fossey, Harvey, McDermott, & Davidson, 2002).

3.2 Population and sample: Purposeful sampling to select fifteen companies

The population that is relevant for this study comes from a couple of thousand suppliers that are located in the Netherlands. When selecting the suppliers, an attempt is made to interview several suppliers from the same part in the supply chain. This would give a clear picture on how the digitization of buyer-supplier relationships affects the information exchange between different buyers and suppliers that are in direct contact. Suppliers are selected based on purposeful sampling, which makes sure that suppliers are selected and identified based on particular interests (Palinkas et al., 2013). Different studies have proven that the right amount

of interview lies between 10 to 30 (Creswell, 1998). Other studies argue that the importance with interviews should be on the relevancy of the data and information that can be drawn out of the data (Bhutta & Huq, 1999). However, the goal with your sample size is always to reach data saturation. A study by Francis, Johnston, Robertson, Glidewell, Entwistle and Eccles argues that this lies around a sample size of 17 interviews (Francis et al., 2010). With all these arguments in mind it is chosen that the sample size will include 15 suppliers. A first selection criteria for the purposeful sampling is to only approach suppliers for the interviews. Because the perception of supplier is in most cases superior to the perception of buyers when talking about buyer-supplier relationship attributes. Furthermore a second criteria in this study is the typical case approach. Which makes sure that the selected companies are average cases instead of outliers (David L Morgan, 2002). With the result that extreme large or extreme small suppliers are excluded from the sample. A requirement for the selected suppliers is also that they developed an adequate level of digitalization within their buyer-supplier relationships. The interviewee must also have an adequate level of knowledge about the digitalization process. This will increase the chance of useful output from the interview.

Table 5. Selection criteria table of the potential interviewed companies

Selection criteria	Explanation
Type of companies	The perception of suppliers is in most cases superior to the perception of buyers when talking about buyer-supplier relationship attributes (Oosterhuis, Molleman, & Vaart, 2013). Therefore it is preferred to interview suppliers over buyers.
Typical case approach	To make sure that average suppliers are interviewed instead of outliers.
Adequate level of digitalization	To maximize the chance of useful interviews. It was chosen to only interview suppliers that have an adequate level of digitalization in their buyer-supplier relationships.
Adequate level of knowledge of the interviewee	The interviewee must also have an adequate level of knowledge about the digitalization process. This will increase the chance of useful output from the interview.

To conclude all interviewees complied with the requirements to participate in an interview. Which meant that their company sizes were ranging from small 1-99 employees, medium 100-499 employees and large 500+ employees. Extreme large or small companies were not contacted to do an interview. All companies had an adequate level of digitalization within their buyer-supplier relationships and the interviewees possessed an adequate level of knowledge about digitalization in buyer-supplier relationships. Lastly each interviewee had a job function that was related to the supply side of the buyer-supplier relationship. Summarized are all the job functions, industries and company sizes of each interviewee in table 6. below.

Table 6. Overview of the interviewees job function, industry and company size

Number	Job Function	Industry	Company size
1	Chief executive officer	Manufacturing industry	Small
7	Sales operator	Manufacturing industry	Medium
12	Commercial manager	Manufacturing industry	Medium
14	Vice president digital business transformation	Manufacturing industry	Large
2	Sales operation manager	High tech company	Large
5	Chief digital officer	High tech company	Medium
9	Chief executive officer	High tech company	Small
4	Digital accountant	Accountancy	Large
13	Accountant	Accountancy	Small
6	Commercial director	Software company	Medium
10	Commercial manager	Software company	Small
3	Account manager	Transport industry	Large
8	Head of SEA	Advertising industry	Small
11	Consultant	Consultancy	Large
15	Commercial manager	Food industry	Medium

- Order of numbers is divided per industry
- Small = 1-99 employees
- Medium 100-499 employees
- Large = 500+ employees

3.3 Data collection: Semi/structured interviews to collect the data

The chosen method to collect the qualitative data are interviews. First it was considered to do this study in a quantitative way. However, after analyzing this method it became clear that the underlying mechanisms of the theoretical framework are insufficiently researched. The goal of this study is therefore to add new knowledge to the existing body of literature. Another reason why a quantitative nature of this study was less suitable was that there were no validated

questionnaires that were related to the theoretical framework which is the main focus of this study. Therefore the choice was made to conduct interviews for this study. Within interviews there are different types and these are structured, semi-structured and unstructured interviews. The difference here is that structured interviews follow a predetermined set of questions and unstructured interviews are less formatted and focus more on spontaneity (Wethington & McDarby). However the chosen interview style for this study is semi-structured. Advantages of semi-structured interviews are that they always include some predetermined key questions which make sure the important topics are asked within the interview. However semi-structured interviews still leave room for follow up questions which help by discovering the reasoning behind certain answers. The focus in the interview will be on the theoretical framework which is the main topic within this study. Different questions are asked in an open way to start a conversation rather than a checklist. The interview is structured in different parts.

The first part focuses on getting to know the interviewee. An example question that is asked within the introduction is: How long are you working for this company? The second part focuses on the influence of the factors on the degree of digitalization in buyer-supplier relationships. With representative example questions such as: Can you indicate one example what this company is doing in regards to digitalization of the buyer-supplier relationships? At the end of part two a couple of questions are asked related to the degree of digitalization in buyer-supplier relationships. The third part also uses example questions but focuses on the contingencies that have an influence on the process of digitalization in buyer-supplier relationships. Both parts therefore make use of examples that are known by the interviewee. Part two focuses on representative examples and part three focuses on a successful and unsuccessful example. It is chosen to use a successful and unsuccessful example for part three since the contingencies can influence the digitalization process of buyer-supplier relationships in a positive and negative way. It also helps to get an insight towards spontaneously named contingencies. These questions help to get insights towards the theoretical framework which is leading in this study. By analyzing and comparing the data of the interviews new insights for the theoretical framework can be gathered. The fourth part is intended to propose the theoretical framework and to see what additional insights are given by the interviewees. The fifth part is a combination of part two, three and four and tries to identify interactions between all these contingencies and factors in the digitalization process of buyer-supplier relationships. All these questions are related to the theoretical framework of this study. In the end part six focuses on the closure of the interview. For a total overview see the interview protocol in Appendix A

(English and Dutch version). To ensure the quality of the interviews a couple of pilot interviews are held in advance. This will help the interviewer to practice his interview skills and another advantage is that the questions can be reviewed before the actual interviews are held (Majid, Othman, Mohamad, Lim, & Yusof, 2017).

3.4 Data analysis: Open, axial and selective coding for the data analysis

The data is gathered via interviews, see appendix A for the interview protocol. After conducting the 15 interviews, all of them are transcribed. Followed by a coding process to get useful insights from the data done in Atlas.ti. The phases of the coding process are open, axial and selective coding. The first phase was open coding in the sense that some concepts were deducted from literature. But how these concepts related to this study was completely open. The goal was to make the first version of the codebook (Kendall, 1999). The four concepts that were taken in mind from the theoretical framework were (1) degree of digitalization, (2) factors, (3) structural characteristics and (4) process characteristics. The second method used was axial coding in order to find the sub categories for the codebook. The last phase included the selective coding to find underlying patterns within the data. The codebook was run several times in order to find out if the codebook is complete and saturated. When the codebook is completed in Atlas.ti the codes will be compared and selected from the codebook. See appendix B for the completed codebook.

3.5 Validity and Reliability: To improve the quality of this study

Interviews are an efficient way to gather extensive data. However, because interviewees can be biased in certain ways by answering questions according to their own experiences, beliefs and knowledge different measures are taken to increase the chance for validity and reliability. First of all to increase validity it was chosen to use pilot interviews (Abdul Majid, Othman, Mohamad, Lim, & Yusof, 2017). This made sure that the quality of the interviews was sufficient. A second measure to increase the chance of validity was that each interview was conducted in the native language of the interviewee namely Dutch or English. This was done to make sure that the interviewee understood the questions correctly. During the interview it was always possible for the interviewee to ask for more information if something was not clear. To increase reliability different measures were taken. First of all, the interviews were recorded which made it easier to reliable transcripts. A second measure taken was that a total of 15 interviews were conducted including different industries and company sizes. With the consequence that suppliers with product based buyer-supplier relationships were interviewed like manufacturers and suppliers with a service based buyer-supplier relationship like

accountants. Resulting in a heterogenous sample if we look at the type of companies and different industries with the consequence of an increased reliability of the study. If we look at the perspective from the interviewees we have an homogenous sample since the choice was made to only interview suppliers instead of buyers.

4. Results: The effect of factors on the degree of digitalization in buyer supplier relationships and the moderating effect of contingencies.

Before continuing towards the results section it should be mentioned that the results were based on open coding. This qualitative study is based on interviews and the interviews were guiding to gather the data for the results. Meaning that it would be possible that after analyzing the data certain contingencies, factors and the degree of digitalization in buyer-supplier relationships were not relevant for the results section. However, this was not the case as almost all relevant contingencies, factors and degree of digitalization in buyer-supplier relationships were relevant for the results section.

To continue, this part covers the results section of this study, including in total five sections. The first three sections deal with various topics within the theoretical framework. Section 1 covers the degree of digitalization and the role of integration within ICT systems. Section 2 covers the factors that have an influence on the degree of digitalization. Section 3 covers the role that the eight contingencies have on the degree of digitalization including the four structural and four process characteristics. Within these three sections different explanations are given with the use of quotes during the interviews. Another method that is used are cross case tables to give a clear overview of different results. The fourth section looks at each contingency individually and explains the effect of each contingency on each individual factor. Giving insights towards the moderating effects between contingencies and factors. The last section focuses on creating a synthesis. The goal in section five is to explain different underlying interactions between the degree of digitalization and the effect of factors and what the effect of the eight contingencies is within this theoretical model. At the end of chapter 4 a new version of the theoretical model is shown with some small adjustments.

4.1 The degree to which different ICT systems are integrated within both sides of the buyer-supplier relationship as an indicator for the degree of digitalization in buyer-supplier relationships.

The first section of the results covers the degree of digitalization in buyer-supplier relationships. As mentioned in section 2.1 the definition for the degree of digitalization in the buyer-supplier

relationship was: “The degree to which companies have digitalized their relationships in regards to communication channels, data streams and transactions resulting in higher levels of automation” (Obal & Lancioni, 2013) (Veile et al., 2021). However after conducting several interviews it became clear that a new definition was more applicable to this study. Because interviewees argued for the importance of integration in ICT systems for digitalization. Interviewee 6 mentioned that “To achieve our company objectives we have to start the digitalization process. Because if we don’t integrate our ICT systems with our buyers we will lose from our competitors”. Another interviewee mentioned that there was an important difference between automation and digitalization. Interviewee 9 mentioned “Automation is about automatic execution of tasks whereas digitalization is more about the interfaces and conversion of information into texts etcetera”. Therefore a new definition is used within this study for the degree of digitalization in buyer-supplier relationships namely: “The degree to which different ICT systems are integrated within both sides of the buyer and supplier”.

Acknowledging the importance of ICT systems for the degree of digitalization, table 7 shows the category ICT systems on the Y-axis with below all the individual ICT systems. On the X-axis all interviewees are shown ranging from 1 to 15 and divided per industry. The X-marks in the table show that an interviewee was quoted with one of the individual ICT systems on the Y-axis. For example, interviewee 13 who worked in the accountancy industry mentioned during the interview at least one time that they used an order system. In total an order system is quoted by four different interviewees namely 7, 12, 5 and 13 resulting in a density of 4.

Table 7. Cross Case Table of focus area ‘ICT systems’

ICT systems	Manufacturing				High Tech			Accountancy		Software		Transport	Advertising	Consultancy	Food	Density
	1	7	12	14	2	5	9	4	13	6	10	3	8	11	15	
ERP system					X	X			X	X			X	X	X	7
EDI system	X		X	X	X	X									X	6
Information system		X		X						X	X			X	X	6
API system				X	X	X	X							X		5
Order system		X	X			X			X							4
Big data				X								X		X	X	4
3D model	X	X										X				3
Forecast system	X	X													X	3
Bank link system								X	X		X					3
Basecone								X	X							2

means that more buyers and suppliers would be able to integrate their ICT systems because of lower costs. Another advantage given by interviewee 15 is “We are noticing in the food industry that our buyers are demanding one order systems namely GS1 DAS “. Resulting in an industry wide integration of one system to do orders in the buyer-supplier relationships of the food industry. During the interviews it became clear that there was a potential returning disadvantage in integrating your ICT systems. As interviewee 11 mentioned “One time we integrated our systems with (company X) we found out that they had acted unethical. We invested a lot of money and time into integrating our systems but the result was that we had to end our relationship because of their unethical way of doing business”. Another disadvantage of integrating ICT systems was mentioned by interviewee 2 “When you link systems with each other, the consequence is that you get more insight into each other's company data. This is not what every company wanted, we have experienced”. A recurring statement from interviewees was that companies find it difficult to lose their privacy when they integrate systems with each other. All these factors have an influence on the degree to which ICT systems are integrated within buyer-supplier relationships and therefore having a direct impact on the degree of digitalization in buyer-supplier relationships.

4.2 The influence of the six factors on the degree of digitalization in buyer-supplier relationships

After the literature review five factors were identified that had an influence on the degree of digitalization in buyer supplier relationships. However, after open coding it became clear that these five factors were also relevant after conducting the interviews. Later the higher order codes were found and these were investment budget, ICT technology, implementation knowledge, content of the data and need for digitalization. During the phases of interviewing, transcribing and coding it became clear that one factor was missing namely human resources. Because the importance of managing people was not included in the theoretical framework. Human resources differ from implementation knowledge as human resources is about the management of people within a buyer-supplier relationship and implementation knowledge is about the degree of knowledge that people have in a buyer-supplier relationship. The next part explains how these six factors influence the degree of digitalization in buyer-supplier relationships. This will be done by using table 8 below. Table 8 shows all six factors from highest density (14) content of the data to lowest density (4) need for digitalization. The influence of all factors on the degree of digitalization in buyer-supplier relationships is explained using quotes from the interviews.

Table 8. Cross Case Table of focus area ‘Factors’

Factors	Manufacturing				High Tech			Accountancy		Software		Transport	Advertising	Consultancy	Food	Density
	1	7	12	14	2	5	9	4	13	6	10	3	8	11	15	
Content of the data	X	X	X	X	X	X	X	X	X	X	X		X	X	X	14
Investment budget		X	X	X	X	X	X	X	X	X	X		X	X	X	13
Implementation knowledge	X	X	X	X		X	X	X	X	X	X		X	X	X	13
Human resources	X		X	X		X		X	X	X	X	X				9
ICT technology				X	X	X		X		X	X			X	X	8
Need for digitalization			X	X				X		X						4

The factor which was quoted the most is content of the data with a density of 14. Different interviewees mentioned the importance of content of the data for the digitalization in buyer-supplier relationships. What interviewee 1 mentioned was “We noticed that the volume of data from our buyers increased in the recent years. Mostly because our buyers are going to use more ICT systems and we gain access to their data”. Another quote from interviewee 11 was “At this moment I have more than one hundred customers in my portfolio which means that I get a lot of questions each day. Resulting in high amounts of data requests which I have to take care of”. These two quotes argue for high amounts of data that are flowing through buyer-supplier relationships these days. Interviewee 13 mentioned “It is not so much about the amount of data, but about the quality of the data, it shouldn’t be too complex”. Suggesting that the content of the data should not be too complex otherwise it is difficult to use. Acknowledging the importance of the content of the data the next factor is investment budget. First of all, interviewee 4 mentioned that there are two types of investment budget “At (company X) we work with two types of investment budget, namely time investment and money investment”. This split was confirmed by multiple interviews. Interviewee 5 mentioned “For most systems we already have the knowledge and money. For us it is more about making the time effort to integrate all the systems”. The other side was highlighted by interviewee 14 “If you want to digitalize your relationship you simply have to invest money, good ICT technologies are never for free”. Given the need for an investment budget when digitalizing your buyer-supplier relationships we continue towards implementation knowledge. A quote that was mentioned more than once and also by interviewee 1 was “Knowledge about how to work with certain systems is important. We often noticed that the cause for unsuccessful digital transformations was the lack of knowledge”. Interviewee 13 also mentioned “More than one person should

know how to work with certain systems. Because when someone is ill or fired it can lead to disruptions”. Another remark on implementation knowledge by interviewee 6 was “The amount of implementation knowledge required for employees also differs per system”. Suggesting that a system with a low degree of integration needs less implementation knowledge than a system with a high degree of integration.

During the interviews a new factor was argued for in the digitalization of buyer-supplier relationships namely human resources. In a variety of interviews it was mentioned that management of people is crucial when starting a digital transformation in buyer-supplier relationships. For example, interviewee 10 mentioned “The manager of the digitalization department of our buyer was once the limiting factor. He was the lead person who had to lead the project but did it so dramatically that the digitization was a failure”. Another quote mentioned by interviewee 13 was “You have to place people in the right places where they can use their capabilities as efficiently as possible”. Several times during the interviews it was argued that the management and placement of people is important. A company can start their digital transformation while having sufficient levels of budget and knowledge. However, if the money and knowledge isn’t managed in a sufficient manner the digital transformation can still be a failure. Therefore a sixth factor was added to the theoretical framework namely human resources. The second to last factor in table 8 is ICT technology. Although the density of ICT technology is (8) in table 8 its importance can’t be forgotten. Interviewee 2 mentioned “ For our (company X) ICT systems are the base of digitalization in our relationships. We use all kinds of ICT systems like ERP and EDI systems. Without these systems it would be impossible to even start a digital transformation”. A remarkable thing is the relatively low density of ICT systems in table 8. This can partly be explained by the fact that ICT systems are mostly used by interviewees in combination with other important subjects such as implementation knowledge, complexity etcetera. Resulting in a lower amount of quotes directly related to ICT technology. The last factor that has an influence on the degree of digitalization in buyer-supplier relationships is the need for digitalization. An interesting vision on the need for digitalization was given by interviewee 6 “For me there is never a need for digitalization. There can be a need for less costs, higher efficiency or more automation but there is never a need for digitalization. I see digitalization as a means of achieving these needs”. This can also be the conclusion to why the density of need for digitalization is quite low (4). Because there is no direct need for digitalization but often an indirect need for digitalization in buyer-supplier relationships. However it is still chosen to leave the need for digitalization in the theoretical framework since

it has an important indirect influence on the degree of digitalization in buyer-supplier relationships.

4.3 The moderating effect of the eight contingencies on the influence that the factor have on the degree of digitalization in buyer-supplier relationships

During the interviews the goal was to find out what the moderating effect of the eight contingencies was on the influence that the factors have on the degree of digitalization in buyer-supplier relationships. In the coding process it was found that there were three categories among these effects namely (1) positive, (2) neutral and (3) negative. These categories define the type of effect namely positive effect, neutral effect and negative effect. Table 9 below shows how these three categories relate to each contingencies. As an example interviewee 6 who worked in the software industry mentioned that symmetry had a positive effect on the influence that the factors have on the degree of digitalization in buyer-supplier relationships. The next part will highlight important results that can be drawn from table 9 by making use of quotations.

Table 9. Cross Case Table of focus area ‘Moderating effect of contingencies’

Contingency factors	Manufacturing				High Tech			Accountancy		Software		Transport	Advertising	Consultancy	Food	Density
	1	7	12	14	2	5	9	4	13	6	10	3	8	11	15	
Positive continuity	X	X	X	X	X	X	X	X		X	X	X	X	X	X	14
Positive complexity	X	X	X	X			X	X	X		X		X	X	X	11
Positive symmetry	X	X	X		X	X			X	X	X		X	X	X	11
Positive informality		X	X		X	X	X	X				X	X	X	X	10
Positive adaptations	X		X	X	X	X	X	X	X	X	X	X	X	X	X	14
Positive coop and conflict	X		X	X	X			X		X			X	X	X	9
Positive social interaction						X				X			X			3
Positive routinization	X		X			X			X	X	X	X	X	X		9
Neutral continuity									X							1
Neutral complexity												X				1
Neutral symmetry							X	X								2
Neutral informality				X					X	X						3
Neutral adaptations																0
Neutral coop and conflict						X	X				X	X				4
Neutral social interaction		X	X	X			X	X	X		X	X		X	X	10
Neutral routinization				X			X									2
Negative continuity						X		X			X					3
Negative complexity		X		X	X	X				X						5
Negative symmetry				X		X						X		X		4

Negative informality	X		X								X				X	4
Negative adaptations		X														1
Negative coop and conflict		X	X					X	X							4
Negative social interaction	X				X											2
Negative routinization		X			X			X							X	4

- Coop and conflict = cooperation and conflict
- Density 0-4 = Red
- Density 5-9 = Orange
- Density 10-15 = Green

To go further with table 9 we start off by looking at the positive effect of continuity and adaptations. The contingencies fall under the category positive when quotes from the interviews mentioned that a certain contingency factor had a general positive effect on the influence that the factors have on the degree of digitalization in buyer-supplier relationships. For example, what interviewee 4 mentioned was “Continuity of the relationship is very important for us. When the continuity of the relationship is unstable we would be less likely to invest in digitalization”. Another quote by interviewee 5 was “The continuity of a relationship helps us to implement systems. Once the systems are implemented it also helps us to improve the continuity of the relationship as we become more agile and scalable”. Other interviewees argued for the positive effect of adaptations. What interviewee 5 mentioned was “The ability to adapt is necessary in a digital transformation. Without adaptations from both sides the speed of digitalization is greatly reduced”. Something else that was mentioned by interviewee 13 was “The older generation often finds it difficult to adapt. Because they think that digitization would take work away from them. They need to realize that you can go more in-depth through digitization and therefore more work is created”. Both continuity and adaptations had a high density in relation to a positive effect. What was remarkable was that social interaction fell far out of the group in terms of density with a positive effect. A potential explanation for this is given in the next section.

The second part of table 9 includes the category neutral. The contingencies fall under the category neutral when quotes from the interviews mentioned that a certain contingency factor had a general neutral or non-existing effect on the influence that the factors have on the degree of digitalization in buyer-supplier relationships. Here it was noticed that social interaction had different density (10) than the other contingencies. Several interviewees mentioned reasons such as interviewee 10 “Social interaction has no role when we talk about digitization. This role would also never come”. This reason was straightforward. Other interviewees like interviewee 4 had a better explanation “The social interaction part doesn't really play a role since everything has to be very formal for digitization. As a result, social interaction is actually seen as nil”.

Another reason was given by interviewee 11 “Digitization in relationships involves a black and white area or a no or yes question. There are no open questions in which social interaction plays a role. Due to digitization, everything often becomes more formal and black and white, in which social interaction plays no role”. From these quotes it can be concluded that social interaction plays a nil role within the digitization of buyer-supplier relationships. Therefore it was also decided to remove social interaction from the theoretical framework.

Looking at the last part of table 9 all the contingencies that had a negative effect on the influence that the factors had on the degree of digitalization in buyer-supplier relationships are shown. The contingencies fall under the category negative when quotes from the interviews mentioned that a certain contingency factor had a general negative effect on the influence that the factors have on the degree of digitalization in buyer-supplier relationships. The one with the highest density of the negative effect was complexity (5). The special thing about the complexity in buyer-supplier relationships was that its effect was argued for in both negative (5) and positive (11). This was nicely explained by interviewee 11 “A high complexity in the relationship is advantageous for digitization because there is much to be gained. The downside is that digitization can also go wrong sooner”.

4.3.1 The strength and importance of each moderating contingency on the degree of digitalization in buyer-supplier relationships

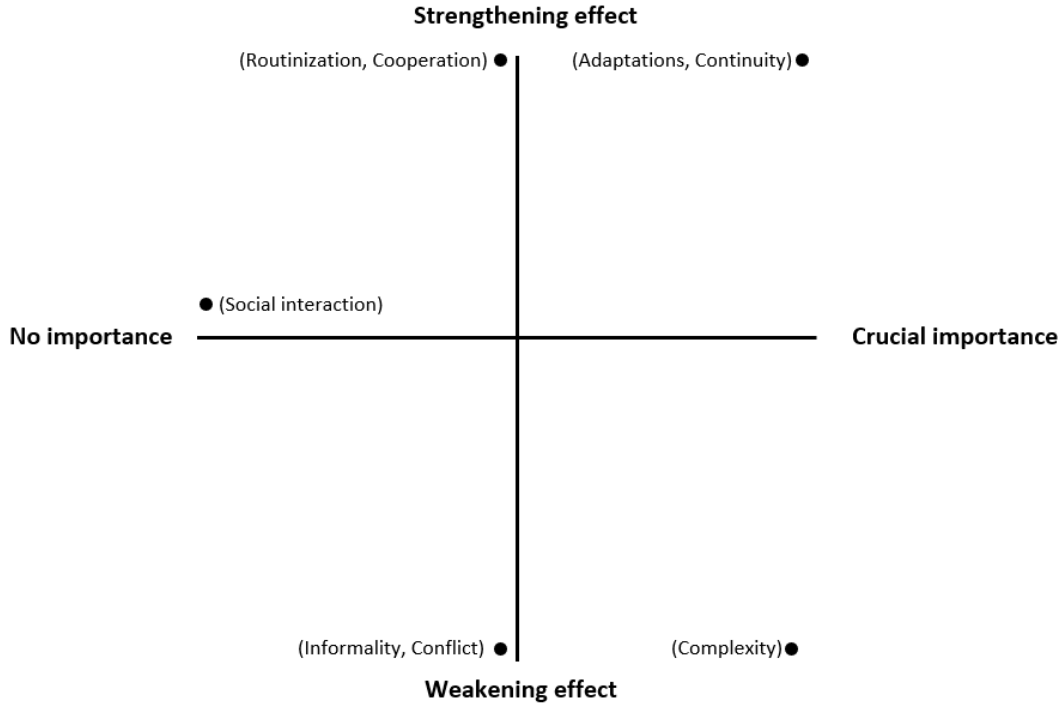
The next section explains what the strength and importance of each moderating contingency is on the degree of digitalization in buyer-supplier relationships. A note that must be given is that over-interpreting this section is not wise as this study is qualitative in nature and the graph is based on densities. This being said, the first part focuses on the strength of each moderating contingencies. For this we consider that every contingency is highly present within the buyer-supplier relationships. As an example there is a high amount of continuity within the buyer-supplier relationship. Which results in a strengthening moderating effect since high continuity in a relationship increases the degree of digitalization in buyer-supplier relationships. By looking at the different effects three categories were identified namely strengthening, no effect and weakening effect. It was chosen to divide cooperation and conflict into two categories since cooperation had a strengthening effect and conflict a weakening effect. The overview of all the three categories can be found in table 11 see Appendix C.

With the use of table 9 it is also possible to divide the eight moderating contingencies on the basis of importance. There are three contingencies which have a high density for positive and

a low density for negative and neutral (crucial importance). The second split includes four contingencies which had an average density for positive, negative and neutral (mediocre importance). The last split was known for the low density in positive and negative but high density for neutral (no importance). An overview of these results can be found in table 12 see Appendix C.

By combining the findings about the strength and importance of the contingencies it is possible to create a graph with x-axis and y-axis. A note that must be given is that over-interpreting figure 2 is not wise as this study is qualitative in nature and the graph is based on densities. With this in mind, the figure is shown below and includes the strength and the importance of each moderating contingency effect on the degree of digitalization in buyer-supplier relationships.

Figure 2. Strength and importance of each moderating contingency effect on the degree of digitalization in buyer-supplier relationships



4.4 The direct effect of contingencies on the factors

The previous sections of the results focused on separate parts of the theoretical framework. Section 4.1 focused on the degree of digitalization in buyer-supplier relationships. Section 4.2 focused on the six factors that influence the degree of digitalization in buyer-supplier relationships. Section 4.3 focused on the effect of the eight contingencies on the degree of digitalization in buyer-supplier relationships. What still remains unclear is the direct effect of each individual contingency on each individual factor. This is what section 4.4 is going to do by covering all the eight contingencies individually and explaining what the direct effect of

each contingency is on each individual factor. This gives a better understanding of the effects of all contingencies on the factors. Each effect is explained by using quotes if these are present in the data. When there are no quotes usable from the interviews but the effect is indirectly spoken about than logical explanations are given which come from the interviews. At the end of section 4.4 a matrix (Table10) is shown which summarizes the effects in three categories namely positive, neutral and negative. As table 10 shows the first contingency that is going to be covered is continuity. Each contingency will be covered in order from highest to lowest as mentioned in table 10. Where each factor is briefly explained, the depth of this explanation depends on the quotes given during the interviews. When there was no effect explained during the interviews the effect is named as neutral.

4.4.1 The effect of continuity on the factors

The first effect that is explained is *continuity* of the buyer-supplier relationship on *investment budget*. What interviewee 11 mentioned was “Continuity of a relationship is important, the continuity must be guaranteed in order to invest towards the digitalization. You have to look at the costs and the benefits and if the investment is too risky”. Another quote by interviewee 8 was “When I think of continuity I relate this to investment budget of a relationship. Since our goal is to keep improving by investing in the relationship but we only do this when we have a long lasting relationship with our customers”. Both of these quotes argue for the positive effect of continuity on the investment budget.

The second effect is the *continuity* of the buyer-supplier relationship on *ICT technology*. During the interviews one quote was mentioned that argued for the positive effect of continuity on ICT technology. Interviewee 7 argued that “As our relationships get longer we tend to increase the amount of ICT technology. Especially the amount and complexity of ICT technologies is higher with our older clients”. Therefore table 10 includes a positive effect of continuity on ICT technology.

For the effect of *continuity* in the buyer-supplier relationship on *implementation knowledge* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

To continue the effect of *continuity* in the buyer-supplier relationship on the *content of the data* was argued for. What interviewee 2 mentioned was “a consequence of a digital transformation is that you give your customers an insight in your own company. To protect our data we only do this by longer lasting relationships since we often have better relationships with them”.

Therefore interviewee 2 argued that continuity is important and positive to protect the content of the data.

The effect of *continuity* in buyer-supplier relationships on the *need for digitalization* is explained by a quote of interviewee 5 “If we have long relationships with our customers we are more urged to digitalize. Because the consumer behavior changes and we try to keep our long lasting relationships. Since these are often the most profitable for us”. Arguing that longer lasting relationships increase the need for digitalization.

For the last effect of *continuity* in the buyer-supplier relationship on *human resources* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

4.4.2 The effect of complexity on the factors

The first effect of *complexity* in the buyer-supplier relationship on *investment budget* was argued for during the interviews. In this study, complexity is related as the complexity of a buyer-supplier relationship instead of the complexity in a digital transformation. What interviewee 1 mentioned was “If we are investing money towards the digitalization with our buyers we want to make sure that the complexity is not too high. Otherwise the chance of failure with the digitalization is high”. Another quote by interviewee 9 was “If the complexity in a relationship is high the costs of a digital transformation are higher which is disadvantageous”. Both quotes argue for the negative effect of complexity on investment budget.

The second effect found was *complexity* in buyer-supplier relationships on *ICT technology*. There were many quotes that argued for the negative effect of complexity on ICT technology. First of all, interviewee 2 mentioned “Complexity affects ICT technology in a negative way, as it imposes higher requirements”. A second quote by interviewee 11 was “Each company have nowadays its own high complexity system. Which makes it very hard for companies to match systems within their relationships because there are so many different type of systems”.

The third effect found was *complexity* in buyer-supplier relationships on *Implementation knowledge*. A quote by interviewee 5 was ”Buyer-supplier relationships are getting more complex due to the fact that there are more changing circumstances nowadays. The current degree of implementation knowledge is therefore also getting weaker”. This quote argues for the negative effect of complexity on implementation knowledge.

For the effect of *complexity* in the buyer-supplier relationship on *content of the data* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *complexity* in the buyer-supplier relationship on *need for digitalization* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The last effect of *complexity* in buyer-supplier relationships on *human resources* was argued for during the interviews. What interviewee 1 mentioned was “For our more complex relationships it is harder to place employees in the right departments. What we often experience is that the system interfaces are too complex for our employees to work with”. Therefore arguing for the negative effect of complexity on human resources.

4.4.3 The effect of symmetry on the factors

The first effect of *symmetry* in the buyer-supplier relationship on *investment budget* was argued for during the interviews. A quote by interviewee 1 was “When there is symmetry in a relationship we feel more obliged to invest towards the digitalization. Since we often have the same resources as our buyers we tend to invest equally as them”. Out of this quote it can be concluded that as the relationship is symmetrical both of the companies feel more towards investing in digitalization.

For the effect of *symmetry* in the buyer-supplier relationship on *ICT technology* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *symmetry* in the buyer-supplier relationship on *implementation knowledge* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *symmetry* in the buyer-supplier relationship on *content of the data* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The fifth effect of *symmetry* in the buyer-supplier relationship on *need for digitalization* was argued for during the interviews. Interviewee 4 mentioned that “We have plenty of buyer-supplier relationships. But what I noticed during my time here at company X is that we focus on digital transformations with buyers that have the same power as we do. Because this increases the chance that both parties are putting effort towards the digital transformation”.

For the effect of *symmetry* in the buyer-supplier relationship on *human resources* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

4.4.4 The effect of informality on the factors

For the effect of *informality* in the buyer-supplier relationship on *investment budget* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The second effect of *informality* in the buyer-supplier relationship on *ICT technology* was argued for during the interviews. What interviewee 14 mentioned was “The amount of informal behavior in our relationships doesn’t benefit the process of digitalization. Since it is hard to digitalize and use ICT technologies in handshake business”. Therefore the statement can be made that an informal relationship weakens the degree of ICT technology in buyer-supplier relationships.

For the effect of *informality* in the buyer-supplier relationship on *implementation knowledge* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The fourth effect of *informality* in the buyer-supplier relationship on *content of the data* was argued for during the interviews. What interviewee 11 mentioned was “Digitalization in relationships often plays a role in the formal area of a relationship. Everything that is discussed informally between the two parties is hard to digitalize since this data is often verbally or non-verbally between persons”. What can be concluded out of this quote is that an informal relationship is harder to digitalize since the data is not useful.

For the effect of *informality* in the buyer-supplier relationship on *need for digitalization* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *informality* in the buyer-supplier relationship on *human resources* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

4.4.5 The effect of adaptations on the factors

The first effect of *adaptations* in the buyer-supplier relationship on *investment budget* was argued for during the interviews. What interviewee 4 mentioned was “For us it is important that our buyer wants to adapt with us. Because this will help us to decrease costs on both sides in the relationship. By combining or integrating systems we and our buyer can decrease the costs”. Another quote from interviewee 13 was “What I see is an interaction between investment budget and ability to adapt. What I noticed by previous digital transformations was that if both parties don’t want to adapt the investments are mostly thrown away. But when both parties want to adapt the investment pays for itself”. Both these quotes suggest that adaptations has a positive effect on the degree of investment budget.

The second effect of *adaptations* in the buyer-supplier relationship on *ICT technology* was argued for during the interviews. What interviewee 14 mentioned was “Of course, I see also an

interaction with adaptations and ICT technology. ICT technologies are often stand alone systems which are not integrated with the other party. Therefore we and our buyers have to adapt in order to integrate systems which make them more efficient”. This quote argues for the positive effect of adaptations on ICT technologies.

The third effect of *adaptations* in the buyer-supplier relationship on *implementation knowledge* was argued for during the interviews. What interviewee 6 mentioned was “We try to produce the easiest interfaces as possible. Because we have some clients that do not want to adapt their implementation knowledge towards our systems. With clients that want to adapt this process goes easier”. Another quote by interviewee 7 was “We have a certain 3D model that has several new updates. For our company a problem is that the ‘older people’ do not want to adapt to these new versions. Therefore the degree to which employees want to learn new features of 3D models is important”. Both of these quotes mention that that degree of adaptations helps to increase the degree of implementation knowledge. Therefore the effect of adaptations is positive on implementation knowledge.

For the effect of *adaptations* in the buyer-supplier relationship on *content of the data* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The fifth effect of *adaptations* in the buyer-supplier relationship on *need for digitalization* was argued for during the interviews. What interviewee 4 mentioned was “The need for digitalization is mostly influenced by the willingness to adapt. When one of the two parties don’t want to adapt there is simply no need to digitalize”. Another quote by interviewee 5 was “The degree to which companies want to adapt is important for the relationship. If someone says like I have done this in the same way for 30 years and I don’t want to adapt. They will create an own island in which they can’t work together with other parties”. Both of these quotes argue that adaptations is important otherwise there is no need for digitalization.

The last effect of *adaptations* in the buyer-supplier relationship on *human resources* was argued for during the interviews. Another quote mentioned by interviewee 10 was “If our employees are willing to adapt it makes it much easier to place the right people in the right place for a digital transformation”. This quote suggest that the willingness to adapt strengthens the factor human resources.

4.4.6 The effect of cooperation on the factors

The first effect of *cooperation* in the buyer-supplier relationship on *investment budget* was argued for during the interviews. What interviewee 7 mentioned was “We look at the

cooperation within relationships when investing money towards the digital transformation. When the cooperation is good there is a greater chance of success for the digital transformation”. Arguing that there is a positive effect of cooperation on investment budget.

For the effect of *cooperation* in the buyer-supplier relationship on *ICT technology* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The third effect of *cooperation* in the buyer-supplier relationship on *implementation knowledge* was argued for during the interviews. Interviewee 4 mentioned “Cooperation with our buyers is important since we have to create an atmosphere in which we have the same level of implementation knowledge as our buyers. This creates a synergy for a digital transformation”. Resulting in the fact that cooperation has a positive effect on implementation knowledge.

For the effect of *cooperation* in the buyer-supplier relationship on *content of the data* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The fifth effect of *cooperation* in the buyer-supplier relationship on *need for digitalization* was argued for during the interviews. What interviewee 2 mentioned was “There is no need for digitalization when one party don’t want to cooperate. It is of great importance to set up goals by both parties that must be fulfilled. You can’t push someone into a digital transformation if there is no sincere will to cooperate”. This quote argues that there is a positive effect of cooperation on the need for digitalization.

For the effect of *cooperation* in the buyer-supplier relationship on *human resources* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

4.4.7 The effect of conflict on the factors

The first effect of *conflict* in the buyer-supplier relationship on *investment budget* was argued for during the interviews. What interviewee 2 mentioned was “Okay, if we look at cooperation and conflict I prefer to start a digital transformation in a buyer-supplier relationships that is known for its good cooperation. For me I would not invest a lot of money into a digital transformation of a relationship that is known to cause a lot of conflicts”. Arguing for the negative effect of conflicts on investment budget.

For the effect of *conflict* in the buyer-supplier relationship on *ICT technology* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *conflict* in the buyer-supplier relationship on *implementation knowledge* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *conflict* in the buyer-supplier relationship on *content of the data* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The fifth effect of *conflict* in the buyer-supplier relationship on *need for digitalization* was argued for during the interviews. What interviewee 15 mentioned was “In our industry we only have a couple of big buyers. Therefore it is important to make sure you can cooperate effectively with each buyer. When there is a conflict within a relationship with a buyer, the digital transformation is hampered”. Arguing for the negative effect of conflict on the need for digitalization.

For the effect of *conflict* in the buyer-supplier relationship on *human resources* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

4.4.8 The effect of social interaction on the factors

For the effect of *social interaction* in the buyer-supplier relationship on *investment budget* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *social interaction* in the buyer-supplier relationship on *ICT technology* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *social interaction* in the buyer-supplier relationship on *implementation knowledge* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *social interaction* in the buyer-supplier relationship on *content of the data* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *social interaction* in the buyer-supplier relationship on *need for digitalization* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *social interaction* in the buyer-supplier relationship on *human resources* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

4.4.9 The effect of routinization on the factors

For the effect of *routinization* in the buyer-supplier relationship *investment budget* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *routinization* in the buyer-supplier relationship *ICT technology* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *routinization* in the buyer-supplier relationship *implementation knowledge* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

The fourth effect of *routinization* in the buyer-supplier relationship on *content of the data* was argued for during the interviews. What interviewee 1 mentioned was “There are different forms of routine within a relationship. Think of same languages and same tax rates if these things are the same for both parties it helps to use the same input of data. When a lot of factors are not the same within a relationship this complicates the data”. Another quote by interviewee 11 was “In the ideal world all data would be routine and almost the same. Since this data is the easiest to use, but this is not often the case”. These two quotes argue for the positive effect of routinization on content of the data.

For the effect of *routinization* in the buyer-supplier relationship *need for digitalization* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

For the effect of *routinization* in the buyer-supplier relationship *human resources* no quotes were argued for during the interviews. Therefore the effect is left empty and white in table 10.

Table 10 Direct effect of the contingencies on the factors

	Investment budget	ICT technology	Implementation knowledge	Content of the data	Need for digitalization	Human resources
Continuity	Positive	Positive		Positive	Positive	
Complexity	Negative	Negative	Negative			Negative
Symmetry	Positive				Positive	
Informality		Negative		Negative		
Adaptations	Positive	Positive	Positive		Positive	Positive
Cooperation	Positive		Positive		Positive	
Conflict	Negative				Negative	
Social interaction						

Routinization				Positive		
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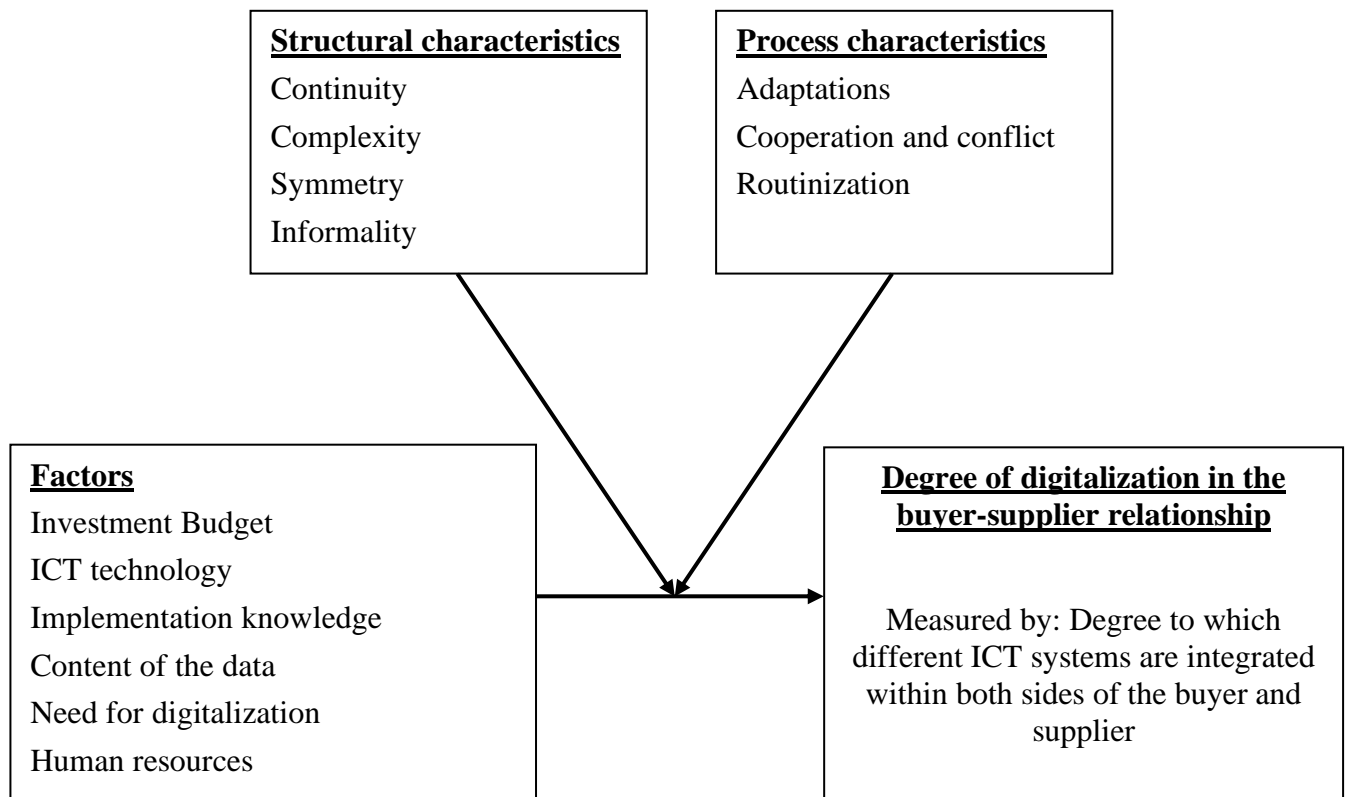
- Positive (green) = A positive direct effect of the contingencies on the factors
- Negative (red) = A negative direct effect of the contingencies on the factors
- Empty (white) = No direct effect found of the contingencies on the factors

To conclude table 10 summarizes all the direct effects of the contingencies on the factors. All white cells in the table had no specific quote during the interviews. For the green (positive) and red (negative) effects the explanations are given in section 4.4. What stands out about table 10 is the fact that for the contingency social interaction all effects were neutral. This could be related to the fact that social interaction plays a nihil role within the digitalization in buyer-supplier relationships.

4.5 Synthesis and introduction to the new theoretical framework

This section summarizes the main findings of section 4.1, 4.2, 4.3 and 4.4. Afterwards these findings are integrated towards a new theoretical framework. First of all, section 4.1 found that there was a direct effect of the degree to which different ICT systems are integrated within both sides of the buyer and supplier and the degree of digitalization in buyer-supplier relationships. Therefore it was chosen to add the way of measuring the degree of digitalization in buyer-supplier relationships towards the model. Secondly, section 4.2 found that there was one factor missing that had an influence on the degree of digitalization in buyer-supplier relationships namely the factor human resources. Different interviewees argued for the importance of managing people in the digitalization of buyer-supplier relationships. Therefore human resources was added as a sixth factor. Thirdly, section 4.3 found that one of the eight contingencies had almost no effect on the influence that the factors had on the degree of digitalization in buyer-supplier relationships. As mentioned by different quotes and confirmed by the high density of neutral effects of social interaction in table 9. It was chosen to remove social interaction from the process characteristics. Lastly, section 4.4 looked into the direct effect of the contingencies on the factors. Table 10 summarizes all the results ranging from positive, neutral to negative effects. The main findings are summarized in the new theoretical framework that is shown below.

Figure 3. New theoretical framework about the effect of the structural and process characteristics on the influence that the factors have on the digitalization of the buyer-supplier relationship



- Social interaction = removed from the process characteristics
- Human resources = added to the factors
- Measurement = added to the degree of digitalization in the buyer-supplier relationship

5. Discussion: Digital transformations in buyer-supplier relationships can be managed by considering factors and contingencies

This study focused on finding out why certain companies differ in their degree of digitalization in buyer-supplier relationships while being exposed to the same internal and external factors. By creating a theoretical framework that explains how contingencies have an effect on the influence that factors have on the degree of digitalization in buyer-supplier relationships. The goal of the discussion is to discuss the results while also covering the limitations, future research and managerial implications. The first section (4.1) covers the contributions of this study and gives answers to the research question. The second section (4.2) focuses on finding out what the limitations of this study are. Next by looking at what the limitations are, the future research is recommended in section (4.3). Lastly, the managerial recommendations are given to advise the managers on what to improve and focus on in their working principles. In short, it is found

that the factors have an influence on the degree of digitalization in buyer-supplier relationships. However, there are different moderating effects of the contingencies that can strengthen or weaken this influence.

5.1 The contributions to close the existing knowledge gaps

The next section looks at the knowledge gaps that were mentioned in the beginning of this study. These knowledge gaps were introduced in chapter one and this chapter discusses the different contributions to close these knowledge gaps. While doing this it is discussed how these different contributions relate towards the existing body of literature.

Chapter 1 mentioned that one of the knowledge gaps was to map out a set of factors that influenced the degree of digitalization in buyer-supplier relationships. As mentioned by other papers there is more research needed in regards to the factors and factors that help companies with the digitalization of buyer-supplier relationships (Kamalaldin et al., 2020). This study conducted a literature review and after the literature review five factors were found that had an influence on the degree of digitalization in buyer-supplier relationships. These five factors were investment budget, implementation knowledge, ICT technology, content of the data and need for digitalization. Different papers argued for the importance of these five factors (Burger et al., 2021) (Annarelli et al., 2021). Something that was new in this study was that these five factors were never researched in coherence. During this study it became clear that all five factors were necessary when performing a digital transformation in the buyer-supplier relationship. The degree to which companies have access to these factors also influences the degree to which companies can digitalize their buyer-supplier relationships.

What became apparent after conducting the interviews and analyzing the data was that one factor was missing that had an influence on the digitalization process of buyer-supplier relationships namely human resources. A book by Ustundag and Cevikcan (2018) explicitly mentioned the importance of human resources in the general sense of digital transformations (Ustundag & Cevikcan, 2017). Nevertheless, the importance of human resources in relation to the digital transformation of buyer-supplier relationships was missing in current papers. Because of this, it can also be explained that human resources were missing in the five factors that influence the degree of digitalization in buyer-supplier relationships after the literature review. Nevertheless, adding human resources as the sixth factor is important after conducting and analyzing the interviews.

The second knowledge gap that was mentioned in chapter 1 was to find out what the effect of the structural and process characteristics was in relation to the digitalization of buyer-supplier

relationships. Different studies argued that there is more research needed to find out why certain companies differ in their degree of digitalization (Wessel et al., 2020). As indicated in the part before, six factors had a direct influence on the degree of digitalization in buyer-supplier relationships. This study investigated what the effect of the eight contingencies was on the influence that the factors had on the degree of digitalization in buyer-supplier relationships. It was found that the contingencies had a moderating effect which differed in their strength and importance (see figure 2). Social interaction was however an exception since it had no effect on the influence that the factors had on the degree of digitalization in buyer-supplier relationships. Therefore social interaction had to be removed. As argued by Håkansson and Snehota (1995) social interaction plays a role in buyer-supplier relationships. Håkansson and Snehota (1995, p. 23) argue that because relationships are essentially about business-specific behaviors – subjective values – the personal bonds and convictions that are always present play an important role in formation of a relationship. The emphasis by social interaction is on the formation of a relationship. This could also be the reason why social interaction has no effect on the digitalization process in buyer-supplier relationships. A paper by Drucker and Gumpert (2012) indicated that the amount of social interaction decreases due to digitalization (Drucker & Gumpert, 2012). Due to the missing effect of social interaction in the digitalization of buyer-supplier relationships it was chosen to remove social interaction from the contingencies.

Section 4.4 did go more into detail toward the direct effect of the contingencies on the factors. Different effects were found ranging from positive, neutral to negative. Since this study was qualitative in nature the effects were based on quotes and therefore provide reasonings in contexts. So all relationships presented in this study are embedded in the specific characteristics of digitalization in buyer-supplier relationships. Table 10 summarizes all the effects of the contingencies on the factors. These effects of the contingencies on the factors were not yet investigated in current literature. Therefore this contributes to the existing literature. It helps to better understand which contingencies maybe strengthen or weaken a digital transformation. The only downside with the qualitative nature of this study is that the strength of each effect cannot be established. This could be covered in future research which will be explained in the next section.

5.2 limitations and future research: Guaranteeing the content validity of this study and the difference in type of industries, companies and sex

First of all, the method to gather the data for this study was interviews. In total fifteen interviews were conducted including eight different industries. Almost all companies in the sample size

sold some form of products for example foods, technical products and software products. There were two companies included in the sample size that sold a service namely consultancy and transportation. Previously it was found in other studies that services differ each time that they are bought and products are more stable (Anderson, Fornell, & Rust, 1997). Therefore it is more efficient and profitable to digitalize buyer-supplier relationships that are known to sell repeated products instead of services. For future research it would be interesting to find out if the theoretical framework is still applicable for buyer-supplier relationships in the service industry and whether the same factors and contingencies play a role.

The second limitation is related to the content validity of this study. There are some factors and contingencies that show some overlap. For example informality and social interaction, both are focused on the contact between buyers and suppliers. This may confuse the readers of this study. Therefore future research should focus on operationalizing these factors and contingencies. With the consequence that the content validity in this study is improved (Hong et al., 2019). Another limitation was discovered with the contingencies complexity. During this study it was found that interviewees could interpret complexity in two directions. Namely as a strengthening or weakening effect on the digitalization in buyer-supplier relationships. In order to arrive at a strong theoretical reasoning, it is necessary that complexity is well defined. Which means that future research should focus on aligning the contingencies complexity. If we look at the amount of interviews (15) and the corresponding data we could argue that the theoretical framework is saturated. Which means that the theoretical framework would hold up to other studies. Something that future research can still improve is finding the strength and significance of all relations in the theoretical framework. This could be done by executing a quantitative study about the theoretical framework in this study.

Table 10 shows a matrix including all the direct effects of contingencies on the factors. A limitation here is that the effects are based on qualitative study. This gives good explanations to why certain effects are strengthening or weakening. But the relative strength of each effect cannot be determined. Because the number of interviews is too low to make statements about the strength of each effect. This would be more suitable for a quantitative study. Giving immediately a recommendation for future research. Namely to investigate what the strength of each effect is of the contingencies on the factors.

The last limitation is the scope of this study. In the methodology part it was chosen to only interview the supply side of the buyer-supplier relationships. With the consequence that only suppliers were contacted and interviewed. This could be a limitation since another study found

that the reasoning of buyers is often different from suppliers (Oosterhuis, Molleman, & van der Vaart, 2013). Therefore future research could add new insights by interviewing buyers instead of suppliers.

5.3 Managerial recommendations: Insights for managers to improve their ability to successfully integrate a digital transformation within buyer-supplier relationships

The last part of this study focuses on giving recommendations towards the managers on the work floor. This study was related to companies that sell products in a variety of industries. Therefore these recommendations are useful for managers in the supply side of a buyer-supplier relationship in a variety of industries.

First of all, this study helps managers to understand which contingencies are affecting the digitalization of buyer-supplier relationships. Figure 2 summarizes all seven contingencies and their relative strength and importance related to the digitalization of buyer-supplier relationships. This helps managers that work on the digitalization in buyer-supplier relationships by understanding which contingencies they have to utilize and avoid. For example managers should be pushed to improve upon adaptations, continuity and symmetry in buyer-supplier relationships while decreasing informality, conflicts and complexity within buyer-supplier relationships. An example to improve on adaptations might be that a manager informs his employees that a digital transformation doesn't steal their work but gives them chances to do even more work. Another example to decrease the complexity within a relationship is that managers can ask the other party to use the same systems, language or data. This will increase the chance of a successful digitalization in the buyer-supplier relationship. Managers could take a look at the importance of each contingencies. To find out which contingencies have the most effect to increase or decrease the chance of a successful digitalization in buyer-supplier relationships.

A second recommendation for managers who have to deal with the starting phase of digitalization in buyer-supplier relationships is to understand which factors are influencing the degree of digitalization in buyer-supplier relationships. This study found out that there are six factors that have a direct influence on the degree of digitalization in buyer-supplier relationships. It is beneficial for managers to know which factors must be met so that managers have a good chance of digitalizing their buyer-supplier relationships successfully. Managers should know that they first have to meet all the factors before looking into more details towards the effect of contingencies. Since the factors form the basis of digitalization in buyer-supplier relationships and contingencies help to strengthen or weaken this digital transformation.

The last recommendation for managers would be to look into the effects of the contingencies on the factors. There are different contingency factors that have a positive, neutral or negative effect on the factors. This would help managers to find out which contingency factors are important to strengthen or weaken factors that enable a digital transformation in buyer-supplier relationships. For example if we look at table 10 managers could learn that increasing the continuity of a buyer-supplier relationship has a positive effect on the amount of investment budget. Another example for managers is that they should be aware that when the buyer-supplier relationship is too complex this could have a negative effect on the role of human resources. Table 10 therefore helps managers to find certain direct effects of the contingencies on the factors.

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Appendix

Appendix A: Interview protocol on digitalization within supplier relationships (on semi-structured basis)

English version

Hello, thanks for doing this interview with me. I will now briefly introduce myself, my name is Lars Nijhof and I am currently doing the Master Digital Business and Analytics at the University of Twente. I'm 23 years of age and currently working on the last part of my Master Thesis. This interview is focusing on the digitalization process of the buyer-supplier relationships. The interview is built up in different parts and the goal is to have a conversation rather than a formal interview.

- Recording: First of all, is it OK if I record the interview to analyze the data afterwards?
- Are you ready to start the interview?

Part 1 (5 minutes): How are you involved in this company with the digitalization process of the buyer-supplier relationship?

Optional sub-questions part 1

- 1.1 What is your function within this company?
- 1.2 How long are you working for this company?
- 1.3 How long have you been working in relation to the digitalization of buyer-supplier relationships?

Part 2 (10 minutes): Can you indicate one representative example what this company is doing in regards to digitalization of the buyer-supplier relationships?

Optional sub-questions part 2

- 2.1 For this representative example which investments are made by this company in order to start the digital transformation of the buyer-supplier relationships?
- 2.2 How is the implementation knowledge and ICT technology influencing the degree of digitalization of the buyer-supplier relationships?
- 2.3 How is data used in the digitalization process of buyer-supplier relationships?
- 2.4 What were reasons for this company to start the digitalization of buyer-supplier relationships?
- 2.5 Can you indicate a top 3 or 5 factors that enabled the digitalization of buyer-supplier relationships? These could also be other factors than indicated before.
- 2.6 Talking about this representative example what are the main developments in regards to the degree of digitalization in buyer-supplier relationships?
- 2.7 Can you explain how the digitalization of the buyer-supplier relationship has developed in regards to the communication channels, data streams and transactions?

Part 3 (15 minutes): Can you indicate one example for a successful relationship in regards to digitalization? And one example where the process of digitalization wasn't successful?

Optional sub-questions part 3

- 3.1 Let's start with the example that was successful. What contingencies of the buyer-supplier relationship were helpful in creating this success?

3.2 What is your explanation why these contingencies made the digitalization of the buyer-supplier relationship a success?

3.3 Now the same for the unsuccessful case: What contingencies of the buyer-supplier relationships were not helpful?

3.4 What is your explanation why these contingencies made the digitalization of the buyer-supplier relationships not a success?

Part 4 (10 minutes): Now I am going to present a model which shows 8 characteristics of buyer-supplier relationships. Based on your experience, can you indicate and explain which of these eight contingencies influenced the digitalization process of buyer-supplier relationships in a positive or negative way?

Optional sub-questions part 4

4.1 What is an example which shows how the characteristics that you indicated are influencing the process of digitalization of buyer-supplier relationships?

4.2 Is it correct that the other characteristics that you didn't mention are not relevant from your point of view?

Part 5 (5 minutes): Now that we talked about all these characteristics of buyer-supplier relationships and the factors of digitalization of buyer-supplier relationships. What additional interactions among these characteristics and factors did you experience?

Part 6 (5 minutes): Closure

6.1 What would you like to add to this interview before we finish?

Thank you for your time. If you have any further ideas you would like to share with me, or questions about the project, please contact me. And I will make sure that you receive the summary of the thesis report and if you like, also the full report once it is finished.

Dutch version

Hallo, bedankt voor het meedoen aan dit interview. Ik zal me nu even kort voorstellen, mijn naam is Lars Nijhof en ik doe momenteel de Master Digital Business and Analytics aan de Universiteit Twente. Ik ben 23 jaar oud en werk momenteel aan het laatste deel van mijn Master Thesis. In dit interview staat het digitaliseringsproces van de inkoper-leverancier relatie centraal. Het interview is opgebouwd in verschillende delen en het doel is om een gesprek te hebben in plaats van een formeel interview.

- Opnemen: allereerst, is het goed als ik het interview opneem om de data achteraf te analyseren?

- Ben je klaar om het interview te starten?

Deel 1 (5 minuten): Hoe ben je bij dit bedrijf betrokken bij het digitaliseringsproces van de inkoper-leverancier relatie?

Optionele sub-vragen deel 1

1.1 Wat is uw functie binnen dit bedrijf?

1.2 Hoe lang werkt u voor dit bedrijf?

1.3 Hoe lang bent u al bezig met het digitaliserings-proces van inkoper-leverancier relaties?

Deel 2 (10 minuten): Kunt u een representatief voorbeeld geven van wat dit bedrijf doet op het gebied van digitalisering van de inkoper-leverancier relaties?

Optionele sub-vragen deel 2

- 2.1 Welke investeringen doet dit bedrijf voor dit representatieve voorbeeld om de digitale transformatie van de inkoper-leverancier relaties op gang te brengen?
- 2.2 Hoe beïnvloedt de implementatiekennis en ICT-technologie de mate van digitalisering van de inkoper-leverancier relaties?
- 2.3 Hoe wordt data gebruikt in het digitaliseringsproces van inkoper-leverancier relaties?
- 2.4 Wat waren redenen voor dit bedrijf om te beginnen met het digitaliseren van de inkoper-leverancier relaties?
- 2.5 Kunt u een top 3 of 5 voorwaarden aangeven die de digitalisering van inkoper-leverancier relaties mogelijk hebben gemaakt? Dit kunnen ook andere voorwaarden zijn dan eerder aangegeven.
- 2.6 Over dit representatieve voorbeeld gesproken, wat zijn de belangrijkste ontwikkelingen met betrekking tot de mate van digitalisering in inkoper-leverancier relaties?
- 2.7 Kunt u aangeven hoe de digitalisering van de inkoper-leverancier relatie zich heeft ontwikkeld met betrekking tot de communicatiekanalen, datastromen en transacties?

Deel 3 (15 minuten): Kunt u één voorbeeld noemen van een succesvolle relatie op het gebied van digitalisering? En een voorbeeld waarbij het digitaliseringsproces niet succesvol was?

Optionele sub-vragen deel 3

- 3.1 Laten we beginnen met het voorbeeld dat succesvol was. Welke omgevingsfactoren van de inkoper-leverancier relatie waren behulpzaam bij het creëren van dit succes?
- 3.2 Wat is uw verklaring waarom deze omgevingsfactoren de digitalisering van de inkoper-leverancier relatie tot een succes hebben gemaakt?
- 3.3 Nu hetzelfde voor het minder succesvolle voorbeeld: welke omgevingsfactoren van de inkoper-leverancier relatie waren niet behulpzaam?
- 3.4 Wat is uw verklaring waarom deze omgevingsfactoren de digitalisering van de inkoper-leverancier relatie niet tot een succes hebben gemaakt?

Deel 4 (10 minuten): Nu ga ik een model presenteren dat 8 omgevingsfactoren van inkoper-leverancier relaties laat zien. Kunt u op basis van uw ervaring aangeven en uitleggen welke van deze acht omgevingsfactoren het digitaliseringsproces van de inkoper-leverancier relaties in positieve of negatieve zin hebben beïnvloed?

Optionele sub-vragen deel 4

- 4.1 Wat is een voorbeeld waaruit blijkt hoe de door u aangegeven kenmerken het proces van digitalisering van inkoper-leverancier relaties beïnvloeden?
- 4.2 Klopt het dat de andere kenmerken die u niet noemde vanuit uw oogpunt niet relevant zijn?

Deel 5 (5 minuten): Nu we het hadden over al deze kenmerken van de inkoper-leverancier relaties en de voorwaarden van digitalisering van de inkoper-leverancier relaties. Welke aanvullende interacties tussen deze kenmerken en omgevingsfactoren heeft u ervaren?

Deel 6 (5 minuten): Afsluiting

- 6.1 Wat zou je aan dit interview willen toevoegen voordat we eindigen?

Bedankt voor je tijd. Mocht je nog ideeën hebben die je met mij wilt delen, of vragen hebben over het project, neem dan contact met mij op. Ik zorg er dan voor dat u de samenvatting van het scriptierapport ontvangt en als u wilt ook het volledige rapport als het klaar is.

Appendix B: The codebook

Code Group	Code
Six antecedents of digitalization	<ul style="list-style-type: none"> Investment budget Implementation knowledge ICT technology Content of the data Need for digitalization Human resources
Eight contingencies	<ul style="list-style-type: none"> Continuity Complexity Symmetry Informality Adaptations Cooperation and conflict Social interaction Routinization
Degree of integration of digital systems	<ul style="list-style-type: none"> High degree of integration Low degree of integration
Type of digital systems	<ul style="list-style-type: none"> 3D models API system Bank link system Basecone Big data E-commerce EDI system ERP system Forecast system Information system Order system Power BI Ticketing system
Reasons to digitalize buyer-supplier relationships	<ul style="list-style-type: none"> Automation Avoiding miscommunication Better alignment More competitive Costs decreasing More efficiency Less FTE needed Pressure of buyers Quality improvements Save money Scalability Visibility improved Win-win situation Service Level agreements Privacy International

Positive or negative effect on contingencies	Negative – Continuity Negative – Complexity Negative – Symmetry Negative – Informality Negative – Adaptations Negative – Cooperation and conflict Negative – Social interaction Negative – Routinization Positive – Continuity Positive – Complexity Positive – Symmetry Positive – Informality Positive – Adaptations Positive – Cooperation and conflict Positive – Social interaction Positive – Routinization
Importance of contingencies effect	Crucial effect – Continuity Crucial effect – Complexity Crucial effect – Symmetry Crucial effect – Informality Crucial effect – Adaptations Crucial effect – Cooperation and conflict Crucial effect – Social interaction Crucial effect – Routinization Mediocre effect – Continuity Mediocre effect – Complexity Mediocre effect – Symmetry Mediocre effect – Informality Mediocre effect – Adaptations Mediocre effect – Cooperation and conflict Mediocre effect – Social interaction Mediocre effect – Routinization No effect – Continuity No effect – Complexity No effect – Symmetry No effect – Informality No effect – Adaptations No effect – Cooperation and conflict No effect – Social interaction No effect – Routinization
Strengthening or weakening effect of contingencies	Strengthening – Continuity Strengthening – Complexity Strengthening – Symmetry Strengthening – Informality Strengthening – Adaptations Strengthening – Cooperation and conflict Strengthening – Social interaction Strengthening – Routinization

	<p>No effect – Continuity No effect – Complexity No effect – Symmetry No effect – Informality No effect – Adaptations No effect – Cooperation and conflict No effect – Social interaction No effect – Routinization Weakening – Continuity Weakening – Complexity Weakening – Symmetry Weakening – Informality Weakening – Adaptations Weakening – Cooperation and conflict Weakening – Social interaction Weakening – Routinization</p>
<p>Successful and unsuccessful interactions</p>	<p>Successful – Continuity Successful – Complexity Successful – Symmetry Successful – Informality Successful – Adaptations Successful – Cooperation and conflict Successful – Social interaction Successful – Routinization Successful – Investment budget Successful – Implementation knowledge Successful – ICT technology Successful – Content of the data Successful – Need for digitalization Successful – Human resources Unsuccessful – Continuity Unsuccessful – Complexity Unsuccessful – Symmetry Unsuccessful – Informality Unsuccessful – Adaptations Unsuccessful – Cooperation and conflict Unsuccessful – Social interaction Unsuccessful – Routinization Unsuccessful – Investment budget Unsuccessful – Implementation knowledge Unsuccessful – ICT technology Unsuccessful – Content of the data Unsuccessful – Need for digitalization Unsuccessful – Human resources</p>

Appendix C: The codebook

Table 11 The strength effect of each moderating contingencies

Strength of the effect	Contingencies
Strengthening effect	Continuity
	Symmetry
	Adaptations
	Cooperation
	Routinization
No effect	Social interaction
Weakening effect	Complexity
	Informality
	Conflict

Table 12 The importance of each moderating contingencies

Importance of the effect	Contingencies
Crucial importance	Adaptations
	Continuity
	Complexity
Mediocre importance	Symmetry
	Informality
	Cooperation and conflict
	Routine
No importance	Social interaction