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The development of learning in a supply network during an upstream lean integration: a comparative case study

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Abstract

Purpose - The lean methodology has spread to more and more organizations as many benefits can be extracted from its implementation. Nowadays, the adoption of lean within an organization is seen as not enough, and organizations are spreading lean across their supply network. However, simply forcing the lean methodology to supply networks has proven to be ineffective, and in some cases counter-productive. Upstream lean integrations are more successful when they are paired with close collaboration and learning in a supply network. This study aimed to find out how learning happens during an upstream lean integration and what hinders and accelerating this learning.

Methodology/research design - A comparative case study was conducted to answer the research question. Two cases were studied, both in the Dutch health care sector. One case exhibited a low level of lean adoption, whereas the other case was characterized by a high level of lean adoption. Mixed methods were used to gather data, employing both qualitative and quantitative methods with a sample size of 15. The sample consisted of two cases, each containing a buyer and its three suppliers.

Findings – The cross-case analysis indicated that two phases of interorganizational learning are present. A first phase characterized by trial and error between buyer and its suppliers, followed by a phase characterized by autonomous learning and collaboration. The first phase seems to be positively influenced by transformational leadership, whereas the second is indicated to be positively impacted by the use of data-driven decision making.

Future research – Further in-depth longitudinal studies validating the two phases of interorganizational learning and their connection to transformational leadership and data-driven decision making can prove to be interesting as today's business environment desires to extract as many benefits from business relationships as possible.

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1. Introduction

Companies across multiple industries have been adopting lean management with the expectation that the implementation will provide a competitive edge over the competition through differentiation in their business (Tortorella, Fettermann, Cauchick Miguel, & Sawhney, 2020) (Moyano-Fuentes & Sacristán-Díaz, 2012). The core of lean Management is working in a streamlined way across the company to produce high quality finished products at the pace of customers 'demand with little to no waste (Womack, Jones, & Roos, 1990). Furthermore, it is important that the lean management practices create value for internal and external customers and other stakeholders of the organisation (Negrão, Filho, & Marodin, 2016). This is realised through the stimulation of continuous learning initiatives such as feedback and reflection processes to achieve perfection in technical and socio-technical factors (Danese, Manfè, & Romano, 2018; Spear, 2009).

However, lean management should not stop at the company itself, according to Womack and Jones (1997), it is very important to spread the lean management philosophy throughout the whole supply chain to streamline production processes and capabilities such as the ability to deliver just-in-time (Shah & Ward, 2007). As both buyer and supplier are engaging in lean management, reducing waste and increasing process quality is a joint activity, which increases its efficiency and its perceived benefits, such as operational responsiveness (Bevilacqua, Ciarapica, & De Sanctis, 2017; Womack & Jones, 2002). Achieving better operational responsiveness is important in lean, as it minimizes the extra steps and mistakes that have to be taken or made when responding to abrupt changes to conditions in the environment, customer's actions or other sudden events (Choi & Krause, 2006).

Lean integration across the supply chain is thus wanted, but a challenge arises, it requires increased integration between buyers and their suppliers (Perez, de Castro, Simons, & Gimenez, 2010). This challenge is also seen in general supply chain literature, as increasing competition around the world has forced companies to steer their supply chain more towards strategic improvement (Tseng, 2014). An increasing amount of companies are synchronising their processes across their supply chains to keep up with the fast adapting competitive landscape (Croxton, García-Dastugue, Lambert, & Rogers, 2001). This integration asks for close buyer-supplier collaboration, by jointly looking at what and how to improve activities across the supply chain (Forslund & Jonsson, 2007).

What makes the challenge of integration especially difficult is that supply networks are very complex, which leads to many failures in integration (Choi, Dooley, & Rungtusanatham, 2001). For lean management transformations across supply networks, Womack and Jones

(1997), suggest that companies in a supply network should first internally become a lean company before connecting with other lean companies. However, Wee and Wu (2009) discovered that the desire to spread lean across the supply network mostly stems from the buyers, meaning that the most common lean integration goes upstream in the supply network and is rarely initiated by downstream suppliers. Downstream lean integrations rarely happen, as the focus on downstream customers is mostly to provide value and to unburden, rather than to educate (Wee & Wu, 2009). When the supply network integration of lean is buyer-led, it requires a buyer-supplier relationship culture that is focussed on continuously improving (Liker & Choi, 2004). Building on this, Powell and Coughlan (2020) discovered that lean supplier development can better be described as organisational learning. A needed critical success factor that companies need to possess is a 'learning-to-learn' capability to increase the chances of a successful lean implementation. It is thus important to know what works at your company and what works at other companies for successful implementation at suppliers (Powell & Coughlan, 2020).

Confirming Powell and Coughlan (2020)'s theory, Marksberry (2012) analysed the 'Toyota way' of implementing lean at their suppliers and found out that simply 'forcing' lean at their suppliers with support of general benchmarks did not guarantee the success of lean. This implied that buyers that want to push lean on their suppliers need to really understand how it can benefit their business with the supplier. In the Toyota case, it was also seen that there were differences in corporate cultures in the US that led to a failure in implementation, or in a failure to build relationship with certain suppliers (Marksberry, 2012). This was also researched by Bortolotti, Boscari, and Danese (2015), who confirm that organizational cultures focussed on learning lead to easier and a higher success rates of lean adoption. The organisational learning maturity of a firm thus supports lean management practices (Tortorella, Marodin, Miorando, & Seidel, 2015). Important to note is that, when a firm is highly mature in their lean practices, it does not mean that these companies are mature in learning. Many established mature companies have a long-term established culture with rooted behaviors that is difficult to change, which can hinder learning (Ansari, Bell, Klammer, & Lawrence, 1997). However, as the focus of lean is to continuously learn and strive for perfection, no matter what the learning maturity of a firm is, during an upstream lean integration, suppliers and buyer are still learning from each other through exploration and exploitation of experiences (Jin & Stough, 1998; March, 1991).

As learning from experiences is the core of lean (Jaber, Bonney, & Guiffrida, 2010; Powell & Coughlan, 2020; Tortorella et al., 2020), this research paper seeks to find out *how* this learning occurs during an upstream lean integration. As described earlier, this is relevant

since upstream customers/buyers are more likely to push for lean integration than downstream companies/suppliers (Wee & Wu, 2009).

However, how an organisational deals with these learning experiences can either enforce or hinder learning, which emphasises the importance of not only knowing *how* learning occurs but also *what influences* its effectiveness (Schindler & Eppler, 2003). Therefore, in this research paper, upstream lean integration initiatives are analyzed to discover how organizational learning develops over time between a buyer and its suppliers as well as how learning can be hindered or accelerated, addressed by the following research question:

Research question: *How does organizational learning in a supply network develop during upstream lean integration and how can learning be hindered or accelerated?*

To answer the research question, a mixed-method research approach was used. Interviews alongside surveys were held in two different supply chains consisting of one buyer and three suppliers. From the data gathered from the interviews and surveys, two case study were conducted, one for each supply chain. Subsequently, the two case studies are cross analysed.

This study contributes to literature as it extends to link between lean and learning in a supply network exposed by papers like Powell and Coughlan (2020) and Bortolotti et al. (2015). These papers describe the fact that learning and close collaboration is present in a supply network, and is very important when integrating lean in the supply chain. This study will focus more in-depth on how this upstream lean integration learning takes place and how this can be hindered or accelerated.

Possible managerial implications of this study are findings on learning initiatives in upstream lean integration, that buyers can potentially use to prepare their upstream integration. Furthermore, potential hindering and accelerating factors of learning are mentioned. The buyer can then use this to their advantage to ensure a more successful lean and learning implementation at their suppliers. This study could also be of use for suppliers as it gives an insight on what they could expect and come across when buyers push for lean integration in regards to learning stimulation and activities. This could then prevent misunderstandings between buyer and suppliers. To conclude the managerial implications, buyers and suppliers can use the outcomes of this study to their advantage to learn from previous positive and negative upstream integration cases to ensure that their integration and learning develops smoothly over time.

First a theoretical background of the research topic is provided, followed by an in-depth description of the research methodology and sample characteristics. After the methodology section the results of both cases are discussed, followed by a cross case analysis. Subsequently, the research question is answered from the results, paired with the theoretical and practical implications of this study. Lastly, the strength, limitations and future research are addressed.

2. Theoretical background

2.1 The lean philosophy

Womack et al. (1990) first introduced lean (production) in their book, 'The machine that change the world', where they analyzed Toyota's production system (TPS). It was established that the goal of lean is linked to the goal of any organization, to *'create and deliver value to customers and end users'* (Mossman, 2009). Value is defined as a capability, which is established by the customer or end user, and is delivered to them at the right time and cost (Wandahl & Bejder, 2003). Lean creates value for customers and end users by eliminating waste to deliver high-quality products and services at low costs and high pace (Womack et al., 1990). Eliminating waste is an important concept in lean, as waste is defined by the value it creates for customers and end users. Waste does not deliver any value to customers and end users, hence eliminating waste is imperative in lean practices (Womack, 2005).

Furthermore, Womack and Jones (2003) later discovered that a driver for lean adoption is the expectation that it brings benefits that help companies differentiate their business and gain an edge over the competition. This edge is provided since lean also improves flexibility and customer responsiveness (Abdallah & Matsui, 2009). One important part of lean that created this competitive advantage was 'just-in-time' (JIT) (Chavez et al., 2015). JIT is a pull-production system that only produces at customer's demand (Sugimori, Kusunoki, Cho, & Uchikawa, 1977). The process eliminates waste by simplifying the production processes through the reduction of inventories to efficiently use resources (Kannan & Tan, 2005). Reduction of inventories is done by creating processes with small batch sizes and ideally, single flow, where the batch size is 1. With this in place, make-to-order is used so that there is only produced when a downstream customer needs something (Sheridan, 1999). Furthermore, JIT also complements process set-up time reduction and quality management (Karlsson & Åhlström, 1996). Process set-up time supports lean as it facilitates smaller batch sizes which enables inventory reductions (Karlsson & Åhlström, 1996). Quality management complements JIT as it increases efforts for continuous improvement and the minimalization of defects (Karlsson & Åhlström, 1996). The focus of lean has been mostly on the automotive sector, like Toyota, in the early development of the philosophy (Shah & Ward, 2003).

However, the focus of lean has shifted from mainly the automotive sector to a wide variety of sectors (Erthal & Marques, 2018; Hines & Bishop, 2006; Moyano-Fuentes & Sacristán-Díaz, 2012). Consequently, the lean concept has evolved from purely production focused to more human-centric. This creates the opportunity to implement lean in many

different contexts (Dabhilkar & Åhlström, 2013). The more human centric approach of lean has been referred to as lean management (LM). In LM 'hard lean tools' are combined with 'soft lean practices' (Shah & Ward, 2007). Hard tools refer to lean technical and analytical tools and soft practices refer to team-work and training exercises (Bortolotti et al., 2015). Furthermore, in general, in LM it is important to foster continuous improvement initiatives trough feedback and reflection activities to learn from previous success and failure (Liker & Hoseus, 2008). Furthermore, Spear (2009) emphasizes that experimentation and knowledge sharing is integral during for the success of LM. This continuous learning process is also known as 'kaizen' events, whereas radical improvement events are called 'kaikaku' (rethinking) (Womack & Jones, 1996). The goal of kaizen and kaikaku is similar to JIT, to create value for the customer by reducing waste. Through this rethinking and continuous improvement, the goal is to reach perfection of processes which is an never ending journey (Womack & Jones, 1996).

Another element of lean management is to reduce supplier variability to reduce uncertainties in quality and delivery times (Arnheiter & Maleyeff, 2005). To reduce this variability, close cooperation and partnerships with suppliers is needed (Arnheiter & Maleyeff, 2005). There is thus need to develop the downstream suppliers (Perez et al., 2010). It is even more important, as these developments significantly improve the performance of a supply chain (Lamming, 1996).

2.2 Supplier development

Buyer's that systematically create and maintain a network of competent suppliers are engaging in supplier development (Hahn, Watts, & Kim, 1990). This is done by long-term cooperation efforts between the buyer and its suppliers to improve the suppliers' capabilities, performance, and to foster continuous improvement (Watts & Hahn, 1993). Furthermore, the goal of supplier development is to ensure that the buyer's short and long-term supply needs are met (Abdullah & Maharjan, 2003). Consequently, the long term supplier development strategy is the basis of an integrated supply chain (Routroy & Pradhan, 2013).

In supplier development, four categories can be distinguished, knowledge transfer, investment and resource transfer, feedback and communication, and management and organisational practices (Bai & Sarkis, 2011). Moreover, supplier development initiatives can be seen as direct supplier development and indirect supplier development (Krause, 1997). Direct supplier development is directed at the long-term, with activities such as, consultation on-site, training and education, personnel transfer between buyer and supplier, and support of buyer towards supplier by providing capital or other resources (Krause & Ellram, 1997). On

the other hand, indirect supplier development is aimed at enhancing the performance of suppliers with minimal resource support, trough incentives and future business guarantees (Sachin & Vincent, 2007). Direct supplier development focusses on improving the product or delivery service of the supplier, whereas indirect supplier development aims to improve the suppliers capabilities (Heide & Weiss, 1995). Contrarily, it was discovered by Wagner (2010), that indirect supplier development actually has a bigger impact on the improvement of the products and delivery performance of the supplier than direct supplier development. It was found that by improving the capabilities of the supplier, this had a greater positive effect on the supplier's products and delivery performance than by just providing capital and resources.

For example, John Deere indirectly developed their suppliers by improving their just-in-time *capabilities*. This was done through John Deere's supplier development teams, which resulted in a major cycle time reduction at John Deere's suppliers (Golden, 1999). Thus, by improving the capabilities of the supplier, indirectly, its delivery performance was increased.

2.3 Lean supplier development

In lean supplier development, the focus is more on indirect supplier development, like the John Deere example mentioned above, where building new and improved *capabilities* in a supply network is key (Wee & Wu, 2009). Developing *capabilities* is emphasized, as there is no longer only a focus on implementing certain successful practices that work at the buyer, but also on what works for the supplier through buyer-supplier cooperation (Taylor, 2006). Jaber et al. (2010) describe this as a continuous learning process for the buyer and supplier to improve the supply network. The goal of this learning process is to extend lean to the supply network, which is done through, supplier involvement, knowledge transfer, lean programme commitment and lean program alignment (Bortolotti et al., 2015; Womack & Jones, 1996). Supplier involvement is important as it is more efficient if both buyer and suppliers work together to identify and reduce waste in the supply chain through for example extended value stream mapping (Womack & Jones, 2002). Sharing knowledge throughout the supply network is beneficial so suppliers and buyers can learn from each other's success and failures (Bruun & Mefford, 2004). There are two types of knowledge, explicit and tacit (Tyagi, Cai, Yang, & Chambers, 2015). Explicit knowledge refers to knowledge that can be easily expressed and subsequently transferred to other people, whereas tacit knowledge is usually formed by own experiences causing it to be more difficult to express and transfer (Chilton & Bloodgood, 2008; Herschel, Nemati, & Steiger, 2001). It is thus also more difficult to share tacit knowledge across a supply network. However, as tacit knowledge makes up 90-95% of an employee's knowledge, it is key to

externalise this knowledge, transforming tacit knowledge into explicit, creating more easily transferrable knowledge (Schoenherr, Griffith, & Chandra, 2014). This is done by publishing and articulating the tacit knowledge gained from personal experiences (Rice & Rice, 2005). Ultimately, effectively sharing tacit and explicit knowledge across the supply network enables lean to be integrated (Bortolotti et al., 2015).

Angelis, Conti, Cooper, and Gill (2011) also stress that commitment to learn is needed at the supplier's management, as a lack of commitment is problematic as it has a negative influence on lean improvement practices. It is important to create a culture at the supplier that is committed to the lean transformation so workers at the supplier are motivated and can fully explore their creativity, which ultimately influences the lean transformation's success (Munene, 1995). However, commitment from the supplier's side is not enough, commitment and incentive is important from the buyer's side, as it motivates the supplier during the transformation process (Cox, Chicksand, & Palmer, 2007). This also creates trust in the supply network, as opportunistic behaviour is prevented through these incentives (Simons & Taylor, 2007). Lean program alignment is created through feedback loops and cost transparency throughout the supply network, so counterparts can learn from each other, which ultimately leads to more alignment (Perez et al., 2010).

However, as Bortolotti et al. (2015) discovered, the alignment of lean supply networks should not be viewed as a whole, but more in separate smaller chains of companies. This is especially important in the early stages of the transformation, as suppliers have different operating characteristics and not just one type of lean is successful across the whole network (Bortolotti et al., 2015; D. Kim, 2014). Powell and Coughlan (2020) support this finding and propose that lean integration throughout the supply network should be viewed as a '*complex organizational problem requiring both programmed knowledge and insightful questioning to foster deeper learning within and across organizations*' (p. 18). By looking at Toyota's lean developments in their supply chain, Jin and Stough (1998) describe the processes of lean supplier development by, *'learning system, learning economy, learning organisation'* and propose that organisational learning is key to gain a competitive advantage through lean. Furthermore, they suggest that the success of lean stems from developing networks by teaching them **how** to learn, which is in line with Powell and Coughlan (2020)'s paper.

2.4 Organizational learning

Organisational learning is the process where organisations understand and learn from their experiences to guide their future (Wang & Ahmed, 2003). This process is important for a firm

as it provides the organization a possible competitive edge over the competition (Tortorella et al., 2015). This edge originates from the refinement, routinization, production and elaboration of learning experiences (Holmqvist, 2003). Adding to that, March (1991) proposes that there is exploitation and exploration in learning, where exploitation is referred to as the extension and refinement of existing processes, and where exploration is the experimentation with new possibilities. Furthermore, a learning organisation should support and facilitate individual learning to continuously learn and transform the organisation to a desired state (Pedler, Burgoyne, & Boydell, 1991). Starting from the individual level, learning has to be embedded in the firm itself through the three learning levels proposed by Crossan, Lane, and White (1999), the individual, group and organisation level. The processes that happen on the individual level are intuiting and interpreting through and resulting in experiences, images and metaphors. Learning on the group level occurs by integrating shared understandings, mutual adjustments and interactive systems. Lastly, learning on the organisational level happens by institutionalising routines, diagnostics systems and rules and procedures. Emphasising learning on an organizational level is especially important as this stage of learning is less reliant on direct cognitive processes but more on formal organisation structures and strategies (Crossan & Berdrow, 2003). These four different processes on three different levels are referred to as the 4I's of learning (see figure 1) (Crossan et al., 1999). However, two other variables are present in the framework to support the 4I's, feed-forward and feedback processes. Feed-forward is when learning occurs from the individual level to the group level to the organizational level, whereas in feedback processes learning flows the organizational level to the group level to the individual level (see figure 1) (Crossan et al., 1999). These processes are important as it is necessary for learning to extend throughout the entire organisational as well as the need for top-down support to refresh and reinforce learning (Vera & Crossan, 2004). However, when top-down institutionalisation occurs there is little to no room for intuiting, since there is more focussed on the interpreting, as the goal is more on how the new idea can be reached (Limba, Hutahayan, Solimun, & Fernandes, 2019). This is solved by the feedback of the new idea from organisational level to the individual level. It must then be feed-forwarded from the interpreting/intuiting phase to the integrating phase to become fully institutionalised on the organisational level (Lawrence, Hardy, & Phillips, 2002). Crossan et al. (1999) support this as it is emphasised that fully assimilating new information requires feed-forward from the individual level to be institutionalized on the organisational level.

However, sometimes increasing a firms learning ability does not need a drastic change in their organisational level/culture. Firms can also enhance their learning by improving what

they are already doing well, which does not require a drastic change on the organisational, group and individual level (Dibella, Nevis, & Gould, 1996; Ulrich, Jick, & Glinow, 1993).

Learning only on an organizational, group and individual level however, is not enough in today's drastically changing business environment (Prahalad & Hamel, 1990). This trend is also in line with (lean)supplier development, as continuously improving and developing skills/competences does not stop at the buyer itself, but is extended to the supplier network (Watts & Hahn, 1993). It is thus also important to foster interorganizational learning in a supplier network (Lane & Lubatkin, 1998).

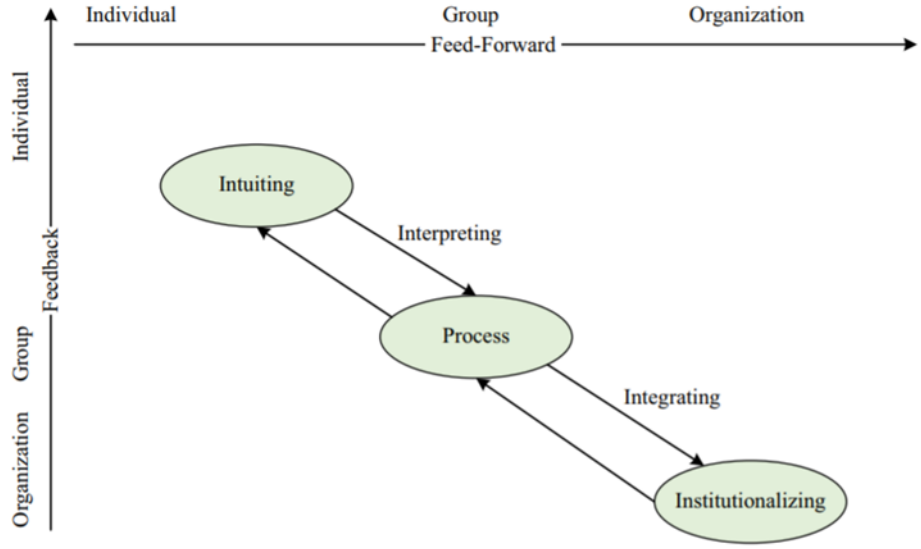

Figure 1: The 4I's of learning (Limba et al., 2019).

2.5 Interorganizational learning and absorptive capacity

When problems or challenges arise, organizations sometimes do not have enough time to internally develop and learn the skills and capabilities required to respond timely and effectively to the arising issues (Dierickx & Cool, 1989). Hence, learning capabilities and skills from partners has shifted to being a primary goal in business relationships (Lane & Lubatkin, 1998). This way, when challenges and problems arise, partners can learn from each other to swiftly decrease the exposure to uncertainties in a rapidly changing business environment (Grant & Baden-Fuller, 1995). Interorganizational learning thus occurs when partners change or influence each other's skills or capabilities (Peronard & Brix, 2019). This can happen intentional, by knowledge sharing, or unintentional through stimulating innovation (Ingram, 2017).

However, in order for interorganizational learning to be effective, a *dual focus on learning* has to be fulfilled by parties involved in the learning (Holmqvist, 2004). This *dual focus* is often referred to as the 'two-level game'. The logic behind the 'two-level game' is that the two parties involved in the learning both have to 'open up' in order to facilitate and engage in interorganizational learning (Jones & Macpherson, 2006). Firstly, a firm has to be capable of transferring their intraorganizational knowledge (local knowledge) to interorganizational learnings through for example knowledge sharing (Jones & Macpherson, 2006). This can be done by presenting the logics and experiences of one company to another company in such a way that it creates a variance in that company's logics, which is followed by the use of their interorganizational exploration techniques to institutionalize the new knowledge (Schulz, 2008). However, the second requirement of the 'two-level game' is that the company receiving the interorganizational knowledge is able to create intraorganizational knowledge from this new knowledge (Holmqvist, 2004). Another word for this second requirement is 'absorptive capacity' (Peronard & Brix, 2019).

Absorptive capacity refers to the ability to *'recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends'* (Cohen & Levinthal, 1990, p. 128). Cohen and Levinthal (1990) suggest that in order to recognize the value of new external knowledge, a company needs to possess a basic understanding of the new knowledge. With basic understanding, it is meant that the firm possesses general understanding or techniques on which the new knowledge is based. This enables the firm to better assess and evaluate the value and importance of the new knowledge. Furthermore, what is also important, is that the new knowledge is diverse of nature, to enable creative utilization of the new external knowledge (Cohen & Levinthal, 1990).

When a firm possesses a basic and general understanding of the new external knowledge the next challenge is how to internalize this information. Here it is important that firms have processes to internalize tacit and firm-specific knowledge (Teece & Pisano, 1994). This is done through knowledge process systems, which are the controls, rules and procedures a firm has put into place to embed information into the organization (Aribi & Dupouët, 2016). Adding to that, Spender (1993) discovered that the internalizing of this knowledge is more effective when the two firms utilize similar knowledge process systems. This way, the documentation, sharing and processing of the new knowledge can be streamlined to increase effectiveness (Cohen & Levinthal, 1990; Spender, 1993).

After the internalization of new external knowledge, the newly assimilated knowledge needs to be used to the firms advantage, to its commercial benefit. The key for firms to counter

this aspect is to know 'why' the new knowledge is useful (Lane & Lubatkin, 1998). The more the firm and its partner have engaged in similar activities regarding the new knowledge, the more 'know-why' the firm has obtained, which assists them in using the knowledge to its commercial benefit (Cohen & Levinthal, 1990). Furthermore, over time, a firm establishes preferences for projects, its size, strategy, success factors, risk levels and other factors (Grant, 1988). This 'dominant knowledge' gives the firm a scope which helps identify where the new external knowledge can be best used to effectively commercialize it (Grant, 1988).

To summarise, when a firm possesses the 'know-what', 'know-how' and the 'know-why' of its core competencies, its absorptive capacity can be used to their advantage for effectively engaging in interorganizational learning resulting from *experiences* with other firms. What is important to note, interorganisational learning links cognition and action, since understanding guides action, but action also causes deeper understanding (Brown & Duguid, 1991). This leads back to the definition of organisational learning by Wang and Ahmed (2003), where *experiences* are the centre of learning. However, how an organisational deals with these experiences can either enforce or hinder learning, which emphasises the importance of not only knowing how learning occurs but also what influences its effectiveness (Schindler & Eppler, 2003).

2.6 Hindering and accelerating factors of (inter)organizational learning

Problems occur when experiences are not sufficiently captured, *'the systematic retention of … experiences enable a company to compare …. more systematically and document its most effective problem solving mechanics'* (Schindler & Eppler, 2003, p. 219). Furthermore, documentation of previous mishaps or other pitfalls can reduce the degree of failures that occur (Schindler & Eppler, 2003).

However, experiences are bound to (a group of) individuals that engaged in problem-solving activities, who are usually not part of the project's documentation which results in a lack of experiences transfer with other people (Argyris, 1999). Subsequently, employees part of the problem solving experiences are transferred or returned to their work stations after completing a project and with that their new learning experience (Kanter, 2013). These learning experiences are often only shared and transferred through informal information sharing which limits the degree of organisational learning (Schindler & Eppler, 2003). Consequently, when a project ends, the collective learning stops, where staff moves on the new projects or challenges and forget to reflect and retain their previous learnings as these learning might not apply to their new challenge. This is referred to as 'organizational amnesia', which is especially a big problem

in knowledge-intensive industries (Schindler & Eppler, 2003). There are four major elements that cause this amnesia: time, motivation, discipline and skills (Crosby, 2014; Schindler & Eppler, 2003; Sun & Ren, 2014). An elaboration based on these elements can be seen in Table 1, in the hindering factors of learning column. However, when debriefing of learning experiences does happen, often the useful information is not edited for reuse, meaning that learning can only takes place at the moment, rather than on the long term, for people who were not part of the debrief.

Table 1: Hindering and accelerating factors of organizational learning based on Argyris (1999); Dickens and Watkins (1999); Garvin, Edmondson, and Gino (2008); Schindler and Eppler (2003); Smith and Dodds (1997)

Hindering factors of learning	**Accelerating factors of learning**
High time pressure towards end of project	Discuss learning learnings throughout the project rather than at the end
Verbal communication not present by people involved in learning experiences because of fear of negative sanctions	Deploy external moderators during learning debriefs rather than the project manager to increase objectivity
Not willing to learn from mistakes	Graphically display learnings on a timeline
Not enough knowledge of debriefing methods to communicate learning experiences	Make use of process mapping, where mistakes and successful practices are pictures
Little to no enforcement of debriefing and documentation procedures in manuals	Ensure participation of all debrief participants
Lack of integration of experiences into project processes	Make learnings visible to all relevant employees
Members of project see no use of documenting experiences as they prefer to directly address the individual(s) involved in the learning experience	
Difficulties in organizing debriefings since people are already engaged in other projects	

On the other hand, there are also factors that can accelerate organisational learning (Argyris, 1999; Dickens & Watkins, 1999; Garvin et al., 2008; Schindler & Eppler, 2003; Smith & Dodds, 1997). After completion of project milestones, regularly discuss with the entire project team what the most important experiences (positive and negative) are instead of at the end of a project to entice continuous learning. In these debriefs, having an external moderator instead of the project's manager or another team member increases the objectivity of the learning. The lessons learned from debriefs are graphically pictured on a timeline on for example a poster format for all employees to see. This can for example be a process map with mistakes and

successful practices. Ensure that during the debrief all members are actively participating in iterative evaluation of the experiences while also creating commitment in the usage of these new learning experiences for future projects.

There are also factors that can both decrease and influence the effectiveness of learning. One of these factors is the use and embeddedness of 'dominant logic'. As explained previously in the interorganizational learning chapter of the thesis, dominant logic entails many variables that over time have found to be project preferences which sprung from previous successful projects (Grant, 1988). As mentioned earlier, dominant logic can be used to effectively commercialise new external knowledge, as it creates a scope for targeted commercialisation. However, Grant (1988) states that since the dominant logic takes a long time to form, it also takes a long time for this logic to be changed or replaced. This creates issues, as it creates organizational rigidity. When new projects and problems do not match the dominant logic, it is difficult to manage. Employees treat the dominant logic as something that is a rule of thumb, so the dominant logic is not easily changed, as it is deeply embedded in the firm (Prahalad & Bettis, 1986). When certain events then mismatch with the dominant logic, employees will not learn from these events, which hinders organisational learning (Cohen & Levinthal, 1990).

2.7 Relationship development history

Experiences are also a core construct in the development of buyer-supplier relationships (Carr & Pearson, 1999). According to Dwyer, Schurr, and Oh (1987), as long as the buyer and the supplier are engaged in a business relationship, both parties expect to see value in the cooperation. However, this cooperation can cause negative effects on performance and development. When too much pressure is placed on collaboration, this can result in supplying firms to feel forced, which damages the relationship (Heide & Stump, 1995). An example of this was when Japanese firms like Toyota were emphasising too much on collaboration, which resulted in bullying and collusion towards suppliers (Heide & Stump, 1995; Marksberry, 2012). However, through the right long-term relationship development this can be avoided (Han, Wilson, & Dant, 1993).

The evolutionary approach of a buyer-supplier relationship, also referred to as *'a cyclical interactive attraction process'*, is a process where a buyer and its suppliers constantly reward each other (Ellegaard, 2012, p. 1224). By rewarding each other over time, the attractiveness and perceived value of the relationship is maintained. This has a positive impact on the performance and development in the supply chain (Ellegaard, 2012).

Another approach to relationship development is the episodic model introduced by Hald (2012). This approach explains developments in buyer-supplier relationships through distinct steps that are guided by alignment of different processes or functions (Hald, 2012). Misalignment of processes can have a negative impact on the relationship and the performance of the supply chain (Hald, 2012). Furthermore, in the episodic approach, distinct good or bad events have a high impact on the perceived relationship value and on supply chain performance (Hald, 2012).

In this theoretical framework, literature was provided to depict the current state of literature regarding the research topic. The next section of this study will describe the research approach that was utilized to extend on the theoretical framework and answer the research question.

3. Methodology

3.1 Research design

This study follows the approach of 'intermediate research theory building', as there is drawn from previous research spanning across multiple research disciplines to proposed new theories or constructs (Edmondson & McManus, 2007). Furthermore, fitting the intermediate research building theory, this study both employs the search for process theories (how a phenomenom works), as well as variance theories (where X leads to an in-or-decrease of Y). In this study the process theories are sought around *how learning in an upstream lean integration develops*, whereas the variance theories that are sought for surround the accelrating and hindering factors of learning.

Fitting this design, an extreme-case-comparison within two supply chains in the healthcare sector was conducted to answer the research question. Comparative case studies, or in special, extreme-case-comparison technique fit intermediate research theory building, as high and low levels of a certain variable are observed to create generalisable theories (Edmondson & McManus, 2007). An example of the succesful use of extreme-case-comparison is displayed in Edmondson (1999), where contrasting high and low learning teams were observed to understand the difference in the team's performance. This study is similar, as high and low level of *lean adoption* organizations were analyzed to find out how different their upstream learning initiatives are, and what influences these processes. This will be discussed more in detail in section 3.2.

The most effective data gathering method paired with intermediate research theory building according to Edmondson and McManus (2007) is making use of both qualitative and quantitative methods, as when paired, these mixed methods increase the strength and validity of each other. To gather data for the extreme cases, thus a mix of qualitative (interviews) and quantitative (surveys) methods are used. With the use of both qualitative and quantitative research methods, a deeper understanding of certain concepts is fostered (Johnson, Onwuegbuzie, & Turner, 2007) This deeper understanding stems from the fact that different types of observations are gathered which creates more diverse and complete data utilization (Fetters, Curry, & Creswell, 2013). This also enables triangulation, which increases the external and construct validity of the research by combining the different perspectives originating from the data and analysis from the mixed methods (Denzin, 2012). This is important since objective reality does not exist in social sciences, hence triangulation is used to offer a different kind of objectivity, which enhances the validation of the research (Flick, 2007). Consequently, mixed-

method research also increases the strength of the practical and theoretical implcations, since research questions are answered more thoroughly and accurately (Venkatesh, Brown, & Bala, 2013). This complements and strengthens the very nature of the study, as a comparative case study was chosen rather than a single case study. A comparative case study creates more generalisable results compared to a single case study which also helps develop more accurate practical and theoretical implications (Caniato, Doran, Sousa, & Boer, 2018; Goodrick, 2020).

3.2 Sampling process and sample description

Non-probability sampling was used, in particular, theoretical sampling. This is a method where the data gathering process is continuously evolving to match the scope of the defined theoretical concepts (Breckenridge & Jones, 2009). By using theoretical sampling, it is thus easier to compare and link already existing theories to gathered data (Ligita, Harvey, Wicking, Nurjannah, & Francis, 2020).

Through theoretical sampling it was identified that to answer the research question more accurately, instead of selecting random cases involved in an upstream lean integration, extreme cases were selected. This was decided, since a bias might be present when randomly selecting supply networks engaged in upstream lean integration. When randomly selecting supply networks, the organizations that are more likely to participate are the advanced lean cases. This is because these organizations are more likely to be open to learning and improving. This results in a one-sided view of reality, decreasing this study's generalizability, as cases where an upstream lean integration has failed or is partially completed are less likely to participate. Hence it was decided to negate that bias by selecting extreme cases, to observe both sides of reality.

The determinant of '*extreme*' was the '*level of lean adoption'* because organizations that are more lean are more likely to be involved in active learning (Powell & Coughlan, 2020). This means that cases were selected not only on the basis of being involved in an upstream lean integration, but also on basis of their current level of lean adoption.

Cases were identified through connections of the researcher and the thesis supervisor. In the end, two cases were selected for this comparable case study. Each case consists of a supply chain encompassing one buyer and three tier one suppliers. In one case, a lean initiator from the buyer-side selected the three relevant suppliers for the study whereas in the other case it was a supply chain consultant. Both cases are located in the healthcare sector, but not in direct competition with each other. One case has a high level of lean adoption, while the other has a low level of lean adoption (these levels are verified through surveys, which is explained further

in section 3.4). Furthermore, both cases have been involved to some degree in an upstream lean integration.

In total, this study had 15 unique participants. There were only 2 participant that were not interviewed. The sample size for Case A is 8, where 3 participants were on the buyer side and 5 on the suppliers. For Case B the sample size is 7, where 4 participants were studied on the buyer side and 3 on the supplier side. These statistics are seen in table 2 below.

Table 2: Sample characteristics

Sample statistics	Case A	Case B
Total sample size	8	7
Sample size buyer	3	4
Sample size supplier	5	3
Not interviewed	1	1

As the participating organizations were selected by the buyers of each case, the sampling population of this study was limited. The participants were selected by the researcher with as only criteria that the participants had been involved in an upstream initiative. This selection was mainly realized through funneling, as the researcher was not able to perform a full analysis of the sampling population.

To avoid the bias of only selecting participants that were eager to participate, the participants were selected only on the basis of their involvement in an upstream initiative. This allowed the selection to be based on experiences rather than on characteristics.

Another bias that was avoided was the bias that exists in buyer-supplier relationships, were the relationship is described as ‘great’ as it is deemed desirable to do so. This bias was avoided by the research by staying as objective as possible, not casting any judgment towards answers. The researcher’s focus is not to find out what is *right* and what is *wrong*, but to find out *how* processes occur. This goal was made clear to every participant to ensure objectivity.

The last biases that was avoided was the bias that participants felt like participation was involuntary. When participants feel like they are participating because their upper-management requires them to do so, their answers might not reflect reality, as participation is not seen as serious. This bias was avoided by providing the participants with the opportunity to receive a summary of this study’s findings. This way, the researcher is able to provide something in return to the participants, in exchange for their participation. By providing value to the participants, they are more likely to provide an accurate picture of reality. In table 3 below, characteristics of all participants can be seen, apart from one participant.

Table 3: Interview participant sample characteristics

Participant	Interviewed	Case	Age	Gender	Education level	Work experience	Experience current company	Job function	Experience current function	Buyer-supplier contact
1	Yes	A	64	M	4 out of 5	50 years	10 years	Contract manager	4 years	5 years
2	No	A	54	M	5 out of 5	26 years	3 years	Supply chain consultant	3 years	1 year
3	Yes	A	46	F	3 out of 5	26 years	6 years	Contract manager	4 years	3 years
4	No	A	53	M	4 out of 5	35 years	7 years	Director	4 years	2 years
5	Yes	A	36	M	3 out of 5	20 years	20 years	Mechanic	5 years	2 years
6	Yes	A	40	M	3 out of 5	17 years	5 years	Team leader	5 years	5 years
7	Yes	A	42	M	4 out of 5	21 years	8 years	Contract manager	4 years	2 years
8	Yes	A	50	M	3 out of 5	35 years	6 years	Project leader	4 years	6 years
9	Yes	B	27	M	4 out of 5	8 years	4 years	Nurse	4 years	3 years
10	Yes	B	47	M	4 out of 5	23 years	8 years	Logistics employee	8 years	7 years
11	Yes	B	43	F	4 out of 5	15 years	6 years	Management assisten	2 years	5 years
12	Yes	B	57	M	5 out of 5	31 years	9 years	Accountmanager	2 years	2 years
13	Yes	B	41	M	4 out of 5	20 years	16 years	National accountmanager	3 years	7 years
14	Yes	B	45	M	4 out of 5	19 years	5 years	Sales and customer care	2 years	5 years

3.3 Qualitative data collection

In both cases interviews were performed. In Case A, 7 interviews were conducted, while in Case B, 6 interviews were performed. The duration of these interviews were roughly 1.5 hours. Thus, in each case, one to two interviews were held at the buyer, and one to two at each of the three selected suppliers. Before interviews were conducted in the cases, two pilot interviews were held to finetune the effectiveness of the interviews. These pilot interviews were held with acquaintances of the researcher, both possessing a background in business and continuous improvement. These test participants have been involved in supplier cooperation in their profession, to accurately practice the interview setup. Before the pilot interviews, an interview guide was already created. The pilot interviews finetuned this semi-structured interview guide, which can be seen in appendix A.

The interviews were semi-structured since many learning activities are case specific (Marsick & Watkins, 2003). Even more so, most of the question listed in the interview guide were created as reminders rather than real questions that were asked in every interview. This was because the interviews were done using the critical incident technique (CIT) created by Flanagan (1954). To uncover how learning and collaboration occurs in a supply chain the data collection method has to be tailored to specific 'learning/collaboration' situations, which is why the CIT was selected. Using the CIT there is not a specific set of questions and rules for the data collection, it is a flexible process modified to specific situations (Butterfield, Borgen,

Amundson, & Maglio, 2005). Hence, in this study there was only one main question that was asked in every interview (apart from introductory questions):

Can you recall an important event during the collaboration with your partner (buyer/suppliers)?

This question meant to start the conversation with the interview participants about '*critical incidents'*. The CIT centers on key moments (positive and/or negative) in the eyes of the respondent to explore people's key behaviors and observations during these important events (Bott & Tourish, 2016). In this study the critical incidents are moments were learning takes place between buyer and supplier during an upstream lean integration. However, the main question of the interviews is not framed around learning activities to counter '*confirmation bias'*. The confirmation bias in interviews is: *'the postulation that individuals prefer messages that align pre-existing attitudes over those messages that challenge them'* (Knobloch-Westerwick, Mothes, & Polavin, 2020, p. 2). This is relevant in this study since if interview participants are asked to describe important events where learning occurred during buyer-supplier collaboration, the interviewees are likely to only give examples where perfect learning occurred as that would seem the 'right' answer. This would make the study less reliable as it does not paint a clear and accurate picture of reality. Hence, instead of asking for learning activities as critical incidents, we asked about key moments in the collaboration between buyer and supplier. This way the interviewer could steer the interview to unravel learning activities from the collaboration events between buyer and supplier. This gives the opportunity for the researcher to not only analyse activities during collaboration where learning *does* occurs, but also identify collaboration activities where learning does *not* occur.

However, it is not only important to make sure biases have limited effects on the CIT. To test the trustworthiness and credibility of the CIT certain checks can be conducted (Butterfield et al., 2005). One of these checks of the CIT is the use of triangulation (Skiba, 1999), which is one of the reasons that besides qualitative data, also quantitative data is gathered in this study.

3.4 Quantitative data collection

Collecting quantitative data was done through conducting surveys. Five variables were identified based on the literature and were measured via the survey, namely, '*learning culture'*, '*lean adoption culture*', '*organizational performance improvement'*, '*buyer-supplier relationship quality'* and *'interorganizational learning and absorptive capacity*'. All

participants in the study were Dutch, so all validated scales were translated and verified using the back-translation method (Brislin & Freimanis, 2001), see Appendix B. All variables followed a 5-point Likert scale ranging from 1: '*strongly disagree'*, to 5: '*strongly agree*'. A 6th answer option was added to the Likert Scale to provide participants the option to abstain from answering. The full list of questions used in the online survey can be found in Appendix C.

'*Learning culture'* was measured by five items on a 5-point Likert scale based on Camuffo and Gerli (2018); Marsick and Watkins (2003); Naqshbandi and Tabche (2018); Pantouvakis and Bouranta (2017); Shao, Feng, and Hu (2017). An example item of this questionnaire is *'My organization recognizes/rewards people for learning and taking initiatives'*. The Cronbach's Alpha of this variable was 0.85, which displays good internal consistency of the measure since it ranges between 0.8 and 0.9.

'*Lean adoption culture'* was measured by eleven items on a 5-point Likert scale based on Santos and Tontini (2018). '*In my organization, visual management using simple visual indicators, both for inspection and for tracking results, to help people identify the occurrence of problems are deployed'* is an example item of this questionnaire. The Cronbach's Alpha of this variable was 0.89. This indicates good internal consistency as it ranges between 0.8 and 0.9.

Another 5-point Likert scale was used to measure *'organizational performance improvement'*, based on Huang and Li (2017); Marsick and Watkins (2003); Prieto and Revilla (2006); Shanker, Bhanugopan, van der Heijden, and Farrell (2017). One example item belonging to this set of questions is: *'In my organization, profit is greater than last year'*. This variable consisted of five items. Cronbach's Alpha was 0.76 for this variable, indicating that the internal consistency of this variable is acceptable as it ranges between 0.7 and 0.8.

Lastly, *'buyer-supplier relationship quality'* and *'interorganizational learning and absorptive capacity'* were measured on a 5-point Likert scale based on Bruneel, Yli-Renko, and Clarysse (2010); Fang and Zou (2010); Fredrich, Bouncken, and Kraus (2019); Li, Humphreys, Yeung, and Cheng (2012); Liu, Li, and Zhang (2010); Yang, Wong, Lai, and Ntoko (2009). An example item for '*buyer-supplier relationship quality'* is: '*I believe that renewal of agreements in this relationship will occur'*, and '*Our company has acquired new or important information from this partner Our company has acquired new or important information from this partner'* is an example item of the questions for the variable '*interorganizational learning and absorptive capacity'*. In total there were twelve items used to measure this two items. However, the first item for *'buyer-supplier relationship quality'*

was removed as almost all participants filled in a 6, indicating that this question was not answerable by most. The Cronbach's Alpha of *'buyer-supplier relationship quality'* indicated that the variable had an acceptable internal consistency, as it ranged between 0.7 and 0.8, scoring a 0.76. This indication of internal consistency was the same for *interorganizational learning and absorptive capacity'*, as the Cronbach's Alpha was a 0.71.

In addition to the five main variables, there were also questions relating participants' demographics which can be seen in Appendix D. We asked about the name of their company, how long their work experience is, how long they have been working at their current company, how long they have been working at their current job function, how long their company has been working with lean or continuous working practices, how long they have been in contact with their partner, how old they are, what their gender is and lastly, what their highest form of education is.

The surveys were sent as an online form to all interviewees, as well as to employees of the buyers and suppliers that were not interviewed.

3.5 Data analysis

The analysis of the interviews is inductive of nature, as its goal is to create a theory where no theory is yet present with the use of empirical data (Eisenhardt, 1989; Ketokivi & Choi, 2014). Before analysis the interview data was transcribed and coded following Gioia, Corley, and Hamilton (2012)'s inductive coding approach. This approach starts with creating *'1st order concepts'* out of the interview transcription. Similar 1st order concepts are then categorized in so-called *'2nd order concepts'*. Lastly, similar or relating 2nd order concepts are grouped together in '*aggregate dimensions'*. To create a clear and structured overview of this process, a data structure was created, similar to Corley and Gioia (2004). This data structure can be found in Appendix E.

The surveys are analyzed through the use of simple statistics, Cronbach's Alpha and means per case. All participants were involved in a collaboration within their supply chain, indicating that their scores are all of equal weight. However, across departments, certain measured variables can be different, as some departments might have a higher level of lean adoption than others. Even though this is the case, means per case is still used to provide a picture of the organization's level of lean, as the average level of lean adoption across all departments for example gives an accurate level of lean for the entire organization.

As mentioned before, the survey data will be used to triangulate the findings of the interview-based data analysis. Important to note is that the variable '*Lean adoption culture'* will

be used to check the nature of the '*extreme*' comparable case analysis. Furthermore, since the sample size of the surveys are relatively small, this will be taken into account when using the survey data to arrive to conclusions.

Both cases will thus be first internally analyzed resulting in the of two separate case narratives. These two narratives will be cross-examined followed by verification through quantitative data to further analyze and validate the two narratives. The qualitative interview data is used as the basis, from which it is verified by the quantitative survey scores. If from the interview emerges that a certain organization is very mature in lean and learning, this is verified by the level of lean adoption in the surveys. Cases that exhibit higher levels of lean and learning from the interviews, are expected to pair with higher levels in the surveys. Furthermore, when looking at the relationship and interorganizational learning characteristics between the organizations, there is not only looked at the levels described in the interviews and in the surveys, but also whether the perception of these levels is similar between the organizations. When organization A perceives their relationship with organization B as very good, with a score of 4, but organization B describes the relationship as mediocre and a 3, conclusions can also be derived.

This thus creates the opportunity to use triangulation to compare emerging patterns among all gathered data resulting in possible accurate theoretical and practical implications (Barratt, Choi, & Li, 2010).

4. Results

In the results section of this paper first the two case studies will be separately analyzed after which they will be cross-analyzed.

4.1 Case A

4.1.1 Introduction

The buyer in case A was a healthcare provider for a specific group of clients. The three studied suppliers of that buyer were a construction maintenance supplier (supplier 1), a digital access/security supplier (supplier 2) and an electrical supplier (supplier 3). Supplier 1 is the supplier that the buyer has been in business with the longest, whereas supplier 2 and 3 have been more recently selected suppliers. Because of this there is long-term focus between supplier 1 and the buyer, but a more short-term focus with supplier 2 and 3. Indeed, supplier 1 enjoys the benefits from their longer relationship with the buyer*: 'We know who to contact when, which decreases time to come to decisions'*. However, since supplier 2 and 3 are not in business with the buyer as long, it does not mean the effects that supplier 1 enjoys will not be present in the future. As noted by supplier 3: *'Business relationship is still in its infancy but it does feel like both parties are ready to improve processes and the relationship'* .

Table 5 on the next page shows common themes seen across interviews, coded in a data structure. The 1st order concepts were created from the raw interview data.

This case is characterized by the buyer showing a low level of lean adoption. The survey showed that the buyer scores a 2.7 out of 5 for 'level of lean adoption'. Interestingly, the 3 suppliers do have a higher score of lean adoption (4, 4.4 and 4.4), even though during the interviews the suppliers mentioned that they did not use the lean methodology.

The results of that variable alongside the other measured variables in the surveys can be seen in Table 4 below. What can be seen in this table are the measured variables and their mean outcomes per measured company.

Table 4: Case A survey results

Variables	Supplier 1	Supplier 2	Supplier 3	Buyer
Learning culture	4	4,4	4,4	2,7
Lean adoption culture	4	4,3	4,3	2,7
Organizational performance improvement	3,8	3,4	3,1	2,9
Relationship quality (**buyer** perspective)	4,7	4,3	4,4	
Relationship quality with buyer (**supplier** perspective)	4,5	4,3	4,3	
Interorganizational learning and absorptive capacity (**buyer** perspective)	4,1	4	3,9	
Interorganizational learning and absorptive capacity (**supplier** perspective)	3,9	3,5	3,6	

Table 5: In-depth data structure

1st order concepts	**2nd order concepts**	**Aggregate dimensions**
Relationship duration	Buyer-supplier relationship history	Buyer-supplier relationship characteristics
Change in importance of supplier		
Time horizon	Scope of relationship	
Customer/supplier importance		
Frequent irregular contact	Before the change of collaboration style	Upstream collaboration oriented supply chain initiative
Tailored collaboration not present		
Switch of collaboration style	Collaboration-oriented supply chain vision	
Goal of collaboration		
Buyer-supplier relationship dynamics		
Upstream collaboration implementation strategy	Upstream collaboration implementation	
Transitory phase		
Upstream collaboration implementation status		
Contract duration and renewal	Contractual arrangements	
Code of conduct		
Creating change awareness difficulty	Changing to collaboration oriented supply chain difficulties	
Short-term mindset		
Trouble with handing over responsibility		
Broadening focus on all suppliers	Future desires for upstream collaboration	
Origin of collaboration idea	Collaboration-oriented support	Upper-management ideology
Awareness of need to change		
Supportive upper-management		
Critical thinking by upper-management		
Aligned values and thoughts		
Number of contract managers	Mismatch expectations and reality	
High ambitions		
‘Cheap’ short-term investments	Lack of long term focus	
‘Just happens’	Attitude	Learning
Mixed results		
Downstream learning		
Two-way street		
Intra-organizational		
Desire		

Continuous improvement	Learning culture	
Flexible when it comes to change		
Lean training	Lean	
Process mapping		
Process improvements		
Increases motivation		
Continuous improvement		
Alignment across the supply chain		
Reducing waste		
Agenda input	Meeting documentation	
Agenda responsibility		
Notes responsibility		
Sharing of meeting outcomes		
Meetings	Buyer-supplier contact	
Intensity		
'Autonomous system'		
Supplier feedback sessions	Supplier satisfaction tracking	
Nature of tracking		
Awareness of supplier's capabilities	Absorptive capacity	Interorganizational learning
Assimilating and commercializing buyer's needs		
Tailoring processes		
Delays in ordering	Over-standardization	Hindering factors of learning
No tailored processes despite lean background	Low level of tailoring processes	
Recipients of feedback	Lack of sharing of discussion outcomes	
Lack of providing feedback		
Shift of relationship focus	Buyer-supplier collaboration priorities	
Lower buyer-supplier meeting frequency		
Different supply chain visions	Multiple supply chain visions	
Lack of vision communication		
Lack of features	Shortcomings of IT systems	
Outdated		
Buyer-supplier integration		
Logistical issues	Consequence of IT systems shortcomings	
Miscommunication		
Lack of information		
Lack of capabilities	Reason of IT shortcomings	
Lack of communication	Communication healthcare and supplier	
Bad communication		
Limited capacity for full scale collaboration	Narrow collaboration scope	
Time consuming	Bureaucracy	
Flexibility		
Right person to contact		
Frustration		
Thoroughness	Bureaucracy	Accelerating factors of learning
Motivation		
Gathering of perspectives	Meeting preparation	
Previous meetings input		
Improved communication	IT systems as facilitator operations	
Provides overview		
Standardization		

Fostering innovation		
Data		
Reduced supplier count	Supplier variation reduction	
Results from variation reduction		
Meeting spot at buyer	Informal communication	
'Water cooler chats'		
Informal communication	Communication between healthcare department and supply chain	
Formal communication		
Middlemen between buyer and supplier	Buyer-supplier communication facilitator	
Match of expertise		
Friendliness	Atmosphere	
Openness		
Trust		
Reduction in size of cross-functional teams	Cross-functional teams	
Ownership of improvement		
Visiting other clinics	Gathering perspectives	
Flat organization	Organizational structure	
Size of organization		

4.1.2 Relationship quality

As shown in Table 4, the relationship between the buyer and supplier 1 shows the highest quality, and both buyer and supplier 1 score relatively consistent (4.7 and 4.5). This supports the findings from the interviews, where buyer 1 stated: *'Since we have been working a long time with supplier 1, the level of collaboration is very high compared to our other suppliers. This is the result of our solid relationship.'* The duration that the buyer has been in business with supplier 2 and 3 is relatively the same (around 2-2.5 years), which is resembled by the fact that they have similar relationship quality scores. Both suppliers had the same amount of time to develop a relationship with the buyer.

The atmosphere between the buyer and its supplier is described as friendly, especially between supplier 1 and the buyer, also indicated by the higher relationship scores from the survey. The buyer states, *'we see each other so many times that we have become friends'*. Followed by supplier 1 stating, *'there is a collegial vibe with our contract managers and that of the buyer'. 'When a backlog of tasks is present a simple phone call to buyer creates understanding',* added by supplier 1. Supplier 2 and 3 did not mention such an atmosphere, also seen in the lower relationship scores from the surveys. Supplier 1 and the buyer also describe the atmosphere as full of trust and openness. The buyer states that *'we can say everything we want to supplier 1'*, followed by buyer 1 stating that there indeed is '*very open communication'*. Supplier 1 also described their experiences with the buyer as having a high level of trust, stating, *'we feel that we and the buyer are 'as one''.* Supplier 2 confirms the trustworthiness supplier 1

and the buyer are experiencing by stating, '*time was needed to get to know each other, which created trust'.*

4.1.3 Interorganizational learning and absorptive capacity

Interorganizational learning and absorptive capacity scores are lower than the relationship quality scores, seen in Table 4. The highest scores, 4.1 and 3.9 are found between the buyer and supplier 1, and the lowest scores can be found between the buyer and supplier 2 and 3, with 3.5 and 3.6. These lower scores can be linked to the attitude towards learning that was found in the interviews. Learning is found to 'just happen' As noted by supplier 2: *'learning happens many times on the job, but it is hard to describe how and when we actually learn'*. Adding to that, supplier 1 stated that *'learning happens when surprises happen'*, which emphasises that learning is not planned.

Another factor found in the interviews that can influence the lower scores is the fact that supplier 2 and 3 have found learning to be more downstream focussed. *'The buyer learns more from us than we learn from the buyer. We do not interfere and do not need to know about the healthcare side of the buyer'* was said by supplier 2, explaining that learning does happen, but it is more one-sided. Supplier 3 adds to that by explaining: *'The buyer learns from us to find better solutions (more efficient light switches, automatic light switches)'*. However, supplier 1 and 2 have the desire to change this, as *'learning from the buyer is something that does not happen enough. It can help us streamline and improve processes'*. Adding to this, supplier 2 has seen that knowing about the healthcare side of the buyer can actually help them develop or suggest better products, *'clients that have bad sight need different light fixtures. Some even need vibrating devices rather than light. Also, some clients at the buyer are more sensitive for certain types of light'*. The fact that downstream learning happens more than upstream learning can explain the fact that the scores are lower, ranging from 3.5 to 4.1. And because suppliers do not learn from the buyer, the absorptive capacity is lower, as there is nothing to absorb. However, this does demonstrate that the desire for an increase in upstream learning is present, but begs the question, why does it not happen more often?

4.1.4 Upstream collaboration oriented supply chain initiative

Since the buyer in case A is not proficient with the lean methodology, they cannot engage in an upstream lean integration. However, a few years ago, the buyer started to aim for an upstream collaboration integration, changing the philosophy for its supply chain from performance-based to result-based. The goal of this switch was to *'create as much value as possible for the clients*

with X amount of money'. One of the reasons for this switch was, as stated by supplier 1, *'that communication with the right people took time and was difficult. Now there are procedures between suppliers to speed this up'*.

The philosophy was first rolled out to a couple of suppliers to see if it led to favourable results. There are gains that can be derived from this collaboration-oriented philosophy, like swifter communication and decision making, but the change is not yet complete. *'There is difficulty with convincing employees that the switch to result-based is vital'* the buyer stated, followed by *'awareness of collaboration importance is difficult to achieve'*. Adding to that, there still seems to be some trouble at the buyer with handing responsibility of processes and tasks over to suppliers. *'If there is a problem the supplier needs to fix it since they have the knowledge'*. However, *'when requests come through the IT system, many employees of the buyer still want to first try and fix the problem themselves even though they should work together with the suppliers since they have the capabilities'*. This showcases the troubles the buyer has with the implementation of a more collaboration-oriented supply chain. This mainly comes down to the fact that *'employees are stuck in an old way of working/thinking'* and '*lack a long-term focus',* according to the buyer.

4.1.5 Upper-management ideology

The upper-management of the buyer had initiated the collaboration oriented change, however '*there is not enough support from upper-management',* the buyer stated. There also seems to be a mismatch in expectations of how to undergo the integration, as an employee of the buyer stated, 'our *directors expected to reduce the number of supplier contract managers when switching to more collaboration-oriented. In reality, this number has actually drastically increased'.* This is contradicting, as a collaboration initiative is wanted, but with less people to facilitate the growth in collaboration. This can indicate that the upper-management might have been out for quick wins derived from collaboration. If the level of collaboration is at a sufficient level fast, then less contract managers are needed to manage the collaboration over time. This part of upper-management philosophy seems to stem from cost saving. Related to that the buyer stated, '*it occurs that top management of the buyer would rather invest in cheaper equipment rather than expensive equipment even though the more expensive equipment would be cheaper on the long term'*. This confirms the buyer's short-term cost saving philosophy. The mismatch in expectations between organizational layers at the buyer might be the foundation of why the change has not yet been successful.

In the supply chain department at the buyer for example there is also a mismatch around their philosophies, '*buyer-supplier collaboration visions are different per commodity'*. Adding to that, *'contract managers want to manage their commodity their own way'*. This creates an environment where, '*there is not talked much about collaboration philosophies among different contract managers in different commodities because their own ways are working just fine'*. This emphasizes what was stated earlier, '*employees are stuck in their own and old way of thinking'.* This creates an environment where it is difficult to facilitate learning *intra*-company, resulting from the lack of communication. Adding to that, if would be even more difficult to foster *inter*-company learning and collaboration. To roll out a successful supply chain integration, first the buyer's own company needs to be aligned.

This is also seen in the way meeting outcomes are communicated at the buyer. *'Only employees that raised agenda points for meetings should be giving feedback on outcomes/documentation'*, stated by the buyer. This seems sensible, as delicate information cannot be shared to the whole company, especially not in a the health care sector. However, stated by a supply chain employee of the buyer, *'reports made from meetings are mostly shared with directors and are not always shared with other departments while they in fact should have'*. Adding to that, an employee of the buyer stated, '*upper-management sometimes does not provide feedback and thoughts back to the tactical level'*. This further hinders the buyer's organizational learning as there is a lack of interdepartmental communication. This adds to the previously described intra-department lack of communication.

4.1.6 Formal and informal communication

Inter-organizational communication, between the buyer and its supplier happens either formal or informally. Formal communication is mostly through buyer-supplier meetings, the IT system, on-site meetings, through middlemen and supplier feedback sessions. Every quartile contract managers meet with suppliers. The buyer stated: *'Prior to buyer-supplier meetings, preparation is done by talking with relevant employees that have raised agenda points'*. During the meetings not only current issues and topics are discussed, but *'meeting notes from last meetings are reviewed'* as well. This ensures that previously discussed topics are taken care of. These meetings are conducted in a structured fashion, initiated by the buyer. This structure dictates that the supplier is responsible for the creation of the agenda, as well as *'taking notes during meetings and processing them following our documentation format'*, stated by the buyer. Furthermore, *'together with the buyer we provide points for discussion for meetings'*, as stated by supplier 2.

The IT-system is also a big source of formal communication between the buyer and its suppliers. *'The IT system is in place to facilitate communication across the supply chain'*, stated by the buyer. This feeling is also shared by supplier 1, stating, *'through the use of IT we can communicate easier with the buyer'.* Communicating maintenance requests to the supplier is also done via the IT-system, *'all our maintenance orders come in via the IT system'*, and *'through the IT service-point, issues are communicated to us'*, which was said by supplier 2. The IT-system also creates standardization, as the buyer explains, '*the IT system offers standardized options for employees of both buyer and suppliers to report problems'*. Furthermore, it also provides valuable data for the supplier. Supplier 2 states, '*the buyer's door locks are always monitored using 40 indicators, which are shared three times a year. From this preventive maintenance can be planned and executed'.*

However, there are some shortcomings of the IT-system, as the system has a lack of features. The buyer states, *'keywords to report problems are not enough to overcome common reporting issues'.* The buyer also receives the occasional feedback from its suppliers that the IT-system is outdated, '*which creates problems for them'*. This is also the results of a lack of integration with the supplier's ERP system, as supplier 3 stated, 'we *have our own ERP system, which is normally integrated with customers before we start working with them. But with the buyer this was not the case, this is still an ongoing process'*. Because of these shortcoming, logistical issues arose. The buyer explains, *'suppliers sometimes visit our site unnecessarily which could have been prevented'*. This happens because of poor key-word usages through the IT-system. Consequently, it creates miscommunication between buyer and supplier because of the lack of information. The buyer is aware of the shortcomings of the IT-system, but cannot decrease these shortcomings at the moment, as '*we have a lack of skill and time present to improve and create wanted features to IT system'*.

Formal communication on-site is kept at a minimum, which is explained by supplier 2, '*we mostly work alone at the buyer. The only contact is when they have to let people at the site know that we are coming to create minimal annoyance for the buyer's healthcare clients'*. While this makes sense, there is still some criticism to this by the suppliers. They would like more communication between the healthcare side of the buyer and their technical staff. Supplier 1 states, '*our project managers have no direct connection to the healthcare side of the buyer, apart from informal communication'*. Supplier 2 adds, *'there are no scheduled meetings (once a week for example), between us and the healthcare staff of the buyer'.* Supplier 3 also experiences the same, *'we and the buyer's healthcare department are only in contact with each other when problems arise (contact through IT system), and not periodically, let's say, every*

other week'. Supplier 2 adds, *'things that go well are not discussed'*. This adds to the fact that upstream learning does not happen, as there is little to no connection between the healthcare department of the buyer and the technicians of the suppliers to foster learning. Which again, is something that the suppliers like to improve, as stated before by supplier 1, *'learning from the buyer is something that does not happen enough. It can help us streamline and improve processes'*. Even more so, supplier 1 experiences that there also is bad communication between the healthcare department at the buyer, and the buyer's own technicians and supervisors. They stated, *'this is typical of the buyer, the communication and connection between healthcare staff and their own project supervisors is bad'* . This relates back to the fact that to have great communication and collaboration throughout the supply chain, first internal communication and collaboration needs to be perfected.

To facilitate better communication between buyer, and its supplier, middlemen were created. Supplier 1 states, *'The middleman is an employee at the buyer's site with technical knowledge'*. Adding to that, supplier 1 states, *'the middleman takes care of problems on parks as a first check'*, followed by, *'the middleman does not fix the problems himself, but links them to relevant stakeholders'*. This middleman can thus prevent many problems that would otherwise occur, ranging from key-word reporting issues through the IT-system, to other communication problems. Supplier 1 is also thinking of, *'employing a full time project manager at the buyer for smoother and closer collaboration. This way if the buyer has certain issues or questions, there is always a person they can ask, which is this manager'*. However, this is still work in progress. Yet, this still leaves the problem of the communication between the healthcare department of the buyer, and the technical employees of the suppliers, because the beforementioned project manager will facilitate downstream communication.

The last form of formal communication is the supplier feedback sessions, or so-called 'tips and tops sessions'. Supplier 1 stated, *'tip and tops session helped them get feedback about their services and their newly hired staff and their capabilities'*. However, as supplier 2 stated, *'before the Covid-19 pandemic, supplier feedback sessions were held but are now put on halt'.* Supplier feedback is now measured, *'between the lines, and not explicitly'*, stated by the buyer. Adding to that, the Covid-19 pandemic has also changed the priorities when it comes to supplier collaboration efforts, as the buyer stated, '*resulting from the Covid-19 pandemic a focus is laid more on core supplier operations rather than on buyer-supplier collaboration efforts'*. Which also influences the formal buyer-supplier meeting frequency as stated by the buyer, '*quarterly buyer-supplier meetings frequency has slowed down as result of the pandemic'.*

Something that has also slowed down resulting from the Covid-19 pandemic, is the amount of *informal* communication that occurs between buyer and supplier. There is a *'meeting spot on our site where employees of suppliers meet, which is separate from buyer's employees because certain information is not allowed to be shared among groups'* according to the buyer. This facilitates communication among suppliers, but not with the buyer. So-called 'watercooler chats' also occur, but this is also mostly between employees of the various suppliers. Supplier 2 stated, *'our workers have brief talks with each other when they meet other supplier's workers when working on buyer's site'*. Informal chats with buyer's clients or healthcare workers are rare, but does occur from time to time, as supplier 3 states, *'on the job we sometimes run into healthcare workers, but we rarely stop to chat'*.

4.1.7 Bureaucracy

The fact that these informal talks are not very likely to happen is caused by the fact that the buyer is a very large company. This makes it more difficult to run into each other. This creates problems for the suppliers, as supplier 3 states, *'it is difficult to find the right person to contact because it is such a large bureaucratic company'*. Supplier 3 also adds, *'because of the many procedures and people involved in communication, including on the IT system, it is difficult to find the right person to speak to'*. Supplier 2 experiences something similar, *'sometimes because it is difficult to talk to the right person it feels a bit political'.* The large bureaucratic nature of the buyer also creates frustration, '*many tasks need to be documented, which takes a lot of time'*. Supplier 2 also states, *'there are times when if something goes wrong, either on the buyer or supplier side, a large amount of paperwork has to be redone'*. Supplier 2 also describes the bureaucracy to be very time-consuming, 'w*hen a problem is reported, we first need to visit the site to check on the problem after which an order number is created. Then another time we visit to solve to the reported problem'*. Supplier 3 also adds that the bureaucracy decreases the flexibility of the buyer, '*because the buyer is such a big company they are less flexible when it comes to change, especially if the change need comes from the supplier. There are just too many organizational rules and procedures in place'.*

However, employees of supplier 2 also experience the bureaucratic nature of the buyer as accelerating factors to their learning, stating, *'when everything is written down, it can possibly be analysed and learned from more since every little tasks is documented'*. This has a motivating effect, as supplier 2 states, *'it keeps the job fun and challenging'*. Interestingly, supplier 1 and the buyer did not mention the bureaucratic nature of the buyer. This is perhaps

because of the fact that they have been in business together for a long time, thus they ‘got used to it’.

This bureaucracy, low flexibility and lack of communication might be the cause the of the low level of learning and lean adoption culture at the buyer. Low support from upper-management might increase this inflexibility, as there is not a strong force pushing for change.

4.1.8 Organizational performance improvement

The three suppliers have higher learning and lean adoption culture scores than the buyer, which is evident in their drive to learn and improve. Seen in the organisational performance improvement scores in the surveys, the buyer also scores the lowest with a 2.9 (Table 2), while supplier 1 has the highest score, with a 3.8. This is in line with the expectations from the interviews. Important to note is that the organizational performance of the suppliers depends on more variables than researched in the interviews and surveys, as the buyer was central in this study. The organizational performance improvement of the suppliers seems to be higher when looking at the interviews and surveys, but in reality this could thus also be lower.

4.1.9 Summary of Case A

Case A is characterised by a low level of lean adoption and learning culture at the buyer’s side, and a higher level of lean adoption at the suppliers side. Resulting from the low adoption scores at the buyer, the scores for interorganizational learning and absorptive capacity are low. Relationship quality is the highest for supplier 1 and the buyer, which is explained by their longstanding business relationship. Supplier 2 and 3 and the buyer have a lower relationship score. The atmosphere between the buyer and its suppliers is seen as friendly, open and full of trust. However, organizational performance change is still on the lower side for all companies.

It seems that downstream learning is the main source of learning in Case A’s supply chain. The buyer learns more from its suppliers than the suppliers learn from the buyer. The suppliers would like that to change, as many potential benefits are seen. An upstream collaboration-oriented supply chain initiative has been initiated by the buyer, but has not been successful. This stems from the buyer’s upper-management not providing enough support and seem to be after cost-savings rather than actually improving collaboration. Furthermore, the buyer’s employees seem to be stuck in an old way of thinking, which clashes with the newly introduced initiative.

Communication across the supply chain is done through various channels. One of these channels is via the IT-system, which causes many logistical and communication problems.

However, the buyer is unable to fix these issues as there is a lack of technical depth. Buyer-supplier meetings have slowed down due to the Covid-19 pandemic. Furthermore, on-site communication has always been at a minimum originating from patient privacy reasons. However, the suppliers would still like more communication between the healthcare department of the buyer and their technical staff, as the lack of this sort of communication is causing issues. This is slowly being improved by special project managers and on site middlemen.

The bureaucratic nature of the buyer is experienced as frustrating, time-consuming, making it difficult to contact the right person at the right time and decreasing the flexibility of the buyer to change. However, it is also seen as a source of motivation and facilitator of thoroughness. All in all, the low flexibility resulting from the bureaucratic nature of the buyer might be one of the causes of a low level of learning and lean.

4.2 Case B

4.2.1 Introduction

The buyer in Case B is a healthcare provider for a specific type of patients. It is a small healthcare clinic, with a flat organizational structure with few levels of hierarchy. Supplier 1 is a food supplier, supplier 2 is a laundry and garments supplier and lastly, supplier 3 is a medical disposables supplier. The three suppliers have all been in business with the buyer for a very long time, as stated by the buyer, *'we have been in business with the three suppliers for a long time'*, followed by *'we have been in business with supplier 2 for 20 years already'*. How long the other business relationship have been exactly is not known. However, all parties mentioned that they have been in business with each other for a long time. Supplier 3 stated for example, *'we have been working with the buyer for a very long time. This is logical as there are high entry costs'*. This was also mentioned by supplier 2, '*the fact that we have been working a long time with the buyer can be explained by the high entry costs in our industry. A long term focus on relationships is typical'*.

Not only do entry costs explain the long duration of the relationships, as the buyer states, *'we carefully select our suppliers based on our values'*. Followed by, *'the three suppliers are total suppliers for our specific needs, they are very important to us'*.

Longer lasting business relationships also come with benefits, as supplier 1 states, *'since we have been working together for such a long time it is easy to find the right person to talk to. This creates easier and faster decision-making'*. Supplier 2 also experiences benefits, *'since we*

have been through many process-changes together we know exactly what we do and how we like to do it'.

Table 5 above and Appendix E show all common themes seen across interviews, coded in a data structure. The 1st order concepts were created from raw interview data.

This case is characterized by a high level of lean adoption. This can be seen in table 6 below. The buyer scores a 4.2 out of 5 for their lean adoption. The three suppliers also score relatively high on this category, ranging from a 3.6 to a 4.4.

Table 6: Case B survey results

Variables	Supplier 1	Supplier 2	Supplier 3	Buyer
Learning culture	3,8	4,6	4,4	4,1
Lean adoption culture	3,6	4,4	4,4	4,2
Organizational performance change	3,6	3	3,2	3,6
Relationship quality (**buyer** perspective)	4,4	4	4,4	
Relationship quality with buyer (**supplier** perspective)	4,7	3,8	4,2	
Interorganizational learning and absorptive capacity (**buyer** perspective)	4,2	4,3	3,6	
Interorganizational learning and absorptive capacity (**supplier** perspective)	4,3	4,2	3,8	

4.2.2 Learning and lean adoption culture

Seen in Table 6, the scores for learning culture range from 3.8 to 4.6 with the buyer having a score of 4.1. The buyer experiences that their learning culture contributes to an environment where there is constantly looked for improvement, *'in our organization we are constantly stimulated to look at ourselves to increase our effectiveness*'. Adding to that, the buyer believes that looking at only themselves is not sufficient, as *'we need to keep challenging each other, which keeps us sharp. That is what fosters continuous improvement'*. Additionally, the buyer also believes that their learning culture fosters flexibility when it comes to change, *'there is an atmosphere where it is easy to implement a change as we are very eager to learn and improve'*.

The buyer has also implemented cross-functional teams, which increases the speed at which learning happens. The key to this according to the buyer is to reduce the size of the teams, *'these teams are made smaller and smaller and are given more responsibility, This way learning happens faster while they are doing more and more'*. This creates ownership of improvement, as the team members are responsible for each other's tasks. The buyer states, *'because employees in these cross-functional teams are responsible for each other's tasks, their ownership of improvement increased their learning'*. These small cross-functional teams have attributed to a more effective learning culture.

Interestingly, the three suppliers do not mention anything specific about their learning culture. However, they do exhibit high levels of learning culture, with supplier 2 and 3 scoring the highest with a 4.6 and 4.4 respectively. Supplier 1 scores the lowest, with a 3.8. These scores can be explained by the lean adoption scores however. Supplier 2 and 3 also exert the highest scores in that category, scoring both a 4.4. Supplier 1 scores the lowest with a 3.6 and the buyer scores a little higher, with a 4.1. The buyer explains that *'starting employees on most of our organizational layers receive a lean training*'. Supplier 2 also makes use of lean training as, '*many of our employees receive lean training. Especially employees involved with logistics'*. Supplier 3 adds to this by saying, '*15 people in my team have a green belt or higher'*, resulting from the fact that '*since 3 years we have been actively schooling our organization in the lean methodology'*. Supplier 1 did not mention any lean training being done in their organization. This could be the cause of their lower score in lean adoption and the lower scores in learning culture.

However, supplier 1 does mention that they employ the lean methodology and that it helps them continuously improve their processes, *'we have been working lean for a while now and it really fosters continuous improvement'*. Another benefit of lean that supplier 1 experiences is the fact that the buyer also practices the lean methodology, *'because we both work with lean it really matches and aligns. It is amazing to see how well you can work together when you have similar thinking processes related to lean'*. Supplier 1 notices this from the buyer's attitude around process optimalisations, *'when talking about process optimalisations with the buyer there is a certain level of expertise and a certain way of working that characterizes the lean way of working'*. This benefit is also experience by supplier 2, *'the fact that the buyer also practices lean really helps integrating our processes'*.

The main facilitator of this benefit is the fact that all four organizations use process mapping. The buyer explains that, *'our processes are mapped thoroughly. A step by step plan of what to do and why it is done. This way improvements can easily be made'*. Additionally, it is explained that improvements are not just made, but are first analysed by considering many different perspectives. Indeed, the buyer explains that *'our nurses are made aware of all processes step by step, resulting in many improvements as certain things can be done easier'*. Not only does the buyer employ the use of process mapping, but it is also utilized by the three suppliers. Supplier 2 states that, *'we always map out our processes and make sure they are simple to understand'*. This is followed by supplier 3 that explains, *'we look at every step of our processes to find bottlenecks so they can be prevented and improvements can be made'*. Supplier 1 notices that because they make use of process mapping their processes are all very

connected, *'if something does not go as it should be, we can really notice this in other processes. This is how connected and thought-through are processes are'.*

The buyer described a process improvement that resulted from process mapping, *'we always put our medical carts near where we are working so other colleagues know where they can assist. This way they do not have to ask for assistance. The cart is the sign that help is welcome'*. Additionally the buyer explains that *'the nurses have a walk-around with the doctors once a week to look at the different patients that are in the clinic'*. Because the nurses are made aware of all processes step by step certain improvements can be made as certain things can be done easier. Supplier 2 explains that because of process mapping they have now been able to implement just-in-time and FIFO practices. Adding to that, supplier 3 explains that, *'the more green belt projects we run the more we see optimizations happen'*.

Employing process mapping and other lean practices does not only generate more process optimisations, but it also increases employee motivation. Indeed, the buyer states, *'the way to improvement is difficult, but once it is implemented it feels really good and this motivates us, it makes the job more fun'*. This benefit is also seen by supplier 3, *'when our employees do green belt projects we can directly see the impact of these projects. We can see that it really motivates our employees as it provides a challenge'*.

A lean process that supplier 2 is heavily involved in is reducing as much waste as possible in their processes, *'we make sure that there is little to no waste by providing insights in usage to the buyer and integrating our processes'*. An example of such a practice explained by supplier 2, '*we use a pool of garments that we re-cycle and reuse to reduce waste. The buyer needs to return garments we deliver so we can wash them and deliver them back for re-usage'*.

The level of lean adoption combined with the learning culture that is present at the buyer and its three suppliers is also seen when looking at the attitude the organizations have towards learning in general. The buyer describes learning as a 'two-way street', as *'we learn from our suppliers and they learn from us. It is important we both know what the others are doing and what they require to do so'*. Supplier 1 adds to this by stating, *'with this buyer, the relationship is more of a two way street rather than a one-way street. We learn from each other's processes and needs'*. The buyer does not only learn from its suppliers, but the suppliers also learn from the buyer's practices, as supplier 2 explains, *'we also learn from the healthcare side of the supplier, as this understanding is needed to increase collaboration'*. The attitude the buyer and its three suppliers displays is also seen in high the interorganizational learning and absorptive capacity scores, which as described next.

4.2.3 Interorganizational learning and absorptive capacity

Looking at table 6 it can be seen that the highest scores for international learning and absorptive capacity and be found between the buyer and supplier 1 and 2, namely a 4.2 and 4.3. The lowest scores are found between the buyer and supplier 3, scoring a 3.6 and 3.8. Furthermore, all scores are relatively consistent between both buyer and supplier. This indicates that both buyer and supplier have a similar view when it comes to their level interorganizational learning and absorptive capacity.

The higher scores between the buyer and supplier 1 and 2 can also be deduced from the interviews. The buyer explains that they are very aware of the capabilities that supplier 1 and 2 possess and are able to use that to their advantage. *'We know exactly what supplier 1 has in store so we know what to build our food menus around',* stated by the buyer. Furthermore, *'supplier 1 has a digital newsletter that describes recent food innovation they have come up with. We are able to implement these innovations ourselves'*. The buyer also experiences this high level of absorptive capacity for supplier 2, as the buyer explains, *'we know what supplier 2's capabilities are so we are not worried when shortages arise.* Additionally, *'we are let know when supplier 2 has new innovation and we are able to assimilate this and learn from it'*.

As described above, the buyer and its three suppliers see learning as a 'two-way street'. This is also seen when looking and interorganizational learning and absorptive capacity, as explained by the buyer, *'our clients can have special needs. When this is the case a discussion can be started with our suppliers and most of the time a solution is found'*. The buyer enjoys the fact that their suppliers are able to assimilate and commercialise their needs, *'we bought table cloths from a third party. We do not have the capabilities to wash and dry the cloths themselves. Supplier 2 was notified and has integrated the cloths into their washing and drying process'*. Supplier 1 mentioned this ability by explaining, *'we are constantly engaging with the buyer to tailor our processes to their needs, as well as our food offerings'*. Supplier 2 also experiences this, *'we know about the healthcare side of the buyer. This enables us to provide solutions based on their needs'*.

A common theme arising from the high absorptive capacity between the buyer and supplier 1 and 2 is the fact that they are able to tailor their processes to the buyer's needs. An area where this can be seen is in logistics, as supplier 2 explains, *'we make sure that our external logistics fit with the internal logistics of the buyer. The right amount of items need to be delivered to the right departments at the buyer'*. Supplier 1 explains that they also tailor their processes to the buyer's need, as this does not only help the buyer, but also increases efficiency

at their end. Plus, as supplier 1 explains, '*we both learn from it'*. The buyer welcomes these tailored approaches, as *'we make sure that processes from our suppliers fit our own processes'*.

The higher interorganizational learning and absorptive capacity scores are thus not surprising between the buyer and supplier 1 and 2. The lower scores between the buyer and supplier 3 are also not surprising, as supplier 3 explains that they are surprised that there are no initiatives to tailor processes despite the buyer's lean background. Supplier 3 explains that, *'when looking at the buyer's story and their background in lean, I found it surprising to see that they do not have a tailored way of delivery. They only have one central warehouse'*. The fact that there is only one central warehouse can be explained by the fact that the buyer is a relatively small organization, as the buyer states, *'we are a small organization'*.

Interestingly, despite the low level of tailoring of processes between supplier 3 and the buyer, the relationship quality was still found to be high.

4.2.4 Relationship quality

The score found in the surveys for relationship quality range from 3.8 to 4.7, as seen in table 6. The highest scores are found between supplier 1 and the buyer, namely a 4.4 and a 4.7. On the other hand, the lowest scores can be found between supplier 2 and the buyer, a 4 and a 3.8. Supplier 3 and the buyer score in the middle with a 4.2 and 4.4 respectively. Interesting to note is that all scores are relatively consistent between the buyer and its suppliers, indicating that the perception of the quality of relationships is similar.

The lower scores between supplier 2 and the buyer cannot be explained by the interviews, as there was no indication of a lower level of relationship quality. Interestingly, supplier 2 even stated that they experience communication between them and the buyer to be pleasant, *'communication between us and the buyer is always friendly'*.

As mentioned in the previous section, the scores for relationship quality between the buyer and supplier 3 are high, even though there is no tailoring of processes. In the interviews, the buyer explained that the person of contact at supplier 3 is someone that really matches their own expertise, *'our person of contact at supplier 3 is a former nurse. This really helps as this enables supplier 3 to provide certain expertise. This expertise is something that we both share, hence it is a pleasure to work with supplier 3. This results in swifter communication and understanding when talking about client specific needs'*. Furthermore, the buyer supports the pleasant work environment with supplier 3's contact person by stating, *'I was happy to see that the representative of supplier 3 was so down to earth. Our energies really matched'*.

The buyer describes their relationship with supplier 1 as full of trust, *'if there is something wrong we know that the next day the right product will arrive. This kind of guarantee gives us a feeling of trust with supplier 1'*. This feeling of trust is also experienced by supplier 1, *'we very open with each other which has created trust'*. The buyer and supplier 1 have also jointly visited other healthcare clinics to gather inspiration, *'with the buyer we visited other similar healthcare institutions. These examples were the basis of the processes that we jointly created at the buyer'*, stated by supplier 1. These visits resulted in a better understanding of both sides about each other's businesses. Supplier 1 adds to this by saying, *'with these visits we both learned a lot more about each other and what each other wishes and preference are'*. The organizational structure of the buyer and supplier 1 also matches as they both have a very flat organization hierarchy wise. The buyer explains, *'everyone can talk to anyone, across all organizational layers. This is because we do not have a lot of hierarchy'*. Adding to that, supplier 1 states that, *'we are a very flat organization, hierarchy wise, even though we are a large organization'*. This match in hierarchy and organizational structure can be a catalyst for the higher relationship scores.

It is thus not surprising that the highest relationship scores can be found between the buyer and supplier 1. It is even less surprising when the relationship history between the buyer and supplier 1 is described, as a drastic change in collaboration style has taken place.

4.2.5 Upstream collaboration initiative

In the beginning of the relationship between the buyer and supplier 1 there was a lot of irregularity. The relationship was described as *'uncertain'* by the buyer. However, there was a lot of contact between the buyer and supplier 1. This contradicts the uncertain nature of the relationship. However, the contact that was present was highly irregular, as the buyer describes, *'we were in contact almost every day with supplier 1. For every little complaint or problem we called the supplier'*. This was the result of no tailored collaboration between the buyer and supplier 1. The buyer only received standard products and services, not specifically fitting to their need. This originates from the supply chain department at the buyer, as there was no focus on creating long-lasting relationship. Indeed, as the buyer states, *'our supply chain department used to be just a department taking care of ordering, now it focusses more on relationship building'*.

When this mentality changed in the supply chain department the goal was to foster more collaboration across the supply chain. The buyer describes their ambitions as, *'we wanted to create a continuously running machine of collaboration'*, resembling the description of a

'learning organization'. To set the basis for this collaboration change, the buyer explains that, *'our suppliers need to deliver tailored solutions to our needs'*. Furthermore, the buyer set out to select their suppliers on the basis of a set of values, *'proactive, servicing and problem solving mentality'*.

The buyer did not specifically mention if this collaboration change also occurred with supplier 2 and 3. However, since the collaboration change is described as supply chain wide, it can be assumed that there was also a change in collaboration with supplier 2 and 3 in some way or form. However, there will thus be focussed more on the change in collaboration between the buyer and supplier 1.

In the beginning of the collaboration change, there was a transitory phase. This phase was characterised by frequent regular contact between the buyer and supplier 1. According to the buyer, this was a phase where, *' there was a lot of trial and error to see what works well and what does not'*. The main goal of the trial and error was to create a tailored solution to the buyer's specific needs, indicating that the supplier had to learn a lot about the buyer's practices. However, as supplier 1 adds, *'we did not only learn about the buyer's needs and practices, but the buyer also learned a lot about our processes'*. This fits the 'two-way street' mentality of learning that was described before. Supplier 1 supports this be stating, *'we had to start from scratch and rebuild the menu's and find out what the buyer really needed based on their patients'*, demonstrating that they indeed had to learn about the buyer's practices and needs. Additionally, the buyer also learned from supplier 1's processes, *'in the beginning there was a bottleneck, we had to order before a certain time every day. We struggled with that but over time we learned how to handle this and overcome our struggles. We did this together with the supplier'*. The key in this transitory phase was thus to learn and overcome challenges together to come to a tailored solution. Supplier 1 confirms this by stating, *'with the kitchen team at the buyer we sat together to find out what could work and what processes could help. Doing this together really helped and accelerated the process'*.

In the end, the collaboration change has been successful, as the buyer states, *'we experience very good collaboration with our suppliers, it is like an autonomous system, it operates smoothly with few hiccups'*. This is also seen by supplier 1, *'we collaborate so smoothly now, it almost feels automatic'*. Additionally, the benefits are not only seen by the buyer and supplier 1, but also by the buyer's clients, *'ever since we implemented the new process with our own kitchen and restaurant I see that 80% of our clients like it better than before'*.

The change has thus been very successful, but the buyer still has future desires. The buyer would like to broaden the focus of collaboration to all suppliers. At the moment the collaboration change is more focussed on bigger and important suppliers. The buyer states that, '*smaller suppliers are not really looked at'*, added by, *'I am not really aware with the type of contract and processes we have with our smaller suppliers'*. This limited focus is the result of the fact that more contract managers are needed to manage all relationship. This is something that might have slowed down the implementation of the collaboration changes. However, this effect is limited since the buyer is a small organization.

Something that was also present, that potentially slowed down the implementation process was the fact that there were employees that are hesitant to change. The buyer explains, *'it is seen that older and more experience employees are more against change and like things the way they are. They say that they have been doing this already for 20 years, and it works'*. Supplier 1 adds to this as they have also been experiencing this, *'employees that are older do not really want new ways of doing things, or new types of processes'*. Both the buyer and supplier 1 acknowledge that employees like these are present and both emphasise that this is part of the process.

4.2.6 Upper-management philosophy

A factor that has a played an important role in the collaboration initiative is the upper-management ideology at the buyer. The idea even originated from the upper-management at the buyer. Additionally, *'upper-management was really into the change and really wanted it to happen'*, stated by the buyer. Naturally, the upper-management is really pleased with the outcome of the initiative.

Supplier 1 has enjoyed the support of the buyer's upper-management, *'the upper-management at the buyer is very enthusiastic and supportive and we really notice this from the level of commitment'*. Adding to that, supplier 1 enjoys the fact that there is high internal commitment at the buyer, *'the fact that there is high internal commitment at the buyer is really helping'*. More so, supplier 1 is pleased with the fact that the ideology of the upper-management at the buyer matches their own values and thoughts. This increase motivation and work-ethic, as supplier 1 explains, *'the upper-management at the buyer's vision aligns with our vision. This creates more room for improvement and relationship building. This gives us more motivation to work with the buyer'*. This is also experience by the buyer, *'the fact that our upper-management has the same vision as supplier 1, where healthy food paired with a good eating, is important, really helps us'*. More importantly, supplier 1 stresses that the fact that the buyer

knows what they want is really supporting, as supplier 1 adds, *'the buyer really knows what they want, this is such a good thing. We can build on that'*.

Additionally the upper-management at the buyer is also critically involved in the change process, offering support in to form of critical thinking. The buyer states, *'they are very supportive but always stay critical which really helps. Many times they mention things we did not even think of yet'*. However, sometimes the critical thinking of the upper-management can come across as overly ambitious, as the buyer states, *'our upper-management is sometimes a bit too ambitious as they want to always keep improving. However, some things are just not attainable in certain timeframes'.* Yet, the buyer does state that this high level of ambition keeps them sharp, as the focus is to always looks for improvement.

Now the upstream collaboration initiative is complete, how is it sustained? And how is there made sure that there is still strived towards continuous improvement across the supply chain? This can be explained when looking at the how the buyer and its suppliers interact, specifically, buyer-supplier contact.

4.2.7 Buyer-supplier contact

Effective contact between buyer and supplier starts with effective communication intra-organization. At the buyer, there is a good communication between their healthcare department and their supply chain department. The buyer states, *'the manager healthcare and manager supply chain communicate periodically. This is mostly informal as our company is small'*. Additionally. this communication is also done formally, *'every day at a certain time a list of new patients comes in via email. This way we know exactly what kind of new special food we need to make'*. Supporting this, the buyer also states, *'weekly there is a meeting between healthcare staff and the logistics staff to see what is needed for the next period. This is based on the variety and amount of patients present'*.

Because there is such effective internal communication at the buyer, the foundation is set for good buyer-supplier communication. Supplier 1 enjoys benefits resulting from good communication between the healthcare department and the supply chain, stating, *'the connection between the healthcare department at the buyer and our own food experts is very important, which is why I am happy it is so good. This is because we want to make sure that we deliver the right types of foods that are needed with the right nutrients and special needs'*. Adding to that, supplier 1 is also going to employ a middlemen at the buyer's site, to improve the already good communication.

Buyer-supplier meetings are mostly between contract managers at the suppliers and the supply chain manager at the buyer. These planned meetings are once every quarter. Before these meetings the buyer checks with their nurses if there are any special issues that need to be raised. The buyer states that meetings outcomes are widely shared, *'buyer-supplier meeting outcomes are not only shared with people that raised the agenda points, but also other relevant employees'*. Once or twice a year there are also buyer-supplier evaluation meetings in which customer satisfactions is talked about. There is also talked about supplier satisfaction, but this is *'mostly between the lines'*, as stated by the buyer. This is also experienced by supplier 3, *'there is a feedback loop for mistakes and problems with the buyer which is mostly done between the lines'*. There are also occasional site visits by the suppliers, *'our sales department also visits the customer at least once a year'*, stated by supplier 3.

However, all parties mention that it does not feel like they have a lot of contact with each other. Supplier 1 states, *'we do not have much direct contact with this buyer since they are so self-sufficient'*. The buyer also experiences this and adds, *'with the three suppliers face-to-face contact is minimal'*. Additionally, supplier 2 adds the same, *'contact with the buyer is minimal'*. Lastly, supplier 3 also experiences this, *'we do not have a lot of contact with the buyer, they order, we deliver'*. So how is learning and collaboration sustained in Case B's supply chain? This seems to stem the fact that autonomous processes are present that generate learning opportunities.

4.2.8 Autonomous system

Even though the buyer feels that face-to-face contact is minimal, the buyer still experiences a lot of contact with its suppliers, *'there is a lot of contact, but this is like a machine, it runs smoothly on a day-to-day basis'*. Additionally, the buyer describes the contact with its suppliers as *'autonomous, it does not feel like contact'*. The buyer expresses the same when looking at collaboration, *'collaboration feels like a machine that keeps going on and on'*. The contact the buyer is talking about are the moments where they order the amounts needed for their operations from the suppliers. The buyer orders 5 times a week from supplier 1, twice a week from supplier 2 and once a week from supplier 3. What makes the collaboration so autonomous is the fact that when the buyer forgets to order, products are still sent to them, *'when we forgot to order (which does not happen often) the supplier still sends a standard amount'*. The autonomous or automatic nature of the collaboration is also experienced by the three suppliers. Supplier 1 states, *'the buyer is very self-sufficient and independent. We have a lot of contact with them through our ordering system, but it does not feel like contact. It is automatic'*. Adding to that,

supplier 2 explains, *'everything is automated and standardized to create a well-oiled machine'*. Finally, supplier 3 describes the day-to-day collaboration as, *'automatic and self-sufficient'*.

It seems that all parties are in agreement with the fact that there is a lot of contact, but it does not feel like 'real' contact. There appears to be an autonomous system of processes which every supplier and the buyer is a part of. However, where are the opportunities in the autonomous processes where learning can be derived from?

Supplier 3 states, *'every week there is a delivery and there are several moments a week were the buyer determines what they want to order'*. This is the same for all the suppliers. The buyer has several moments a week where they order their desired amount of products from their suppliers. This is where the learning occurs, as both buyer and its suppliers are involved in the optimalisation of the ordering the right amounts of the right product. The source of these optimalisation opportunities is found in the IT systems that are used, and specifically, the data that is extracted from these systems.

4.2.9 IT systems and data

Via the IT systems the buyer lets its suppliers know what and how much is needed. It also improves communication as it removes the need to send unnecessary emails. Supplier 1 provides an example of this, *'if for example all patients cannot have gluten, the ordering system does not show those products. This way it is very easy for the buyer to order the right types of foods with minimal effort'*. This decreases the amount of time it takes to order products.

The IT systems also create standardization, *'our supplier's ordering systems are standardized which makes it very easy to use'.* Moreover, the buyer states that the website supplier 1 has created significantly decreases their time to place orders, *'supplier 1 has an amazing and clear website with pictures and icons which supports us greatly. It makes it easy'*. The buyer feels the same way about supplier 3, *'the standardized way that supplier 3 arranges their products makes it really easy to order the right products when needed'*.

The suppliers also experience standardization, as supplier 2 states, *'our IT ordering system creates standardizations as standard task need to be done in certain time increments during the week'*. Supplier 3 adds to that by explaining that their system is standardized in a certain way that enables ordering per department, *'the IT system we created for ordering makes it really easy for the buyer to order in a standardized way. It is categorized per department'*. However, sometimes the buyer experiences the standardized nature of the IT systems to be a bottleneck, *'I sometimes feel that our way of ordering is too standardized. This results in delays in ordering'*.

The IT systems also foster innovation as it allows the suppliers to provide information to the buyer about recent innovations. The buyer praises the newsletter that supplier 1 sends out, *'supplier 1 has a digital newsletter that they send food innovation they have come up with'*. This is confirmed by supplier 1 by stating, *'we communicate new innovations or ideas to the buyer through our IT ordering system via a newsletter'*. Supplier 2 also utilises their IT ordering system to communicate changes or innovations to their products, *'when we have certain innovations or product changes and updates we notify the buyer through our IT system'*. Lastly, supplier 3 adds, *'when we have changes or innovation in our product range we notify the buyer via a pop-up message on our ordering system'*.

Where most of the learnings can be derived from is the data that is gathered from the ordering system. When the buyer orders products from the suppliers, the suppliers are able to analyse the ordering history of the buyer. The suppliers are then able to provide analysis, for example in quarterly meetings. The buyer is really pleased with this as they state, *'supplier 1 really helps our processes as they can provide us with analysis based on our historical ordering data'*. Supplier 2 provides a management rapport to the buyer with many insights to their usage. The buyer states, *'supplier 2 analyse our usage of their products and provides us clear and visual rapport'*. This is also the case with supplier 3, as their insight in the buyer's ordering history also provides optimalisation opportunities. The buyer explains, *'supplier 3 has a lot of data about our usage which they analyse'*. The analysis that is provided by looking at the ordering history seems to be the most thorough with supplier 2, *'with all the data we gather from the operation at the buyer, we create a management rapport. In this rapport there are usage figures, stock level optimalisations and many more KPIs'*. These KPIs are created with the use of Business Intelligence technology, *'we have a BI system that runs on the gathered data, this creates visuals to show usage and other KPIs'*. The data that is gathered helps supplier 2 deliver a better tailored experience to the buyer.

4.2.10 Organizational performance improvement

Looking at table 6, the organizational performance improvement scores are the highest for supplier 1 and the buyer, namely a 3.6. The lowest score can be found at supplier 2, with a 3. While there cannot exactly be explained why what organizational has what score, it can be argued that the buyer has the highest score because they excel in every other variable. They exert a high level of lean adoption and learning culture, have good relationship quality with the three suppliers, and have high levels of interorganizational leaning and absorptive capacity. The

organizational performance improvement of the three suppliers depend on more factors than measured in the interviews, hence it is more difficult to explain.

4.2.11 Summary of Case B

Case B is characterised by a high level of lean adoption as well as a high level of learning culture. Supplier 2 and 3 exhibit the highest levels of learning culture and lean adoption, while supplier 1 scores the lowest. This can be the result of a lack of lean trainings provided to their employees.

Interorganizational learning and absorptive capacity is the highest between the buyer and supplier 1 and 2, and the lowest between the buyer and supplier 3. Supplier 1 and 2 have tailored processes to the buyer's needs, whereas supplier 3 has no tailored processes to the buyer's specific needs. This is to the surprise of supplier 3, as they would have expected to tailor their processes to the buyer's needs given the buyer's level of lean adoption. All scores for interorganizational learning and absorptive capacity are consistent between the buyer and its suppliers.

Relationships quality scores are the highest between the buyer and supplier 1, which can be explained by their relationship development history. The buyer and supplier 2 have the lowest scores, which cannot be explain with the use of the interviews as no indication of a low level can be found. Surprisingly, the buyer and supplier 3 have a relatively high level of relationship quality considering their lack of tailored processes. The relatively high score can be the result of a match of expertise between the account manager of the buyer and that of the supplier. All scores between the buyer and its supplier are consistent, indicating similar conceptions of relationship quality between the buyer and its suppliers.

Organizational performance improvement was the highest for the buyer and supplier 1, and the lowest for supplier 2. The highest score for the buyer can be explained as they excel in all other variables. However, the scores for the suppliers cannot be explained with the use of the interviews.

The supply chain department at the buyer has started and completed an upstream collaboration initiative with the focus on fostering more learning and collaboration across their supply chain. In the beginning of the implementation there was an transitory phase were a lot of trial and error has taken place. Learnings from the trial and error phase have resulted in solid thought-out collaboration initiates. Important contributors to the collaboration change have been the upper-management of the buyer. Not only heavily supporting the change, but also

contributing to the development by being critical. These benefits have been noticed by the buyer and its suppliers alike.

To sustain upstream collaboration, the buyer and its supplier are frequently engaged in contact. However, this is more contact via their IT systems and analysis of data, then real face-to-face meetings. The collaboration between the buyer and its suppliers can be characterised as an autonomous system, as it seems to operate like a well-oiled machine, fuelled by learnings resulting from BI and gathered data.

5 Cross-case analysis

From the data that was gathered from the analysis of Case A and Case B, table 7 was created. This table, seen below, showcases the similarities and differences between the two cases. The most important differences seen between the two cases related to the survey variables, the collaboration initiatives, upper-management support, communication, and the IT systems that are operating in both cases.

Table 7: Similarities and difference between Case A and Case B

Variables	**Case A**	**Case B**
Lean adoption	Low level	High level
Learning culture	Low level	High level
Interorganizational learning and absorptive capacity	Low level	High level
Buyer-supplier relationship duration	Short and long	Long
Size of buyer	Large	Small
Upstream collaboration initiative	Not complete	Complete
Upper-management support	Not enough support	Very supportive
Internal and external communication	Lacking	Abundance
IT systems	Lacking features	Supporting
Organizational performance improvement	Mediocre	Mediocre

5.1 Lean Adoption

In Case B trainings are deployed to educate employees in the lean methodology on all hierarchical and departmental levels. In Case A on the other hand, there is no mention of any implementation or training in lean. Case B's organizations make use of process mapping to better understand their processes, resulting in many improvement and learning opportunities. Not only are learning and improvements fostered, but the use of process mapping also increases employee motivation. Case A did not mention the use of process mapping or any other form of lean practices, hence their lower score in lean adoption. Case A being less proficient in lean was also seen in the survey scores, as Case B is characterised by an average level of lean adoption of 4.1 and Case A showcased a lower level of lean adoption, a 3.8.

5.2 Learning culture

In Case B there is a continuous learning culture present where there is always strived for improvements. Employees at Case B are expected to look critically at themselves and others, which creates an atmosphere full of learning. At Case A the opposite is present, many employee like the way things are and are not actively looking for improvements. Case B deploys cross-

functional teams, which creates ownership of improvement leading to higher motivation and more effective learning. Case A on the other hand did not mention the use of such teams.
The overall occurrence of learning in Case A is describe as ‘incidental’. Learning only happens when surprises happen or when things go wrong. In Case B, learning is describe as something that happens day-to-day, and is also strived for. Not only do you learn from mistakes, you also learn from when things go well. The fact that in Case A there is a less of a learning culture was also seen in the survey scores, as Case A exhibits an average level of learning culture of 3.9, while Case B displays an average level of 4.2.

5.3 Interorganizational learning and absorptive capacity

In Case A interorganizational learning is described as one-sided and downstream focussed. This is to the disliking of the suppliers as they see many improvement opportunities if they were able to learn more about the healthcare side of the buyer’s business. The opposite is seen in Case B, where interorganizational learning is seen as two-sided, both upstream and downstream. In this case the importance of the two-way street is seen by all parties, as it is important for the buyer to not only learn about the supplier’s business, but it is also important for the suppliers to learn about the buyer business. This enables Case B’s suppliers to assimilate and commercialize the buyer’s specific needs. This is something that is not seen in Case A. Something that is related to that, is also not seen in Case A, but is seen in Case B, the fact that most processes are tailored to fit the logistics and needs of both buyer and supplier. In Case B external logistics and needs meet internal logistics and needs. The surveys support the difference between both cases, as Case A displayed a lower average level of interorganizational learning and absorptive capacity than Case B, namely a 3.8 and 4.1 respectively.

5.4 Buyer-supplier relationship duration

Case A consists of one long relationship and two short relationships. On the other hand, Case B’s buyer exhibits long relationship with all three suppliers. For both cases the longer the history between the buyer and its supplier, the better the relationship quality. Additionally, the longer the business duration, the more time the buyer and its supplier have had to create effective collaboration. Overall, Case B has thus had more time to create such collaboration with its three suppliers. The atmospheres between the buyer and its suppliers in both cases are characterised as friendly, open and full of trust.

5.5 Size of buyer

Case A's buyer is a large company with many hierarchical layers. This frustrates but also motivates its suppliers. This also create a situation where it will take more time to find the right person to talk to. This results in buyer-supplier collaboration initiatives, and change in general, taking a long time to form. In contrast, the buyer in Case B is relatively small with a flat hierarchical structure. Everyone can talk to anyone as there are very few hierarchical layers. It is easy to find the right person to talk to. Change is easy to implement, as well as buyer-supplier collaboration initiatives. Related to this difference in flexibility, at the buyer in Case A there is a high level of bureaucracy, while on the contrary the buyer in Case B exhibits a low level of bureaucracy. At Case A, where the level of bureaucracy is high, there is less room for trial and error, as every procedure and change needs to happen in line with prior created guides and regulations. In this case, since many standard processes are already formed and rooted deep into the buyer's organizational culture of the organization over time, the entry barrier towards change is large. This decrease the opportunity to learn, as the organization is rigid and inflexible. This is the exact opposite for Case B, where the small non bureaucratic nature of the buyer fosters learning, as flexibility is high.

5.6 Upstream collaboration initiative

In both cases, an upstream collaboration initiative has taken place. The difference here is that in Case A the change was not fully successful, whereas in Case B it was successful. Case A is still undergoing the initiative in a transitory phase, where the collaboration is first tried out at a few suppliers. Case B also first started the initiative in a transitory phase, which was categorised by trial and error. This was a phase where buyer and supplier learn a lot from each other, mostly about each other's needs, preferences and processes. As mentioned, Case A is still in their transitory phase, as it was found hard to create awareness and support at the buyer for a more collaboration oriented supply chain. Most employees are satisfied with the *'old way of working'*. The opposite is the situation at Case B, where there is a high level of internal and external commitment for the initiative. In both cases the buyers possess the desire to roll out the collaboration initiative to all suppliers. At Case A this is not yet happening as the collaboration is not yet complete at the few suppliers where the initiative is being debuted. Case B has not expanded its scope to all suppliers as there is a lack of resources in the supply chain department.

5.7 Upper-management support

In both cases, the buyer's upper-management was the party that initiated to beforementioned upstream collaboration initiative. However, in Case A it is found that the upper-management has not been supportive enough during the implementation of the change. It seems that the upper-management was out for short-term cost savings, rather than long-term benefits resulting from solid supply chain collaboration. This might the a reason why collaboration has not yet reached it desired level. Furthermore, because of this philosophy, the suppliers are not certain what the buyer actually desires to achieve with the collaboration. On the opposite, Case B's suppliers know exactly what the upper-management at the buyer wants. Additionally, the upper-management at the buyer is seen as very supportive. The fact that the vision of the upper-management at the buyer aligns with the visions of its suppliers is seen as very helpful. Additionally, the focus in Case B is more on the long-term rather than on the short-term. The alignment of values across the supply chain paired with the long-term focus has been one of the factors for Case B's high level of collaboration and learning. When all parties know what is desired and are in agreement, collaboration and learning happens more easily. Hence collaboration is not at the same level in Case A, as it is unclear what parties desire, resulting in misalignments.

5.8 Internal and external communication

Internal communication at Case A's buyer is characterised as 'not enough'. There is a lack of communication interdepartmental as well as intradepartmental. Specifically, the communication between the healthcare staff and the buyer's other staff is not sufficient. This is also seen by the suppliers, as the communication between the healthcare staff at the buyer and the supplier's employees is not sufficient. On the opposite, in Case B, internal communication at the buyer is seen as very good. There is a good connection between the healthcare staff at the buyer and its other employees, like the supply chain department. This good inter-and-intradepartmental communication is also experienced by the suppliers, as they experience good communication between the healthcare staff of the buyer and their own employees.

The fact that internal communication at Case A's buyer is not sufficient might be the cause of the bad external communication. This can then lead to bad collaboration across the supply chain, as communication is key. Case B is an example where good internal and external communication provides a solid foundation for supply chain collaboration.

In both Case A and B, there is a quarterly buyer-supplier meeting. At Case A there is also buyer-supplier communication between middlemen and the buyer or supplier. Case B also

has bi-yearly evaluation meetings between buyer and supplier as well as the occasional visit of the suppliers to the buyer's clinic. Supplier satisfaction is also measured at both Case A and B, however, since the Covid-19 pandemic this has been done more 'between the lines'.

In general, buyer-supplier contact in Case A can be seen as incidental. Most contact happens when problems arise. This communication is then done via the phone, or via the IT system. At Case B, buyer-supplier communication can be seen as an autonomous system. There is a lot of contact that is not experienced as contact. These contact moments are mostly moments of placing orders, or shipping and receiving deliveries. There is a well-oiled machine of collaboration that keeps on running day-to-day.

5.9 IT systems

In both cases, IT systems are used. It is seen that these systems facilitate better communication and improve operations. However, in Case A it is seen that these effects are limited by a lack of features. These features are not created as there is not enough skill present to change the IT system in such a way. On the other side, Case B has easy to use, standardized IT systems, mostly in the form of websites and ordering systems. Case B's suppliers extract a lot of data from these systems which they analyse with Business Intelligence technology. These analysis give the buyer refreshing insights from which they learn. This is arguably the area where the most learning happens in Case B. The buyer and its suppliers in Case A do not use and analyse data in the same way. This is apart from one supplier, that uses data analysis for preventive maintenance.

Lastly, IT systems are also seen to foster innovation in Case B, as this is a platform where suppliers can share innovation and ideas with their buyer, from which they can learn and improve. In Case A there is no evidence that their IT systems foster innovation in such a way.

5.10 Organizational performance improvement

Interestingly, after all the differences between Case A and Case B, the average level of organizational performance improvement is exactly the same, namely 3.3. This is surprising, as it would be expected that the average level would be higher for Case B. This is expected because Case B exhibits higher levels of learning and collaboration, from which more benefits can be extracted.

It can be said that the organizational performance improvement of the suppliers is not as connected to the other measured variables as much as the two buyers. This is because there are many more contingencies influencing the performance change at the suppliers than measured.

This is also the case for the two buyers, however it can be argued that this is less of an effect resulting from the setup of the measurement, as the buyer are in the centre. W

When looking at the level of organizational performance improvement of both buyers, interestingly, a difference *can* be seen. For Case A the level is 2.9 and for Case B this is 3.6, which is more in line with expectations. This indicates that a higher level of lean adoption, learning culture and interorganizational learning and absorptive capacity is paired with a higher level of organizational performance improvement.

6. Discussion

In this research, using comparative case studies, *how* organizational learning in a supply network develops during an upstream lean integration was explored alongside how this learning can be *hindered* or *accelerated*.

Before engaging in an upstream lean integration it is important for the initiating organization, mostly buyers, to find out if their own organization is ready for such an integration. Internal commitment and communication of the integration needs to be on a sufficient level. If the buyer is not able to ensure internal commitment and sufficient internal communication this needs to be addressed and improved first. Without this it will be difficult to engage in an upstream lean integration with other organizations. Buyers also need to carefully select the participating suppliers based on their values and beliefs around collaboration.

Organizational learning in a supply network starts with a trial and error phase. This is where involved organizations test the waters and find out what is desired and needed by which organization. In this phase it is important to find out what exactly each organization's processes are. This information is assimilated and subsequently commercialized. This way, tailored processes can be created between the buyer and its suppliers, where external processes meet internal processes. This can be a difficult processes, but as seen in this study, when a firm has a high level of lean adoption and learning culture, a challenge creates motivation, followed by satisfaction. However, when external processes meet internal processes, learning is not done, this is only the beginning. This is where the day-to-day learnings occur from buyer-supplier contact. This is where buyer-supplier contact and collaboration is effortless, because it is a well-oiled autonomous machine. This is where multiple learning organizations turn into a learning supply network.

Hindering factors of learning during an upstream lean integration are, a low level of inter-and-intradepartmental communication, interorganizational learning and absorptive capacity and a low level of upper-management support, a lack of features and integration of IT systems and a 'one-way street' approach to interorganizational learning.

Accelerating factors of learning are, a low level of inter-and-intradepartmental communication, interorganizational learning and absorptive capacity, a supportive upper-management, the collection of data and analysis with BI, the use of cross-functional teams, making use of lean trainings for all employees, utilizing lean practices such as process mapping, and lastly, striving for a 'two-way street' vision towards interorganizational learning.

6.1 Theoretical implications

As mentioned in the previous section, it was concluded that there are two phases of interorganizational learning. The first phase being the trial and error phase, followed by the autonomous learning phase. The theoretical implications will build further on the two phases of interorganizational learning during an upstream lean integration with the use of already existing literature and empirical evidence found in this study.

6.1.1 The 6 I's of learning on 4 levels

Findings of this study expand the theory of the 4 I's of learning first proposed by Crossan et al. (1999) by adding a fourth level of learning to the already existing levels of the individual, team and organisation, namely: learning on the interorganizational or supply network level. This new level is also seen in knowledge management literature, where Seufert, Krogh, and Back (1999) introduced 'knowledge networking', where participants are grouped to accumulate and transfer knowledge with the primary purpose to create value. Knowledge on this network level is continuously being altered by learning activities, creating the basis for knowledge creation and transferring.

This network level extends beyond the organisational level, which makes it tricky as two or more organization levels interact with one another and many learnings have already been institutionalised within the involved organizations. These institutionalised learnings have a foundation on the individual level through intuiting, followed by the interpretation to the group level after which the learnings are integrated to the organizational level (Limba et al., 2019). So how do organizations learn on the interorganizational level while already having existing institutionalized learnings?

This is done by making clever use of feed-forward and feedback mechanisms. Seen in the 4 I's of learning, when top-down ideas are communicated to the individual level, only interpreting occurs, skipping intuiting (Lawrence et al., 2002). This is solved by feedback mechanisms so the learnings can first be intuited on the individual level after which it is feed-forwarded and interpreted to the group level (Limba et al., 2019). This is also the case when looking at the supply network level of learning. When organizations interact in a supply network it was seen that simply top-down communicating collaboration initiatives and learnings to the individual level does not work. When this is done, no internal commitment is seen on the individual, group and subsequently the organizational level. This results in lacklustre collaboration and learning on all four levels, including on the supply network level. Internal commitment is also seen as a key in knowledge networking, as such *facilitating*

conditions, the network's internal and cultural structure, set the dimensions in which knowledge creation and transferring takes place (Seufert et al., 1999). Such conditions are also referred to as 'categories to be taken into account', as these facilitating conditions can exhibit a positive or negative effect on the effectiveness of knowledge sharing activities (Von Krogh, 1998).

According to Limba et al. (2019), the first step to create internal commitment by organizational learning is through intuiting on the individual level. In this study it was seen that when it comes to interorganizational learning, intuiting on the individual level is not enough. Intuiting is a process where individuals learn about the usefulness of new information (Crossan et al., 1999). However, when individuals are not able to understand the new interorganizational knowledge, they will be unable to fully understand why it is important. This is where it is important for the individual to internalize the new external knowledge. This is also seen in the knowledge spiral introduced by Ikujiro Nonaka, Toyama, and Konno (2000) and Ikujirō Nonaka and Takeuchi (2007), seen in figure 2 below. In this spiral, internalization happens when (inter)organization-wide explicit knowledge is transferred to tacit knowledge of an individual. This happens mostly through 'learning by doing' and provides an individual with the 'know-how' of the knowledge. The tacit knowledge that is gained from interorganizational knowledge can in turn by shared to the group level by socialization where tacit knowledge is transferred to new tacit knowledge, so that the knowledge can spiral once more (Seufert et al., 1999).

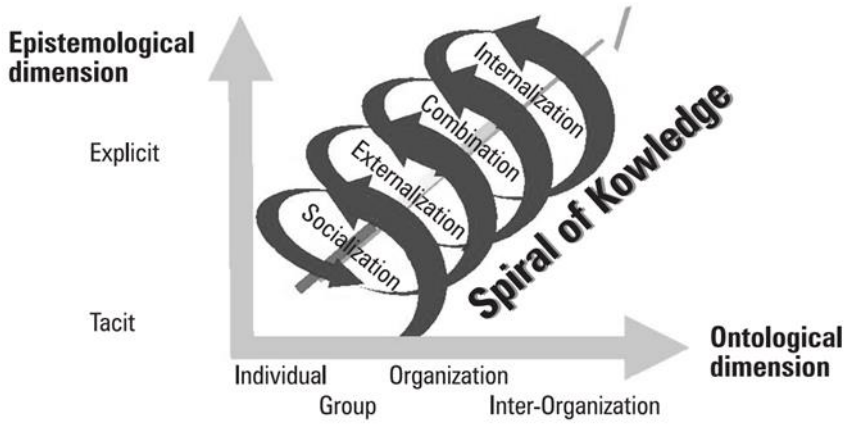

Figure 2: The knowledge spiral (Ikujirō Nonaka & Takeuchi, 2007; Ikujiro Nonaka et al., 2000; Seufert et al., 1999)

A firm's ability to internalize external knowledge is also known as the absorptive capacity (Lane & Lubatkin, 1998). This was also seen in this study, as the higher the level of absorptive capacity, the better the individuals of a firm are able to internalize external knowledge. When individuals in an organization are able to effectively absorb and understand external knowledge, they are subsequently able to more effectively intuit. This in turn results in more effective interpreting to the group level followed by integrating learnings to the organizational level. Finally, when new external knowledge is institutionalized on the organizational level through learning, this creates internal commitment. This enables interorganizational collaboration as the learnings are also integrated to the supply network level.

Creating internal commitment with as basis internalizing and intuiting of new external knowledge was especially important in the first stage of interorganizational learning and collaboration, namely the trial and error phase. Here firms are experimenting to find out each other's desires and capabilities. For example, in Case B, one of the suppliers absorbed external knowledge from the buyer that certain food diets are needed for their patients. For the supplier, through internalizing and intuiting, the importance is seen of commercializing the specific food diets of the buyer. This learning is then interpreted on the group level, followed by an integration on the organizational level, where processes are implemented to commercialize the different food diets of the buyer. On the other side, the buyer absorbed external information that their supplier is able to tailor their offering to their desire. The buyer creates internal commitment through internalizing and intuiting on the individual level, realising that they need to communicate their special food needs to their supplier. Through interpreting this learning to the group level, a process is created, after which this process is integrating and institutionalized on the organizational level. Now the buyer is able to communicate the special needs, and the supplier is able to commercialize the special needs. By integrating these processes on the supply network level a joint process is created that is able to operate autonomously on a day-to-day basis. This extension on the 4 I's of learning can be seen in figure 3 below.

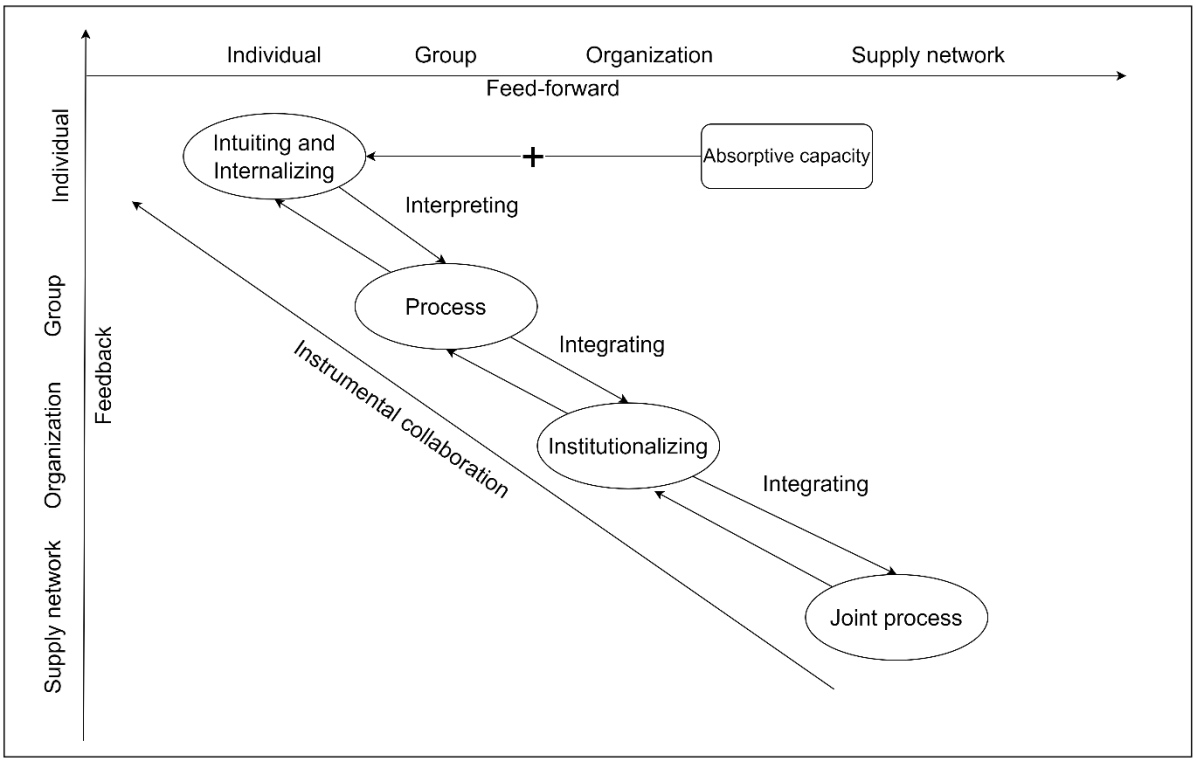

Figure 3: The 6 I's of learning on 4 different levels

When joint processes are established in a supply network, the next phase of interorganizational learning and collaboration begins, the autonomous learning phase. In phase 1, learning and collaboration in a supply network is pushed by individuals or groups within the organization, whereas in phase 2, this push in not present. This is where instrumental collaboration takes place. Instrumental collaboration happens when highly-skilled employees autonomously engage in collaboration (Gardner & Valentine, 2014). In literature, incremental collaboration is described as a phenomenon that occurs *within* an organization (Gardner & Valentine, 2015). This study proposes that this also occurs on the supply network level¸ creating a feedback-loop between the supply network level and the other levels, as instrumental collaboration can create learnings on any level as long as it is autonomously created.

Revisiting the previously introduced example where a joint process was created in phase 1, it was seen that after the joint process of communication and commercialization was created, this process will run autonomously resulting in many extracted learnings. These learnings can materialize in many forms, ranging from incremental changes in the current process or the creation of complementary processes, to new sorts of special food needs from the buyer's side, to an individual realising their work can be done more efficiently. This demonstrates the nature

of instrumental collaboration, where any level of learning can be created. It does not necessarily have to start at the individual level.

What was also discovered in this study, was that making use of process mapping, or value stream mapping, increased the effectiveness of internalizing, intuiting, interpreting and integrating. With the use of process mapping a firm is able to map their current processes by highlighting who is involved in what activities (Aldowaisan & Gaafar, 1999). By utilizing this, internalizing, intuiting, interpreting and integrating the new interorganizational knowledge becomes easier as process mapping creates an overview of potential areas where this new information can be deployed, making it easier to use to commercial benefit.

Even though the network level of learning is already found in knowledge networking literature, this study still proposes a theoretical implication regarding the extension on the 4 I's of learning model, as it provides a basis for explaining the two phases of interorganizational learning.

Proposition 1: Next to the individual, group and organizational level, the supply network level of learning can be distinguished by combining the 4 I's of learning and knowledge networking

Proposition 2: In phase 1 of interorganizational learning, the trial and error phase, it is key to not only intuit external knowledge, but also to internalize new external knowledge, which is positively influenced by a firm's absorptive capacity

Proposition 3: In phase 2 of interorganizational learning, a mature supply network characterized by autonomous collaboration, instrumental collaboration occurs creating possible learnings on the individual, group and organizational level

Proposition 4: Process-or-value stream mapping has a positive effect on internalizing, intuiting, interpreting and integrating

6.1.2 Transformational leadership

From this study it was found that leadership has a direct positive influence on the success of upstream collaboration initiatives as well as an indirect positive effect on interorganizational learning. The positive influence was created by the upper-management advocating their future vision, not only to their own employees, but also to that of the supply network. This enabled the upper-management to empower employees within the supply network to act on that vision. The vision focussed on fostering collaboration within the supply network, creating the positive beforementioned variables. As collaboration matured and intensified resulting from the upper-

management support, it was seen that the degree of interorganizational learning also increased. The upper-management's leadership style resembles a transformation leadership style.

Transformational leaders motivate their followers to conform with organizational goals as well as to surpass them (H. Kim, 2014). These leaders are seen as the key for effective change as they are able to transform an organization by their visions of the future (Buil, Martínez, & Matute, 2019). By effective communication of these visions transformational leaders can empower their employees to act and achieve the visions. Furthermore, several published papers have concluded that transformational leadership promotes and enables innovation (Bass, Avolio, Jung, & Berson, 2003; García-Morales, Jiménez-Barrionuevo, & Gutierrez, 2012). Adding to that, literature has also concluded that transformational leadership facilitates individual employees to learn and develop new capabilities by enabling creative thinking (Bass et al., 2003; Prasad & Junni, 2016).

From the cross-case analysis it was concluded that the resembling transformational leadership does indeed foster innovation and learning within an organization. However, what was also discovered, transformational leadership enables interorganizational collaboration. It was seen that when transformational leadership actively advocates their vision not only to their own organization, but also to the supply network, that this increased the level of collaboration. This occurred because organizations in the supply network are able to act and feel empowered to fulfil that vision. They are empowered to not only act on their own organization's goals but also for supply network goals. When an organization thrives in the supply network, benefits are also seen back across the supply network, hence the motivation to strive towards the goal communicated by the transformational leadership. This effect was the more present in phase 1 of interorganizational learning as the support and communicated future visions of the transformational leadership were an integral part of the interorganizational collaboration's success.

The indirect increase in the level of interorganizational learning was mostly seen in phase 2, since the autonomous nature of interorganizational learning was sustained by the support and future visions of collaboration established and maintained by the transformational leadership.

A moderator of the direct and subsequent indirect effect was the alignment and clarity of these transformational visions across the supply network. It was seen that alignment of future visions between organizations in the supply network resulted in a higher level of collaboration and interorganizational learning. Furthermore, the higher the clarity of the transformation leadership's vision, the more the vision is absorbed across the supply network. However, it can

be argued that when a vision is not clear and well communicated by transformational leadership, the leadership is not transformational.

Proposition 5: Transformational leadership has a direct positive effect on the level of collaboration within a supply network and an indirect positive effect on interorganizational learning

Proposition 6: The direct and indirect effect of transformation leadership on interorganizational collaboration and learning is moderated by the alignment and clarity of communicated future visions

6.1.3 Data-driven decision making

Literature has established the need for organizations to transform gathered data to a valuable resource, providing a basis for optimization activities (Gokalp, Kayabay, Akyol, Eren, & Koçyiğit, 2016; Xu & Duan, 2019). These optimizations are created by using data analytics, where valuable insights are gained from the data (Delen & Demirkan, 2013). This allows decision making to be less intuitive and more reliant on data (Brynjolfsson & McElheran, 2016). The dependence on effectively using data to come to rational decisions has become a core dimension for competitive success (Rejikumar, A., & Sreedharan, 2020). Furthermore, data not only enables better decision making, it also creates organizational learnings, as data visualization and presentation provide meaningful insights (Donoho, 2017). Indeed, Bhatt and Zaveri (2002) support this, as when decision making is based on data, decision outcomes are easier understood and learned from, as the decisions are based on facts rather than opinions. Not only are these decisions more easily understood, but also more effectively communicated across the organization through visual data representation, enabling organizational learning (Argote & Miron-Spektor, 2011). Darr and Kurtzberg (2000) add to that, as data-driven decision making allows for more efficient knowledge transfer.

Data-driven decision making creates an atmosphere where decisions, as well as organizational learning occur more structured and less incidental (Wohlstetter, Datnow, & Park, 2008). This is supported by this study, as in the case where few decisions were made based on data, learning was found to be incidental, whereas in the case that deployed data-driven decision making, learning was described as structured and autonomous. In this case, on a day-to-day basis, IT systems were used, where useful data was available at all times, fostering learning and allowing informed decisions to be made. However, these learnings did not stop at organizational boundaries, as the IT systems were integrated across the supply chain, creating a bridge of information and knowledge transfer between the buyer and its suppliers.

Literature on data-driven decision making has established that when it is employed across organizational boundaries, this also creates a competitive advantage as it can counter demand uncertainty (Qiu, Ge, & Huang, 2010). Supporting this, Hedgebeth (2007) discovered that data-driven decisions derived from data analytics also minimized operations costs as it can accurately forecast market trends. This was also seen in this study, as data analytics deployed on ordering history allowed accurate forecasting, enabling the supplier to deliver the right amount of products needed by the buyer. This in turn provides maximum value to the buyer, as they receive the correct amount of a certain product, and the supplier lowers their operation costs. Ultimately, this increased the level of collaboration within the supply network, as all parties are benefitting from data-driven decision making. Long (2017) indeed discovered that data-driven decision making increased collaboration within a supply network, with as main reason that making decisions based on data allowed all parties in the supply network to be involved in the decision making process. This indicates that interorganizational learning can be derived from the interorganizational use of data-driven decision making. However, this has not been established in literature, as literature on data-driven decision making is still in its infancy (Long, 2018). As mentioned before, organizational learning has been established to increase from the use of data-driven decision making (Bhatt & Zaveri, 2002; Donoho, 2017; Pozzi, Cannas, & Ciano, 2021).

This study expands on the connection between organizational learning and data driven decision making by stating that it also increases the level of interorganizational learning. It was found that when data-driven decision making was utilized within the supply network, that this created interorganizational learning opportunities on a day-to-day basis. Even more so, in the researched organisations, most of the discovered interorganizational learnings were derived from data-driven decision making. Additionally, interorganizational communication was found to be less incidental and more structured and autonomous. This not only increased the level of interorganizational learning, but also the level of collaboration across the supply network.

However, this only occurred in one of the cases, namely, the case where phase 2 of interorganizational learning was reached. This case was mature in interorganizational collaboration and learning, as well as mature in lean practices. These lean practices were not only mature within the organizations, but also integrated across the supply network.

Tortorella, Giglio, and Van Dun (2019) discovered that simply utilizing data analytics and basing decisions on data was not enough. The combination of the adoption of lean practices and using data for decision making is the key to successfully extracting its benefits. This is the result of behavioural habits and routines originating from lean practices laying the foundation

for systematic improvements extracted from data (Tortorella et al., 2019; Zawadzki & Żywicki, 2016). The results of this study confirm and extend these findings, as it was seen that the more mature lean case was indeed able to successfully employ data-driven decision making, not only within their own organization, but also across the supply network.

In the more mature case, the use of data-driven decision making resulted in a more autonomous and structured way of learning within the supply chain. This links to section 6.1.1, where in phase 2 of interorganizational learning, an autonomous source learning in the form of instrumental collaboration was found. In the mature case, most of this autonomous learning stemmed from data-driven decision making. Employees across the supply network in that case were able to autonomously extract learnings from data, indicating the direct positive effect that the use of data-driven decision making has on interorganizational learning.

Proposition 7: The use of data-driven decision making has a direct positive effect on interorganizational learning across a supply network, enabled by a mature lean supply network

6.2 Practical implications

This study highlights the importance of internal commitment at every organizational layer in order to realize effective interorganizational learning and collaboration. To realise this, it is vital that absorbed interorganizational information and learnings are understood on the individual level of an organization to create a basis for future optimizations. When interorganizational learnings are understood on the individual level, this can create a basis for process tailoring between collaborating organizations in a supply network. This in turn results in a supply network being able to align their internal and external processes to optimize the supply chain's performance. This is done by trial and error, where frequent buyer-supplier contact is required, in the form of buyer-supplier meetings or site visits. Open conversations about needs and desires are key to find out what is needed to successfully collaborate. When joint processes are created resonating both buyer and supplier's needs and desires, highly skilled individuals will start autonomously learning about what works best and what can be improved within the supply network. This is an environment where incremental optimizations and learnings occur on a day-to-day basis.

Another way to foster learning during an upstream lean integration is by vigorous upper-management support. Upper-management's support increases the overall success of the upstream integration across the supply network. When management exhibits a clear vision of the future and is able to communicate and form a guiding coalition not only does internal commitment rise, but most importantly, commitment across the supply network rises. This

effect is increased when these future visions of upper-management are aligned across the supply network. This increases motivation and willingness to collaborate, which ultimately leads to more interorganizational learning, and in turn, process optimizations.

Lastly, data-driven decision making also increases learning across a supply network. Making decisions based on data rather than on opinions changes learning in a supply network from incidental, to structured and autonomous. Data provides a basis for many improvement and learnings activities by providing clear and visual overviews. Data can be shared and analysed by various organizations in the supply network. The many organizations in a supply network are all able to provide different perspectives and views on the data, increasing the amount of learnings that can be derived. However, the use of data-driven decision making on its own is not enough, it needs to be accompanied by the adoption of lean practices. Introducing lean trainings provides employees across the supply network the ability to think in a structured way that resonates with data-driven decision making. This in turn increases the benefits that can be extracted from its use.

For Case A it is important to re-examen the nature of their upstream collaboration initiative, as internal commitment is not found within the organization. The upper-management of the buyer and its suppliers need to sit together to create clear and easy to understand future vision surrounding the upstream collaboration initiative. Furthermore, the buyer in Case A needs to decide whether they first want to increase collaboration within the supply network, or first develop their own organization by introducing the lean methodology. Developing their own organization with the lean methodology should be a key priority, which is done by introducing green belt projects within all horizontal and vertical organizational levels. This might solve the lack of learning culture and intradepartmental communication. By deploying green belt projects around intradepartmental communication, possible improvements can be found. As described in 6.1.3, it would be wise to simultaneously adopt the lean methodology and data-driven decision making. While running green belt programmes within the organization, the upper-management should consider what sources of data are wanted and needed to come to more informed decisions. When these dimensions are set, data-driven decision making processes can be simultaneously created alongside lean processes. While establishing an environment within the buyer of Case A where the lean methodology is used, decisions are made based on data, good intradepartmental communication is present, the buyer should start looking to develop their supply network.

There are a lot less practical implications for Case B, as this case is already competent with the lean methodology and data-driven decision making. Furthermore, their upper-

management seems to already exhibit a transformational leadership style. However, the focus of their upstream lean integrations seems to be narrow, as not all suppliers of the buyer are involved. This was the results of lacking resources in the supply chain department. To extract maximum benefits from Case B's buyer's supply network, the upper-management should consider allocating more resources to the supply chain department. This can create opportunities, as more resources are able to foster improvements across the supply network. Having more contract managers to maintain business relationships is key, not only for the level of collaboration, but also the performance of Case B's supply chain. For example, more in-depth data can be collected and analysed for all business relationships of the buyer in Case B. This in turn results in better decision making based on data, as well as more interorganizational learnings.

6.3 Strengths, Limitations, and Future Research

While previous studies have focussed on the connection between lean and learning, this study has focussed more on lean and interorganizational learning. The strength of this study comes from the cases that were selected, as the two selected cases are complete opposites. This created a situation where the cross case analysis was able to provide meaningful differences that led to the beforementioned theoretical and practical implications. Furthermore the validity of the research was strengthened by the use of mixed methods. Not only were in-depth interviews conducted in both cases, but anonymous surveys were also distributed. This mixed-method approach enabled more in-depth understanding of the cases (Fetters et al., 2013; Johnson et al., 2007). Furthermore, this also enable triangulation, increasing the external and construct validity of the study by combining different perspectives provided by the mixed methods (Denzin, 2012). However, even though meaningful implications were able to be derived in this study, a few limitations remain.

The first limitation was present in the sample selection for both the interviews and surveys. Initially, more than two cases were desired as sample for this study, however this was desire was not met. Furthermore, the participating organisations and its employees were selected by the buyer in both cases. This can result in an inaccurate picture of reality. Furthermore, most of the interview participants were also the participants in the surveys. Only a handful of survey participants were not interviewed. This did increase the alignment of the interview and survey results but might in turn not be an accurate display of reality (Ercikan, 2009). Additionally, the small sample size of the interviews and surveys can also result in an inaccurate picture of reality (Hertzog, 2008). Furthermore, because of the small sample size,

less statistical test were able to be used to validate and analyse the sample (Del Giudice, 2017). Also resulting from the small sample size of the surveys, means per organization was used to scale and compare the measured variables. The limitation here resides in the fact that different hierarchical roles and departments influence employee's answers as some roles and departments are more knowledgeable than others. This essentially decreases the validity of the means per organization, as some participants require different weights than others. Additionally, the study was conducted in one particular sector, decreasing the generalisability of the study (Ferguson, 2004). Furthermore, the study was performed at a certain point in time, whereas more findings could be derived if the study was longitudinal, as the goals of the study was to research the development over time of learning in a supply network during an upstream lean integration, rather than at a certain point. However, this limitation was partly countered by asking question based on the past. Still, the surveys were measured at a certain point in time rather than over a period. Lastly, the survey were also filled in by considerable more men resulting less generalisable results (Moons, van Es, Deckers, Habbema, & Grobbee, 1997). Large-scale random sample selection of participating organizations and employees in different sectors and industries, employing a longitudinal study can limit the effect of these limitation.

A second limitation of this study was present in the survey questions belonging to '*lean adoption culture'*. The expected level of lean adoption was lower than the measured level in Case A. Suppliers in this case exhibit a high and similar level to Case B even though the use of lean was not mentioned in the interviews with the suppliers in Case A. This could indicate that the survey questions belonging to lean adoption culture were too general. The buyer at Case A did score a low level of lean adoption, as expected. By using a set of less general questions to determine the level of lean adoption this limitation can be prevented. A less general set of questions for a lean adoption questionnaire can be found in (Bortolotti et al., 2015)

The last limitation of this study is the bias of the research towards the two cases. The researchers knows beforehand which case will exhibit what levels of learning and lean. This can result in targeted questions and perhaps a set attitude going into interviews with the two cases (Chenail, 2011). In Case A it was evident that learning in the supply network was going to be less present, while learning would be more present in Case B. This could thus have created a certain focus and thus a bias during the interviews. While the extreme case study nature is one of the strengths of this study, it can thus also be a limitation. This can be solved by randomly selecting participating supply networks without not knowing which network has a high level of lean adoption. However, even though there are several limitations, this study still provides openings for future research.

For future research it would be interesting to see whether in a more diverse sample, employing a longitudinal study, the two theorised phases of interorganizational learning can also be discovered. A first phase where trial and error is key, to establish mature collaboration across the supply network followed by a phase characterised by autonomous instrumental collaboration and learning. Furthermore, for future research it would be interesting to research the found effects of *transformation leadership,* and the use of *data-driven decision making*. In future research it would be interesting to see if these moderating factors are also present in larger scale and cross-industry samples. Subsequently it can be interesting to research these variables in combination with the two phases of interorganizational learning. Additionally, as no prior research has been done on how learning develops during an upstream lean integration, a larger scales cross-industry study can also prove to be interesting.

Given that supply chain disruption and shortages are more and more common, it is important that maximum benefits are extracted in supply networks. As a lean integration across a supply network is found to be a way to increase benefits from buyer-supplier relationships by increasing learning, it is important that studies are performed to find out exactly how the success of these initiates are increased. Thus, future studies can explore what exactly the effect of *transformational leadership* and *data-driven decision making* is on these upstream initiatives and how it can increase learning across a supply network.

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Appendix A: Critical incident technique interview **(Butterfield et al., 2005; Flanagan, 1954)**

Interview guide	Check
1. Introductie	
Voor welk bedrijf werkt u? (industrie, locatie, belangrijke processen/producten)	
Wat is uw baan? (Vaak in contact met leveranciers?)	
Heeft u vaak contact met de leveranciers?	
Hoe lang heeft u al contact met de leverancier? (hoe lang werken jullie al samen?)	
Hoeveel mensen werken er op de afdeling? (strategisch, tactisch en operationeel)	
2. Hoofdvraag: Kunt u zich een belangrijke gebeurtennis herinneren met uw partner? **Main question: Can you remember an important event during the collaboration with your partner (buyer/suppliers)?**	
3. Aanleiding van gebeurtenis	
Waarom vond het plaats? (Was het gepland?)	
4. Voorbereiding gebeurtenis	
Wie namen er deel uit van de voorbereiding?	
Uw verwachtingen/gedachten?	
Teams verwachting/gedachten?	
Liepen verwachtingen uiteen vanaf uw team? Was er discussie/gesprekken?	
Waren er dingen waar tegenop werden gekeken, of juist waar naar uit gekeken werd?	
5. De gebeurtenis chronologisch	
Waar vond het plaats?	
Wie was er tijdens de gebeurtenis?	
Wie deed wat/zei wat? Hoe werd daarop gereageerd? Wat volgde?	
Waren er dingen die de gebeurtenis moeilijk/makkelijk maakte? IT, gedrag, processen?	
Gingen er dingen fout/goed?	
6. Na de gebeurtenis	
Is de gebeurtenis doorgesproken/evaluatie?	
Wie was er in de nabespreking?	
Zijn de verwachtingen uitgekomen?	
Is er iets gebeurd dat u niet verwacht had?	
Was er iets boven verwachting?	
Was er iets dat beneden uw verwachtingen was?	
Zijn er dingen uitgekomen waar u iets aan had?	
Zijn er dingen waardoor u ‘achteruit’ bent gegaan?	
7. Veranderingen na de gebeurtenis	
Zijn er dingen verandert in de keten/uw bedrijf na de gebeurtenis? (of voor de persoon zelf)	
Waardoor is dit ontstaan? Door wie voorgesteld en uitgevoerd (klant/leverancier)?	
Wat is de impact van de verandering op uw bedrijf en de keten samenwerking?	
Wordt er anders gekeken naar de relatie/omgang met de leverancier/klant?	
Zijn er verandering in processen/producten?	
8. **Onderzoek uitleg**	
Heeft u nog iets toe te voegen nu u het doel van het onderzoek weet?	

Appendix B: Full survey question list in Dutch

Deel 1: Bedrijfscultuur

Deel 1.1: Leercultuur

Q1: Mijn organisatie erkent/beloont werknemers die leren en initiatief nemen

Q2: In mijn organisatie passen teams hun denkwijze aan naar aanleiding van groepsdiscussie of informatie

Q3: Mijn organisatie deelt geleerde lessen met alle medewerkers

Q4: In mijn organisatie krijgen de meeste werknemers de kans om deel te nemen aan de besluitvorming

Q5: In mijn organisatie zoeken leidinggevenden constant naar kansen om te leren

Deel 1.2: Mate van Lean adoptie

Q6: De strategische plannen van mijn organisatie zijn gebaseerd op de lange termijn met langzame maar zekere verbeteringen

Q7: Mijn organisatie communiceert zijn strategie en doelen met alle werknemers

Q8: In mijn organisatie gebruiken we visuele indicatoren om de resultaten te monitoren en werknemers te helpen met het identificeren van problemen

Q9: In mijn organisatie wordt iedereen, inclusief de leidinggevenden, aanmoedigt om te observeren waar en waardoor problemen ontstaan om deze op te kunnen lossen

Q10: In mijn organisatie is er een gestructureerde hulpprocedure voor alle werknemers zodat problemen snel worden opgelost

Q11: In mijn organisatie worden leidinggevende opgeleid om ervoor te zorgen dat ze diepgaand inzicht hebben in het werk zodat zij andere kunnen opleiden en helpen

Q12: In mijn organisatie worden toeleveranciers betrokken bij de planning en ontwikkeling van nieuwe producten, diensten en processen

Q13: In mijn organisatie worden er verbetersessies gehouden om nieuwe tools/processen te leren en in een week tijd veranderingen door gevoerd dat anders maanden zou duren

Q14: In mijn organisatie wordt bij het ontwikkelen van nieuwe producten of diensten de behoefte van interne klanten meegenomen

Q15: In mijn organisatie is er periodiek contact met interne klanten om vragen en problemen rondom nieuwe producten of diensten te bespreken

Q16: : In mijn organisatie wordt bij het ontwikkelen van nieuwe producten of diensten de behoeften van externe klanten meegenomen

Q17: In mijn organisatie is er periodiek contact met externe klanten om vragen en problemen rondom nieuwe producten of diensten te bespreken

Deel 2: Organizational performance development

Q1: De winst van mijn organisatie is hoger dan vorig jaar

Q2: Onze klanttevredenheid is hoger dan vorig jaar

Q3: Onze werknemerstevredenheid is hoger dan vorig jaar

Q4: Ons aantal nieuwe producten of diensten is hoger dan vorig jaar

Q5: Mijn organisatie heeft een dominantere positie in de markt dan vorig jaar

Deel 3: Buyer-supplier relatiedynamieken

Deel 3.1: relatie kwaliteit tussen buyer en supplier

Q1: Ik geloof dat het contract met deze partner verlengt gaat worden

Q2: Ik vertrouw erop dat deze partner onze belangen in gedachten houd

Q3: De prestaties van mijn organisatie is verbeterd mede door de samenwerking met deze partner

Q4: De relatie die mijn organisatie met deze partner heeft is als een goed huwelijk

Q5: Er wordt snel en vaak gecommuniceerd met deze partner, op verschillende managementniveaus en vanuit verschillende functies

Q6: Beide partners focussen niet alleen op het huidige contract, maar maken al plannen voor het voortzetten van de relatie

Deel 3.2: Interorganisational leren en absorptive capacity

Q7: Onze organisatie krijgt regelmatig nieuwe of belangrijke informatie van deze partner

Q8: Deze partner helpt mijn organisatie met het ontwikkelen van onze huidige vaardigheden en kennis

Q9: Mijn organisatie heeft nieuwe cruciale vaardigheden en kennis geleerd van deze partner

Q10: Mijn organisatie is goed in het begrijpen van de vaardigheden en kennis van deze partner

Q11: Mijn organisatie kan de vaardigheden en kennis van deze partner goed incorporeren

Q12: Mijn organisatie kan de vaardigheden en kennis van deze partner doelgericht toepassen

Deel 4: Demografische vragen

Q1: Wat is de naam van uw bedrijf?

Q2: Wat is uw werkervaring?

Q3: Hoe lang werkt u al voor dit bedrijf?

Q4: Hoe lang werkt u al in deze functie voor dit bedrijf?

Q5: Hoe lang werkt uw bedrijf al met lean of continu verbeteren?

Q6: Hoe lang bent u al in contact met deze partner?

Q5: Wat is uw leeftijd?

Q6: Wat is uw geslacht?

Q7: Wat is uw hoogste opleidingsniveau?

Appendix C: Survey questions. **All surveys are on a 5-point Liker scale ranging from 1:'strongly disagree' to 5: 'strongly agree'**

Organization's learning culture and lean adoption (Camuffo & Gerli, 2018; Marsick & Watkins, 2003; Naqshbandi & Tabche, 2018; Pantouvakis & Bouranta, 2017; Santos & Tontini, 2018; Shao et al., 2017)

Learning culture

Q1: My organization recognizes/rewards people for learning and taking initiatives

Q2: In my organization, teams/groups revise their thinking as a result of group discussions or information collected

Q3: My organization makes its lessons learned available to all employees

Q4: Most members in the organization get a chance to participate in decision making

Q5: In my organisation, leaders continually look for opportunities to learn

Lean adoption culture (based on Santos and Tontini (2018)'s lean maturity model)

Q6: In my organization, strategic planning is based on long-term philosophy, slow and steady Advancement

Q7: In my organization, strategies and goals are communicated to all employees

Q8: In my organization, visual management using simple visual indicators, both for inspection and for tracking results, to help people identify the occurrence of problems are deployed

Q9: In my organization, there is a problem-solving process that encourages everyone, including leaders, to personally observe problems where they occur

Q10: In my organization, a structured chain of help is deployed for rapid problem solving

Q11: In my organization, leadership development processes are present that ensures a deep understanding of the work so that these leaders can teach and help others

Q12: In my organization, suppliers are involved in the development and planning of new products and processes

Q13: In my organization, there are carried out improvement events to teach teams to apply the tools and make changes in a week that would otherwise take months

Q14: In my organization, during product development, the needs of internal customers are considered

Q15: In my organization, periodic contact with internal clients is ensured to discuss issues related to the development of new products

Q16: In my organization, during product development, the needs of external customers are considered

Q17: In my organization, periodic contact with external clients is ensured to discuss issues related to the development of new products

Organisational performance improvement (Huang & Li, 2017; Marsick & Watkins, 2003; Prieto & Revilla, 2006; Shanker et al., 2017)

Q1: In my organization, profit is greater than last year

Q2: In my organization, customer satisfaction is greater than last year

Q3: In my organization, employee satisfaction is greater than last year

Q4: In my organization, the number of new products or services is greater than last year

Q5: In my organization, the competitive position in the market is more dominant than last year

Buyer-supplier relationship quality + interorganisational learning and absorptive capacity (Bruneel et al., 2010; Fang & Zou, 2010; Fredrich et al., 2019; Li et al., 2012; Liu et al., 2010; Yang et al., 2009)

Buyer-supplier relationship quality

Q1: I believe that renewal of agreements in this relationship will occur

Q2: I trust this partner keeps our best interests in mind

Q3: Our performance is perceived better resulting from this relationship

Q4: The relationship we have with this partner resembles a strong marriage

Q5: The communication between us occurs at different levels of management and cross-functional areas and is timely and frequently

Q6: The parties make plans not only for the terms of current purchases, but also for the continuance of the relationship

Interorganisational learning and absorptive capacity

Q7: Our company has acquired new or important information from this partner

Q8: This partner has helped us to build our existing capabilities/skills

Q9: We learned or acquired some new critical capabilities or skills from our partner.

Q10: We are good at understanding our partner's knowledge and skills

Q11: We are good at assimilating our partner's knowledge and skills

Q12: We are good at applying our partner's knowledge and skills

Appendix D: Demographic question of survey

Q1: What is the name of the company you work for?

Q2: How long is your work experience?

Q3: How long have you been working at your current company?

Q4: How long have you been working at your current job function?

Q5: How long has your company been working with lean or continuous improvement pratices?

Q6: How long have you been in contact with this partner?

Q5: How old are you?

Q6: What is your gender?

Q7: What is your highest form of education?