

Faculty of Behavioural, Management and Social Sciences

**Master Thesis**

Master of Science (M.Sc.) Business Administration

Purchasing & Supply Management

**Make, buy, or ally (MBA) decisions in Central Sterilisation  
Department in Dutch hospitals: influential factor analysis**

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**Abstract**

This qualitative study aims to identify the influential factors in make, buy, or ally decisions for Central Sterilisation Departments (CSDs) and develop a final supporting model. Nine interviews were conducted with individuals in Dutch hospitals, revealing that the make strategy is suitable for urgent or elective care in larger hospitals. Outsourcing CSDs does not lead to direct cost savings due to taxes and hidden costs. Internal CSDs offer flexibility, shorter communication lines, and expertise, positively influencing quality. In-house CSDs tend to have shorter lead times compared to those involving external logistic processes. The relationship of the CSD with the clients, particularly with the Operating Room (OR), is crucial. The undervaluation of CSD, known as "Calimero syndrome," impacts decision-making and workforce motivation. Factors such as costs, flexibility, relationship, expertise, and lead time were validated, but there were deviations from initial expectations regarding costs and communication in buy and ally decisions.

**Keywords:** Make, buy, or ally (MBA), Central Sterilisation Department (CSD), strategic sourcing, influential factors, Make or Buy framework, Transaction cost of Economics (TCE).

## **Preface**

This research is written for the Master's Thesis in Business Administration in the track Purchasing and Supply Management at the University of Twente. During a period of six months, research was conducted and analysed at the company Coppa Consultancy.

This study aims to identify the influential factors in make, buy, or ally decisions within the Central Sterilisation Department based in Dutch hospitals. The subject is chosen based on an open assignment within the company Coppa and immediately caught my attention. I have always wanted to do research within the Healthcare sector and this, in combination with my purchasing education, made it an easy decision.

In total, nine individuals were interviewed and I would like to thank all of them. In addition, I like to express my gratitude to my Coppa supervisor, Mr Willem Hoek, for his guidance, support and feedback these last months, as well as given me the opportunity to conduct this study.

I learned a lot, especially about the importance of the sterilisation department in Dutch hospitals. Lastly, a big "thank you" to my two supervisors, Dr Carolina Belotti-Pedroso and Dr Frederik Vos from the University of Twente. Their kind encouragement and helpful advice have undoubtedly contributed to the completion of this thesis.

Bo Slaghekke

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## Abbreviation list

Central Sterilisation Department	CSD
Operation Room	OR
Make, buy, or ally decision	MBA decision
Supply Chain Management	SCM
Transaction Cost of Economics	TCE

## 1. INTRODUCTION

Strategic purchasing is becoming more important in healthcare to improve healthcare system performance. Health purchasing is connected to all product and service operations in healthcare and is considered strategic when operating decisions are integrative, have a long-term purpose and are proactive in achieving a firm's success (Miah et al., 2014). One particular part of strategic purchasing is strategic sourcing. Strategic sourcing is concerned with finding suppliers to obtain maximum value. Strategic management of suppliers and strategic planning is central here (Carr & Smeltzer, 1999). Since the 1980s, strategic purchasing became popular in literature. Therefore, the high involvement, accountability and responsibility of all managers in an organisation is necessary. Porter, (1980) also mentioned suppliers and buyers are the most important factors in sourcing due to increasing competition. To compete in this market, the financial health of a company is vital and hence all business strategies applied focus at the lowest possible price and taking into account the factor of quality. However, many other factors linked to the buying decision such as lead time or service were not taken into account (Mcivor et al., 1997) .

Mainly because of this incomplete consideration, make, or buy decisions became a more and more discussed topic in the literature. The process of decision-making, the "make or buy" decisions, entails the buyer's deliberation between the internal production of products or services, commonly referred to as insourcing, or the procurement of such goods or services from external suppliers, commonly known as outsourcing (Mcivor et al., 1997). Furthermore, the increasing expenses associated with healthcare in the Netherlands have given rise to considerable challenges. The Netherlands budgeted in 2021 a total amount of more than 107 billion euros with a population of approximately 17 million people (Statista, 2021). The Dutch healthcare system is structured through a combination of public and private arrangements, where all Dutch citizens must insure themselves. Within the healthcare industry, the purchasing process has significant importance, as the supplies expenditures form the second-largest cost (Abdulsalam & Schneller, 2019).

Make, or buy decisions are predominantly driven by cost-benefit analysis, assessing the costs and benefits associated with in-house production (insourcing) versus purchasing from external sources (outsourcing). Since the 1970s, outsourcing has emerged as one of the most commonly employed strategies, with companies primarily prioritizing the lowest price. However, it is now widely recognized that price alone is not the sole determining factor. Additionally, opting for

outsourcing can result in long-term supplier dependency, which carries its own set of challenges (Ford et al., 1993). So the choice between these two decisions is difficult.

Another upcoming trend and alternative for the make-or-buy decision is collaboration/ally. Collaboration means a combination between make and buy, also a hybrid strategy called, for choosing to collaborate with different partners in the buying decision. Vivian-Smith (2000) has identified two distinct perspectives through which make or buy decisions can be analysed: a cost-based perspective and a strategic perspective. While the cost-based perspective emphasizes cost-related factors, the strategic perspective takes into account additional strategic dimensions. The primary focus of this research is directed towards the Central Sterilisation Department (CSD) within Dutch hospitals, which serves as a pivotal entity for ensuring safety in healthcare. Within this department, the crucial tasks of cleaning, disinfecting, and sterilizing instruments utilized in operations rooms, outpatient clinics and other departments are performed.

Hospitals face challenges in determining whether to make, buy or ally decisions and identifying the influential factors involved in the Central Sterilisation Department (CSD) while transitioning between these strategies. The absence of a standardized approach for selecting the appropriate strategy poses difficulties for the board of directors as they collaborate with the purchasing department and other relevant departments within the organisation. And therefore a lot of unnecessary costs are involved with this, which is a problem and not efficient. Furthermore, the Central Sterilisation Department (CSD) plays a vital role in enabling the execution of the primary processes within hospitals. Hence, it is crucial for hospitals to make the correct decision regarding the CSD. A typical example that happened a couple of times in the last years, is that hospitals choose for outsourcing sterilisation and after a few years the hospital finds out that they can do it better in-house because of emergency operations for example.

It is important to note that the type of healthcare provided significantly influences the final make, buy, or ally (MBA) decisions. This aspect is essential to consider in the study. Recognising this challenge, Coppa, a procurement and consultancy company specialising in healthcare and government sectors in Arnhem, the Netherlands, acknowledges the significance of incorporating the type of healthcare service in the decision-making process. To better serve healthcare organisations and save costs, this research focuses on gaining more insight and theory about the make, buy, and ally choice in the field of CSD. The primary objective of this study is to develop a comprehensive model that substantiates the make, buy, or ally choices

based on influential factors associated with CSD. Overall, this research contributes to the existing literature by bridging the gap between cost-based decision-making and strategic dimensions, providing a comprehensive model for hospitals to navigate the make, buy, or ally choices regarding the CSD based on influential factors. By examining the influential factors guiding these decisions, hospitals can gain valuable insights and make well-informed choices using the proposed model as a guiding framework.

#### 1.1 CENTRAL RESEARCH QUESTION

The following Central Research question has been formulated;

*“Which factors play a role in the choice of hospitals in the Netherlands to Make, Buy, and Ally decisions about the Central Sterilisation Department (CSD)?”*



## 1.2 THEORETICAL AND PRACTICAL CONTRIBUTIONS

The investigation of factors influencing make, buy, or ally decisions in healthcare organisations, specifically related to the Central Sterilisation Department, remains largely unexplored in previous research. While numerous studies have examined factors influencing make or buy decisions in other industries, the healthcare sector presents unique complexities due to its critical nature and direct impact on human lives and therefore is not a 'standard' industry looking at the sourcing factors with make, buy, and ally decisions. Sterilisation, being a fundamental aspect of healthcare, is essential to prevent the presence of bacteria in medical instruments used during procedures, which can pose significant health risks to patients (Ostrowsky, 2013). Therefore, it is crucial to conduct this research distinctly and intricately, considering the specific complexities of the healthcare industry. Furthermore, limited information is currently available regarding the factors influencing hospitals' choices to make, buy, or ally decisions in the Netherlands, particularly concerning (parts of) the Central Sterilisation Department which results in the wrong choice of hospitals and unnecessary extra costs. In addition, this study presents a novel theoretical contribution by integrating the make-or-buy model proposed by Cádiz et al., (2001) and the Transaction Cost Economics (TCE) framework. Moreover, a unique aspect of this study is the examination of the barriers and advantages related to the influential factors involved in the make, buy, or ally decisions. This combination of theoretical perspectives and the comprehensive analysis of factors sets this research apart from existing literature in the field. In addition, this study aims to address this research gap and shed light on the decision-making process in healthcare organisations within the context of the Central Sterilisation Department.

There is also a practical implication in this research. Healthcare is an industry which is needed for every person living in the world (Kroneman et al., 2016). The outcome of the central research question is crucial for all the healthcare organisations in the Netherlands and gave insights into the healthcare organisations on which factors to consider in CSD when making make, buy or ally decisions. To explore these factors, action research and interviews will be conducted in hospitals, facilitating a comprehensive investigation. Furthermore, in addition to its impact on healthcare organisations, this research also contributes to the company Coppa and other procurement departments in hospitals in the Netherlands.

## 2. LITERATURE REVIEW

### 2.1 STRATEGIC SOURCING PROCESS

Since the 1980s, strategic sourcing has gained popularity as management gurus like Porter developed procurement models with a strategic approach. Previously, sourcing was often used interchangeably with purchasing (Mark Gottfredson et al., 2005). The purchasing process can be divided into six phases, comprising both tactical and operational components, as depicted in Figure 1 according to Weele, (2010). This distinction in tactical and operational parts allows efficient and effective day-to-day activities and enables procurement decisions to be made at the appropriate organisational level.

Tactical buying, predominantly managed by senior procurement professionals, entails a strategic decision-making process. This includes defining the procurement strategy, identifying potential suppliers, selecting the appropriate suppliers and negotiating contracts. Furthermore, effectively managing the supplier-organisation relationship is crucial to this phase. In contrast with tactical buying, the operational part focuses on executing the established procurement strategy. This involves placing orders, inspecting and evaluating goods, managing inventory and conducting evaluations (Bäckstrand et al., 2019). During expediting and evaluation, it is very important to ensure that the quality of the goods and services meets the contractual standards. The entire procurement process, spanning from internal customers to suppliers, is referred to as procurement.

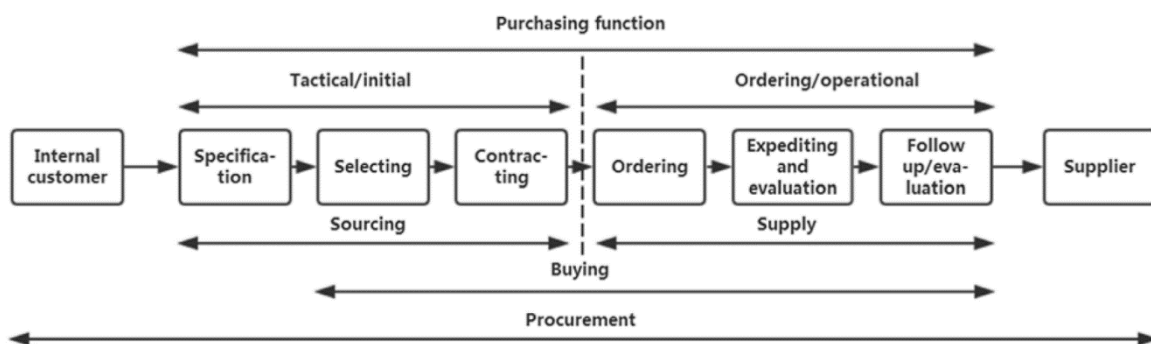


Figure 1. Linear process model Arjan van Weele and reproduced through J. Bäckstrand.

Strategic sourcing is embedded throughout the procurement process as a key component of the procurement process to achieve long-term objectives, including cost reduction, risk management, and quality improvement among others. In today's sourcing market, increased uncertainty and complexity prevail. Failure in sourcing decisions and failure in the management of the entire supply chain can have negative consequences for companies, such as financial losses and quality losses (Kanyoma et al., 2013). Consequently, strategic sourcing holds

significant importance in the healthcare industry and especially in the sterilisation departments of hospitals where making the right decisions is critical. Strategic sourcing is concerned with finding suppliers to obtain maximum value. Strategic management of suppliers and strategic planning are central here (Carr & Smeltzer, 1999). In this context, sourcing decisions are commonly referred to as make, buy, or ally decisions, which will be elaborated upon later in this theoretical section.

2.2 THE DECISION PROCESS OF MAKE, BUY, AND ALLY (MBA)

As previously mentioned, the decision-making process of make, buy or ally, often referred to as outsourcing or insourcing decisions, constitutes an integral part of the initial stage of strategic sourcing (Medina-Serrano et al., 2020). Managers and key decision-makers within the organisation must understand the factors that influence the choice between procuring products/services externally or producing them internally. Savelkoul, (2008) studied this, and two key differentiations were identified; the level of competitiveness among suppliers and the strategic importance of competence in distinguishing core and non-core activities. Figure 2 presents the figure made by Savelkoul where make, buy, and ally is explained within these two distinctions.

According to Cádiz et al., (2001) the decision process of make, buy, or ally is divided into four phases (1) the preparation phase, (2) internal, and external analysis, (3) evaluating options, and (4) choosing the strategy.

<i>Level of competitiveness relative to suppliers</i>	<b>High</b>	<p><b>Maintain/invest (opportunistically)</b></p> <p>Competencies are not strategic but provide important advantages; keep in house as long as these advantages are (integrally) real.</p>	<p><b>In-house /invest</b></p> <p>Competencies are strategic and world-class; focus on investments in technology and people; maximise scale and stay on leading edge. This includes publishing activities such as editorial, design and layout</p>
	<b>Low</b>	<p><b>Outsource</b></p> <p>Competencies have no competitive advantage. In book publishing this includes activities such as printing of the final product</p>	<p><b>Collaborate/maintain control</b></p> <p>Competencies are strategic but insufficient to compete effectively; explore alternatives such as partnership, alliance, joint-venture, licensing, etc. This includes activities such as e-publishing</p>
		<b>Low (non-core)</b>	<b>High (core)</b>

*Strategic importance of competence*

Figure 2. Sourcing decision matrix by Savelkoul (2008)

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### 2.2.1 BUY DECISIONS

In addition to strategic sourcing, make, buy, and ally decisions can be made through companies in the initial stage of the strategic sourcing process. The initial stage of strategic sourcing is the tactical part from specification through contracting. These make, buy, or ally decisions are made by senior management in collaboration with the purchasing department and other relevant departments, taking into account the organisational strategy. The organisational strategy, including the mission and vision, serves as the foundation for strategic sourcing.

The rise of globalisation and intensified competition has made buying a widely adopted decision strategy worldwide, primarily becoming a very popular decision strategy worldwide to reduce costs (Mark Gottfredson et al., 2005). Buying, means that organisations choose to take distance from some of their key activities and look to others for expertise and buying products and services from others. There are various sourcing options available within the buy strategy. Common sourcing options within buying include managed networks, co-sourcing, outsourcing, preferred relationship, spinoffs and disinvestment (Davids & Hendriks, 2008). In the context of this study, the focus primarily lies on outsourcing, as it is the most relevant option for sterilisation in hospitals in the Netherlands. Organisations worldwide have increasingly turned to outsourcing production and evaluating what best suited for creating a firm's performance. Cost savings remain one of the main motivations for companies to adopt the buying strategy.

In an outsourcing decision, firms opt to relocate their production and activities to an external third party rather than performing them in-house (Schniederjans & Zuckweiler, 2004). Typical outsourcing activities in the healthcare sector include IT services and administrative tasks. In today's strategic decision-making landscape, organisations can not only decide to do the firm's activities internally. Studies indicate that 91% of companies already engaged in outsourcing are highly satisfied with the outcomes achieved (Gunderman, 2008).

Numerous reasons have been identified by researchers as to why companies choose outsourcing including risk reduction, access to external expertise and the ability to focus on core competencies. Cost reduction is one of the primary reasons for outsourcing activities (Fan, 2000). For instance, labour costs in Eastern regions of the world are significantly lower than in Europe, making outsourcing a cost-effective option. Moreover, cost reduction can be achieved when the suppliers' costs are lower than the internal costs incurred by the organisation, even after considering delivery, overhead and other expenses. Additionally, rising raw material

expenses, shaped by occurrences like the 2008 financial crisis, the COVID-19 pandemic, and the Ukraine conflict have driven organisations to seek cost-saving measures. Indirect costs, such as reduced infrastructure expenses due to a smaller workforce, and economies of scale also contribute to outsourcing (Edvardsson & Teitsdóttir, 2015). However, it is crucial to acknowledge that cost reduction alone does not ensure decreased expenses, as additional costs can emerge within the organisation, including the "social costs" associated with providing employee education. Nevertheless, these costs are declining, as more third parties are reluctant to bear these social costs (Kremic et al., 2006).

When companies decide to outsource, it becomes essential to establish and manage relationships with third-party providers, necessitating the creation of contracts. Trust and dependency are critical factors in outsourcing in the contract phase; therefore, a good relationship in outsourcing is crucial. Contracts between third parties and the organisation are drawn up to foster stronger relationships (Lee & Kim, 2005). Trust, in this context, refers to the belief that the partner's actions will yield positive outcomes and that the partnership aligns with the common agreement (Pulles et al., 2014).

Disadvantages of outsourcing also play a role such as loss of control within the organisation and lack of ownership over intellectual property. Loss of control refers to the organisation's limited authority over production costs, quality and lead time (Medina-Serrano et al., 2020). Additionally, organisations may not possess intellectual property rights, potentially impacting innovation. Supplier dependency is another drawback of outsourcing, as organisations become highly reliant on suppliers, sharing information, knowledge and resources. This dependency poses a risk if a single supplier experiences disruptions or other issues. Supplier dependency is a crucial aspect of supplier risk management, which involves collaborative supply chain management among partners to ensure profitability, and continuity, and minimize supply risks (Hofmann et al., 2014). Supply chain risk management (SCRM) is divided into four phases; identifying the risk, risk assessment, risk management and risk monitoring. One potential solution to mitigate supplier dependency is to explore alternative suppliers.

According to (Guimarães & de Carvalho, 2011), the healthcare industry is experiencing an increasing tendency towards outsourcing. The author cites the main reasons for outsourcing in healthcare as follows: “ (1) cost reduction, fewer risks for the firm, (3) fast adaptability to unexpected and rapid shifts without risking the internal resources and (4) give the value stream new focus”. Moreover, non-clinical support services, such as laundry, are more commonly

outsourced compared to clinical support services. This preference for outsourcing non-clinical support services stems from the cost-saving motivation associated with such activities (Billi et al., 2004). Table 1 provides a comprehensive overview of the advantages and barriers associated with the buying strategy.

Table 1. Advantages and barriers associated with the buying strategy

Decision process	Advantages	Barriers
<u>Buy</u>	<ul style="list-style-type: none"> <li>→ Cost reduction</li> <li>→ Lower indirect costs</li> <li>→ Focus on core competences</li> <li>→ Flexibility</li> </ul>	<ul style="list-style-type: none"> <li>→ Job losses</li> <li>→ Loss of control</li> <li>→ Other unexpected costs</li> <li>→ Increased complexity of supply network</li> <li>→ Violation of privatisation</li> <li>→ Quality issues</li> <li>→ Supply issues</li> <li>→ Lack of knowhow employees</li> </ul>

### 2.2.2 MAKE DECISIONS

As previously mentioned, the decision to outsource activities is positively influenced by various factors. Many companies experience quality issues and supply-related risks, such as extended delivery and lead times, which prompt the consideration of outsourcing as a viable option (Stentoft et al., 2015). While outsourcing offers numerous advantages, it also has certain drawbacks leading to an alternative decision strategy known as insourcing or make-decisions. In recent years, insourcing is a more discussed topic in the literature regarding the potential value creation and heightened uncertainty associated with complex supply chains that can be achieved through insourcing (Bals et al., 2016). Concerns surrounding quality losses, the need for higher flexibility, and the desire for increased control have further contributed to the adoption of insourcing decisions.

Unlike outsourcing, insourcing involves conducting all of the firm's activities internally within its operational infrastructure, thereby differing in cost implications in contrast to outsourcing (Foerstl et al., 2016). As previously mentioned, outsourcing often results in increased supplier dependency. By bringing activities in-house, firms reduce their reliance on suppliers and enhance their internal resources, thereby potentially improving quality (Shook et al., 2009). Whereas outsourcing focus on the core competencies, insourcing distracts from core competencies resulting in disadvantages for the company. Moreover, insourcing can lead to higher costs and resource limitations compared to outsourcing.

The internal knowledge and expertise of an organisation are critical considerations in insourcing decisions, as the operational activities are conducted in-house. It is important to note that while insourcing is sometimes referred to as reshoring, they are not exactly synonymous. Reshoring refers to; bringing back the firms' activities from another location back to the home location (Barbieri et al., 2018). So, relocation of the manufacturing process of the company. However, in this research, the term reshoring is not utilized, although the concept of insourcing is discussed.

The healthcare industry poses unique challenges due to its complexity and the critical nature of dealing with human lives. A growing trend toward insourcing, rather than outsourcing, is observed in the healthcare sector. Hospitals, in addition to cost reduction, are now focusing on other factors such as quality when making decisions regarding the allocation of activities (Yang et al., 2020). Table 2 provides a comprehensive overview of the advantages and barriers associated with the make strategy.

Table 2. Advantages and barriers associated with the Make strategy

Decision process	Advantages	Barriers
<u>Make</u>	<ul style="list-style-type: none"> <li>→ High brand image</li> <li>→ High quality</li> <li>→ Bring more value creation</li> <li>→ Direct communication</li> </ul>	<ul style="list-style-type: none"> <li>→ Lack of internal expertise</li> <li>→ Time spending</li> <li>→ Storage requirement costs</li> <li>→ Extra labour costs</li> </ul>

### 2.2.3 ALLY DECISIONS

The earlier discussion highlighted the decision process of make and buy in sourcing strategies. However, there is an additional emerging trend in sourcing decisions known as an ally, which is also referred to as a strategic alliance. Ally refers to a hybrid arrangement and collaborative relationship often employed in complex processes (Mudambi & Tallman, 2010). While strategic alliances have been known for over a century, their prominence increased in the 1980s with the emergence of new trends such as technological advancements, increased product and service complexity, intensified competition and shortened product life cycles (Vyas et al., 1995). In the healthcare industry, various categories of strategic alliances can be separated including stakeholder alliance, service and opportunistic alliance. These alliances became necessary as companies faced new challenges and opportunities that could not be addressed solely within their internal resources (Zuckerman & Kaluzny, 1991). The growth of strategic alliances in companies has been driven by the adoption of technologies and innovations,

facilitating information sharing and collaboration, such as collaborative research and development. Within the ally sourcing strategy, various options exist, including participation, joint venture, strategic alliance, consortium, co-branding and franchise (Davids & Hendriks, 2008). This study primarily focuses on the strategic alliance, as the most relevant option for examining sterilisation processes in Dutch hospitals.

A strategic alliance is defined as a collaborative arrangement involving one or more entities working towards a common goal, often characterised as a hybrid arrangement (Mudambi & Tallman, 2010). These alliances facilitate information sharing and innovative ideas, enabling collaborative development and risk sharing. Moreover, strategic alliances can enhance economies of scale. However, in many cases, the manufacturing, R&D etc. is shared with the partner which can lead to disadvantages such as disclosure of information. Various forms of disclosure of information can occur including; loss of image, loss of power, loss of tactical flexibility and loss of control (Ramsay, 2004). Some examples of strategic alliances in the healthcare sector could be a pharmaceutical collaboration, mostly to develop new medicines/drugs. Different forms of alliances in healthcare could be formed. Bernardo et al., (2012) studied different types of alliances in hospitals; alliances between hospitals, alliances between hospitals and primary care centres and alliances between hospitals and other institutional entities. Collaborations among hospitals may involve sharing resources and expertise, such as the Central Sterilisation Department responsible for sterilisation services.

Ketchen and Hult (2007) examined the concept of the best value supply chain and emphasized the importance of establishing contracts to govern relationships when two or more entities collaborate. Building a relationship, long-term agreements and good communication are crucial in strategic sourcing to develop trust and facilitate ongoing developments which often require time. Additionally, cultural competitiveness plays a vital role in fostering positive relationships and collaborations. Understanding the desires and costs associated with each party's objective is essential (Ketchen & Hult, 2007). Furthermore, establishing a collaboration with a partner can be a complex and time-consuming process, necessitating coordination and communication.

Contract breach violations can occur when a party experiences negative outcomes, leading to emotional distress due to the failure of a contract. Hence, trust is crucial to prevent contract breach violations (Eckerd et al., 2013). Alongside trust and power, interdependency is another crucial dimension within the construct of collaboration. Interdependency arises when the partnerships 'needs in collaboration are equal (Mudambi & Tallman, 2010).



Table 3 provides a comprehensive overview of the advantages and barriers associated with the ally strategy.

Table 3. Advantages and barriers associated with the ally strategy

Decision process	Advantages	Barriers
<u>Ally</u>	<ul style="list-style-type: none"> <li>→ Improved levels of service</li> <li>→ Greater technical differentiation</li> <li>→ Greater business differentiation</li> </ul>	<ul style="list-style-type: none"> <li>→ Opportunistic behaviour</li> <li>→ Loss of managerial control</li> <li>→ Loss of financial resource control</li> <li>→ Leak of technical resources</li> </ul>

**2.3 ADVANTAGES AND BARRIERS TO MBA DECISIONS**

The decision-making process for make, buy, or ally strategies involves senior management collaborating with purchasing and other departments within the company. As discussed earlier, these strategies entail distinct approaches. In this section advantages and barriers associated with each strategy.

As previously mentioned, one of the primary reasons for choosing to buy is cost reduction and the ability to focus on core competencies. Cost reduction is the key advantage of outsourcing, as it allows for lower labour costs in countries with lower wages (Fan, 2000). Additionally, indirect cost savings, such as reduced employee count, contribute to the advantage of outsourcing decisions. However, a potential barrier is the risk of deteriorating quality in the outsourced activities and the emergence of unforeseen costs, such as training expenses. Reduced quality may result from external employees lacking familiarity with the business’s know-how and know-how and delivering different levels of quality (Ye et al., 2014). A third advantage is the flexibility provided by remote employees, which is crucial for rapidly growing companies to adapt and expand easily (Kremic et al., 2006). However, a barrier to consider is the potential loss of jobs within the company, which can lead to dissatisfaction among employees. Moreover, outsourcing non-core process activities allows firms to concentrate more on the core activities which can lead to greater firm competitive advantages (Sislian & Satir, 2000).

As the company grows rapidly, more time and resources can be allocated to focus on core activities, reducing money on non-core activities (Bailey et al., 2002). However, a barrier to buying is that the firm's business assets become wholly or partially controlled by the outsourced provider, creating concerns about privatization violation. Additionally, supply issues and

increased complexity in the supply network can arise when buying involves activities across international borders (Harland et al., 2003). Loss of control is another barrier associated with outsourcing, as the firm may lose control and monitoring capabilities over the outsourced activities. However, establishing a high level of trust between both parties can mitigate this barrier. The buyer-supplier relationship can be beneficial here, which fosters trust. Open communication, respect and mutual benefit are some factors that contribute to a good buyer-supplier relationship (Gullett et al., 2009)

While the loss of quality is considered a barrier to outsourcing, increased quality is regarded as an advantage in insourcing. In-house activities lead to improved quality because all of the firm's activities are performed internally, ensuring consistent quality and allowing the company to maintain control over product quality. However, conducting these activities in-house requires additional labour costs (Stentoft et al., 2015). Furthermore, a lack of internal expertise can pose a risk to the company. Additionally, storing all products in-house results in high storage costs, although transportation costs are reduced. It is important to note that in-house production can be time-consuming, which can be perceived as a risk for the company as time equates to money. On the other hand, one advantage of in-house production is the enhancement of the brand image (Zhang et al., 2018).

Direct communication can be seen as one of the pivotal advantages of insourcing, as employees can better communicate when the employees are situated in the same location and time zone. This helps prevent misunderstandings and saves time in addressing issues within the organisation (Stentoft et al., 2015). Additionally, cultural differences within the company are less pronounced, minimizing potential misunderstandings. A fourth advantage of insourcing is that conducting activities in-house can lead to greater value creation. Working together in the same location fosters stronger relationships among employees, resulting in higher productivity and potentially more innovative ideas (Foerstl et al., 2016). Loss of managerial control is a barrier both in outsourcing and forming alliances. In alliances, decision-making control is no longer exclusive to the firm and must be shared. Moreover, there is a loss of financial resource control, which can be seen as a barrier when there is a lack of trust in the partnership (Alvaiez, 2001). However, greater business differentiation can be seen as an advantage in alliances as they provide opportunities to access new markets. One of the significant advantages of insourcing is an improved level of service, as the firm can provide service to customers that would not be available. Additionally, greater technical differentiation can be seen as an advantage of insourcing, as technical capabilities can be shared (Elmuti & Kathawala, 2001).

In the case of contract breach violation, opportunistic behaviour can be seen as a barrier in alliances. When one party fails to meet the terms of the contract agreement, long-term opportunistic behaviour poses a threat to alliances, and resolving such problems can be challenging (Eckerd et al., 2013). A visual overview of the presented advantages and barriers is provided in Figure 3.

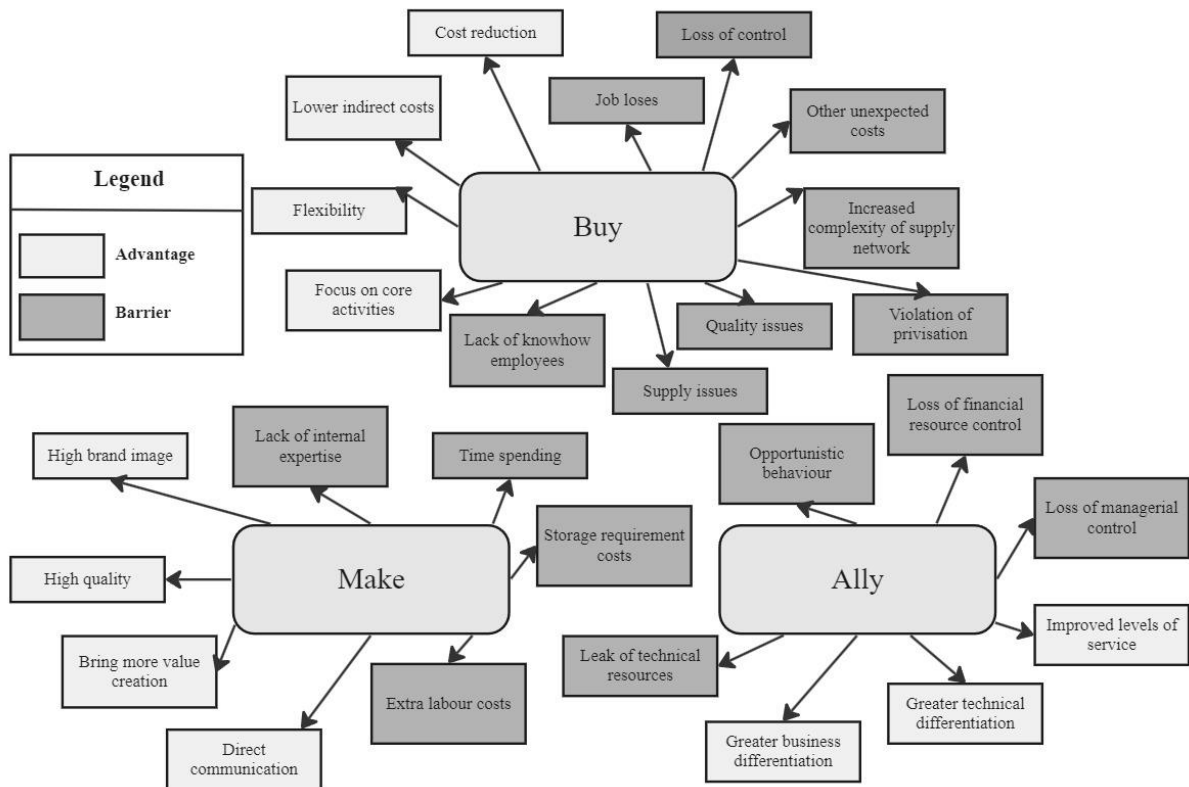
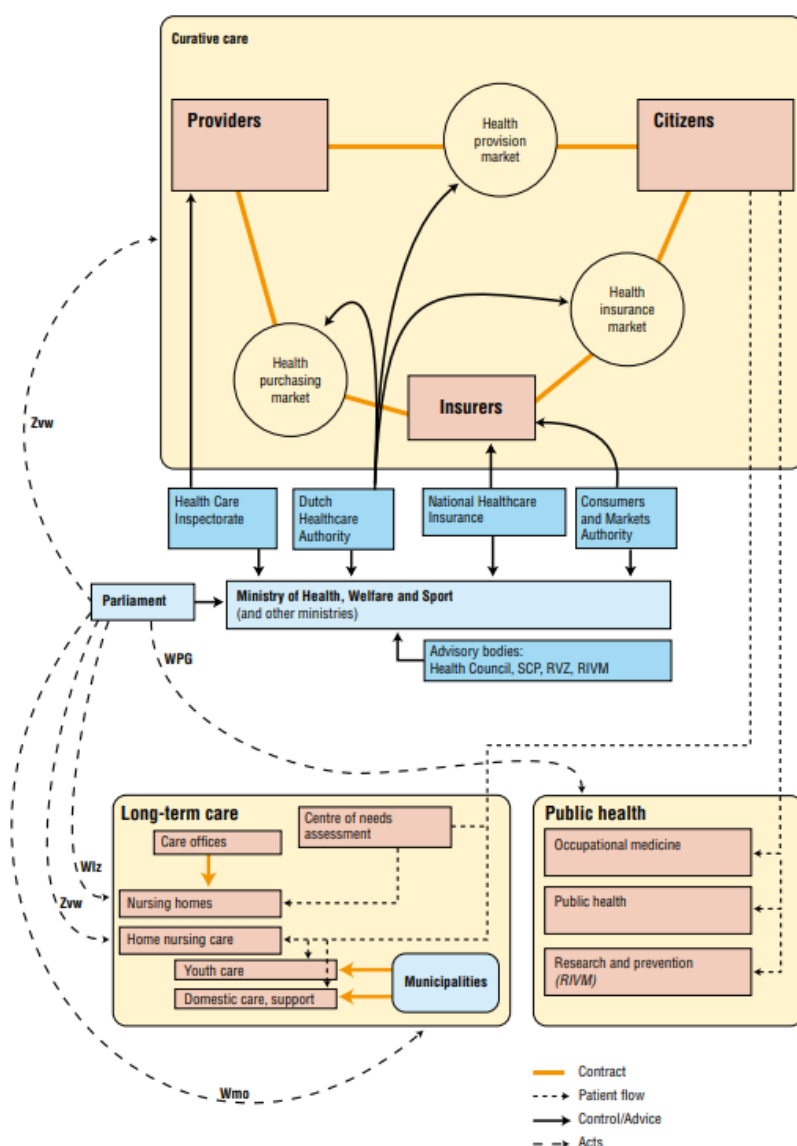


Figure 3. Advantages and Barriers in make, buy, or ally decisions

The choice between the strategies of make, buy, or ally depends on decision criteria related to advantages and barriers. In terms of the buying strategy, factors such as cost reduction, focusing on core competencies, and flexibility are crucial. Therefore, outsourcing (buy strategy) becomes the preferred option. On the other hand, the make strategy prioritizes maintaining a strong brand image, ensuring high quality, and creating value through direct communication. Consequently, insourcing (make strategy) is the preferred choice. Lastly, the ally strategy is driven by decision criteria such as improved service levels, access to specialized technical expertise, and achieving economies of scale. Hence, forming a strategic alliance (ally strategy) is the recommended approach. Nevertheless, it is important to consider the potential barriers and evaluate the specific advantages and disadvantages within the given context.

## 2.4 THE DUTCH HEALTHCARE SYSTEM

The Dutch Healthcare system is widely regarded as one of the world's leading hybrid healthcare systems (Jonas & Krause, 1975). The system is arranged via social health insurance, ensuring that all Dutch citizens have mandatory health insurance coverage. The government plays a significant role in the healthcare system, as it holds ultimate responsibility and has influence over healthcare costs (Altman & Morgan, 1983). The organisational structure of the Dutch healthcare system is divided into three categories of care: curative care, long-term care and public health (Kroneman et al., 2016). Curative care focuses on patients where a cure is achievable. Long-term care is designed for individuals with chronic illness or disabilities who



require ongoing assistance and support for an extended period (Gardiner et al., 2015). As third, public health focuses on care for the general population and preventing the onset of diseases. Research is focused on all three within the health purchasing market, as sterilisation is needed in every care. Within the health purchasing market, three key actors operate in separate markets: providers, citizens and insurers. Providers offer healthcare services in the health provision market, citizens utilize these services, and insurers operate in the health insurance market (Kroneman et al., 2016).

Figure 4. Organisational structure healthcare Netherlands- M. Kroneman et al. (2016)

Figure 4 illustrates the organisational structure of the healthcare system in the Netherlands. Healthcare providers, including hospitals, have the responsibility for delivering quality care (Victoor et al., 2012). In the Dutch healthcare system, every Dutch citizen is required to pay a monthly premium for basic health insurance, with the option to expand coverage through additional insurance for services like physiotherapy or dental care. Citizens can choose from different insurance packages available in the health provision market (Asbroek et al., 2004).

In addition to the three categories of care mentioned earlier (long-term care, curative care, and public health care), it is important to consider different types of health within this study. This is because certain situations, such as emergencies, require immediate access to medical instruments, whereas elective care like knee operations can be planned in advance and potentially outsourced. Therefore, this study specifically focuses on two types of health care: elective care and urgent care.

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#### 2.4.1 CENTRAL STERILISATION DEPARTMENT (CSD)

Now the Dutch healthcare system has been explained, the focus of this research is on the sterilisation department. The CSD, also known as Central Sterilisation Department plays a crucial role in healthcare by ensuring sterilisation and supply departments to prevent risk of infection transmission and ensure patient safety. In the Netherlands, healthcare facilities experience an annual healthcare infection rate of 4.9% due to inadequately sterilised medical equipment (*Decontaminatie En Sterilisatie / Medisch / 3M Nederland*, n.d.). Every hospital requires a central sterile department to clean and disinfect and sterilise medical equipment used in operations, departments, and outpatient clinics (Rüther et al., 2013). The sterilisation process provides sterilised materials such as surgical instruments to operations rooms in hospitals (Basu et al., 2015). On average, a medium-sized hospital in the Netherlands processes around 200-250 sets of medical equipment per day that need to be sterilised.

The organisation of the central sterilisation department varies across different hospitals in the healthcare sector. The responsibility for central sterilisation is often assigned to the healthcare facility's infection control department or a separate sterilisation department. In some cases, there may be a dedicated department within the hospital, such as the operating room, responsible for sterilisation. This variation adds complexity to the process (Sophie Lerouge; Anne Simons, 2012). Key tasks of the sterilisation department include cleaning and disinfecting medical equipment, sterilising equipment before use, ensuring proper packaging and labelling

of sterilised equipment, and supplying the equipment to the appropriate locations, such as the operating room (Shriyan & Shriyan, n.d.).

According to Shriyan & Shriyan ( n.d.) CSD is separated into four zones to ensure an efficient workflow (1) decontamination area, (2) packing area, (3) sterile area and the (4) storing area for sterile goods. In the decontamination area medical equipment is received and the instruments are disinfected and cleaned within a machine. After disinfecting and cleaning the instruments, the instruments are inspected by the CSD staff, and if the instruments meet the cleanliness criteria, they are packed. The packed instruments are then labelled and placed in an autoclave. The autoclave process involves a vacuum phase of approximately 45 minutes, followed by sterilisation for about 5 minutes, with the entire autoclave process taking approximately an hour. After the autoclave, the sterilised instruments must cool down for half an hour in the sterile room and are then checked before being placed in lockable containers for transport to the sterile room. The packed sets of sterile instruments are stored in the storage area for sterile goods. Appendix 2 provides more detailed information about the sterilisation process, and Figure 5 offers a condensed overview of the CSD process.

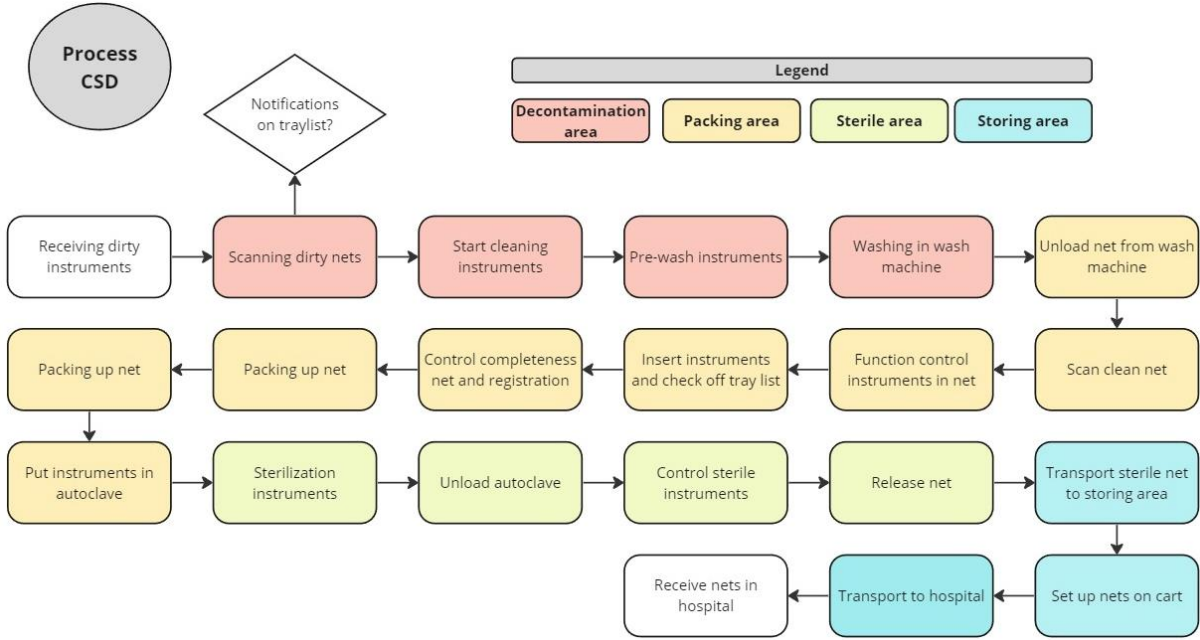


Figure 5. Process CSD Dutch hospitals

### 3. THEORETICAL FRAMEWORK

#### 3.1 KEY DETERMINANTS OF MBA DECISIONS

Companies often employ three primary strategies: make, buy, and ally decisions. The make decision entails producing resources internally within the organisation. This choice is typically made when the costs of conducting external transactions outweigh the expenses associated with in-house production (Foerstl et al., 2016). On the other hand, the buy strategy involves outsourcing activities. However, in terms of innovation decisions, the make-and-ally strategies yield more substantial positive effects compared to the buying strategy (Davids & Hendriks, 2008). Before engaging in a buy decision, firm managers should familiarize themselves with the process involved. Lastly, ally decisions encompass hybrid arrangements where collaborating parties work towards a common objective. The advantages and barriers associated with these make, buy, and ally decisions have been discussed previously.

Cáñez et al., (2001) investigated the make or buy decisions and the factors influencing them across different areas. It is important to note that organisations are not always the sole influencers of the make-or-buy decision; external environmental factors play a significant role. These factors, depicted in Figure 6, include competition, social, economic, supplier availability, political, and environmental elements.

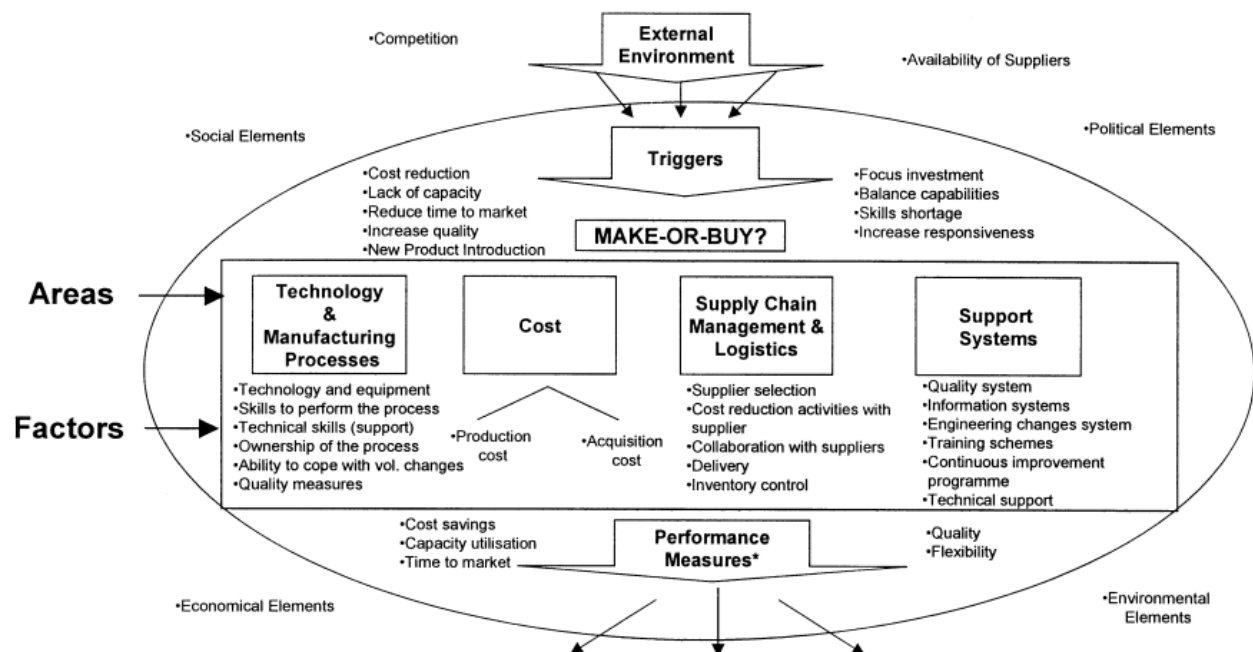


Figure 6. Make-or- buy framework by Cáñez et al. (2001)

Another critical factor in this study is the supply chain lead time, as delays in the central sterilisation process can result in operational disruptions and unsterilized equipment in hospitals (Sophie Lerouge; Anne Simons, 2012). Additionally, when outsourcing instruments for the

operating room (OR), transportation delays due to traffic congestion become a potential trigger. Each of these external environmental factors has specific triggers that impact the make or buy decision. For example, the war in Ukraine may lead to supplier issues, forcing organisations to switch between suppliers. By examining the reasons behind specific strategy choices, triggers within the framework can be identified. Triggers refer to events that activate a particular action and serve as the starting point for decision-making. To identify triggers, one can ask why a particular decision is being made. The framework focuses on different areas or domains, four in total, each with a distinct perspective and separable factors. These factors influence the central sterilisation process studied in this research. Finally, the framework includes performance measures, which serve as criteria for evaluating the different factors and are closely related to the triggers (Cáñez et al., n.d.).

As previously discussed, cost reduction is the primary trigger that activates the factor of production costs. Cost reduction is a key factor in the decision-making process for make, buy, or ally decisions. Specifically, in this study, production costs are related to investments in healthcare equipment, labour costs, and location-specific costs (Wernz et al., 2014). Cost savings serve as the performance measure in this context. Another important factor is the shortage of skills, which highlights the significance of expertise within the organisation, particularly in the field of central sterilisation. The level of expertise in the organisation directly impacts the quality of outcomes, with higher expertise generally leading to improved quality (Berry et al., 2021). Therefore, quality is the performance measure associated with this factor. The increase in responsiveness serves as a trigger for the degree of flexibility. Responsiveness refers to how quickly and effectively unexpected circumstances are addressed within the organisation. Given the unpredictable nature of the healthcare industry, adaptability to unforeseen situations is crucial (Ward et al., 2015). Therefore, adaptability is an important measure to assess the effectiveness of the central sterilisation department (CSD) in responding to changing circumstances.

Communication problems emerge as a significant trigger between the Central Sterilisation Department and the operating room. These departments heavily rely on each other, making effective communication essential. The factor of relationship is associated with the collaboration between the Central Sterilisation Department and its main clients. Trust is the performance measure that contributes to fostering a strong buyer-supplier relationship (Gullett et al., 2010). Lastly, transportation acts as a trigger for the supply chain lead time, particularly in the context of outsourcing the central sterilisation department. When outsourcing the



instruments of the operating room, transportation delays, such as those caused by traffic jams or disruptions, can occur (Zhang et al., 2018). Lead time serves as the performance measure, which reflects the variation experienced in lead time. The determinants as discussed in this section are depicted in Table 4.

Table 4. Determinants make, buy, ally decisions in CSD

Key source	External environment	Triggers	Factors	Area	Performance measure
(Cáñez et al., n.d.) (Wernz et al., 2014) (Fan, 2000)	Economical element	Cost reduction	Production costs	Cost	Cost savings
(Cáñez et al., n.d.) (Berry et al., 2021)	Economical element	Skills shortage	Expertise in organisation	Technology and manufacturing process	Quality
(Cáñez et al., n.d.) (Leiblein et al., 2002; Bailey et al., 2002)	Environmental elements	Increase responsiveness	Degree of flexibility	Technology and manufacturing process	Adaptability
(Cáñez et al., n.d.) (Gullett et al., 2009) (Davids & Hendriks, 2008)	Social element	Communication problems	Relationship	Technology and manufacturing process	Trust
(Cáñez et al., n.d.) (Stentoft et al., 2015)	Environmental element	Transportation disruption	Supply chain lead time	Supply chain management and logistics	Lead time

In the context of Central Sterilisation Departments (CSDs), several aspects are considered highly relevant. One of the key factors is the degree of flexibility, which holds significant importance in the healthcare industry, particularly in CSDs dealing with urgent care situations. The ability to adapt and respond fast to unexpected changes or emergencies is crucial for ensuring the timely availability of sterile instruments and equipment. Additionally, costs play a critical role in the decision-making process for CSDs. The efficient allocation of resources and effective cost management is essential to maintaining the financial viability of the department. Considering the previous discussions, it is evident that costs are consistently mentioned as one of the main factors influencing the decision-making process.

### 3.2 TRANSACTION COST OF ECONOMICS

This study seeks to explore the factors that influence make, buy, and ally decisions within specific aspects of the Central Sterilisation Department (CSD). To comprehensively examine these factors, the theoretical framework of transaction costs of economics is employed. Additionally, the make-or-buy framework proposed by Cádiz et al. (2001) is referenced in Section 3.1.

Transaction costs of economics are widely used to elucidate corporate governance in MBA decisions. The origins of this theory can be attributed to Coase (1937) who aimed to explain why certain assets are produced within firms with hierarchical governance structures, while others are outsourced. Transaction costs encompass both indirect costs and production costs. Indirect costs include activities such as searching, negotiating, and monitoring the relationship, whereas production costs pertain to the costs associated with producing the product or service (Greiner & Goodhue, 2005). Within the framework of transaction costs of economics, three primary determinants—uncertainty, asset specificity, and frequency of transactions—shed light on why firms choose to make, buy, or ally during transactions. Initially, alliance decisions were not explicitly incorporated into the transaction costs of the economics framework.

However, subsequent developments have led to the inclusion of ally decisions, which are further categorised into relational governance and hierarchical governance within the transaction costs of the economics framework (Dahlberg, 2015). There has been a shift in describing transaction costs economics (TCE) using organisational terms instead of neoclassical terms. Within the framework of TCE, several factors contribute to positive transaction cost economics, and at least three key factors can be identified. Firstly, the business world is characterized by high complexity and uncertainty, making it challenging for

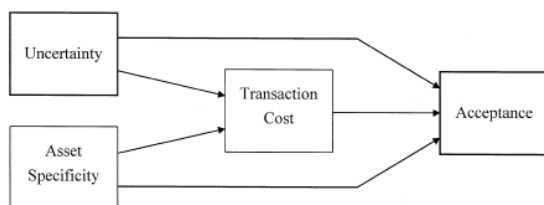


Figure 7. TCE framework by Liang & Huang (1998)

individuals to accurately forecast and plan future outcomes. This lack of knowledge hinders effective planning (MacHer & Richman, 2008). Secondly, negotiations between parties involved in transactions can be difficult due to the absence

of a common language or shared understanding. This communication barrier adds complexity to the relationship (O. Hart, 1995). Thirdly, when parties establish a good relationship and negotiate contracts, the enforcement of those contracts can be facilitated by a third party, such as a court. This external enforcement mechanism provides assurance and encourages compliance (O. Hart, 1995).

TCE has found applications in various fields, including the healthcare sector, where factors like changing medical technology have prompted its adoption. Furthermore, Noordewier et al., (1990) suggested that TCE can be utilized to examine alliance outcomes in environments characterized by high uncertainty. According to O. D. Hart, (2016), the transaction cost exists in uncertain environments where vertical integration is the solution. In the context of the relationship between the Central Sterilisation Unit (CSSD) and the Operating Room (OR), vertical integration refers to the integration of both departments within the same hospital, operating under a unified organizational structure. Vertical integration facilitates close collaboration between the CSSD and OR, enabling them to align their goals, decision-making processes, and responsibilities. This promotes effective communication, streamlined coordination, and a seamless workflow between the two departments.

The TCE framework facilitates the assessment of the most favourable option by considering transaction costs and the allocation of control and ownership rights. In the 'make' scenario, the hospital maintains complete control over sterilisation activities but assumes the costs and risks associated with internal operations. In a 'buy' approach, the hospital outsources sterilisation services to an external supplier, enabling cost reduction and risk mitigation, although potentially sacrificing some control over quality and scheduling. Alternatively, in an 'ally' arrangement, hospitals can collaborate to attain economies of scale and distribute risks, contingent on the establishment of an effective collaborative structure and coordination. Transaction Cost Economics (TCE) is a relevant framework to consider within the context of the Central Sterilisation Department (CSD). TCE examines the costs and risks associated with transactions between different entities or organizational units.

In the case of the CSD, there are various transactions and relationships involved, such as interactions with suppliers, internal departments, and external stakeholders. TCE helps to identify and analyse the costs and risks associated with these transactions (Joskow, 1988). For example, the CSD may have to consider the costs of outsourcing certain sterilisation processes to external providers versus performing them in-house. Furthermore, TCE can be applied to evaluate the relationships and contracts between the CSD and its suppliers (O. D. Hart, 2016). By examining the governance mechanisms and contractual arrangements, the department can assess the efficiency and effectiveness of these relationships. Studied the relationship between two or more parties where the transaction cost plays an important role.

The subsequent section will provide information on the different developed propositions. The two theoretical frameworks discussed earlier, transaction cost economics and the make-or-buy framework depicted in Figure 6, offer different perspectives on the influential factors in make, buy, and ally decisions.

**3.3 APPLYING TCE AND MAKE-OR-BUY FRAMEWORK TO EXPLAIN THE INFLUENCING FACTORS IN MBA DECISIONS ABOUT CSD**

The make-or-buy framework theory provides general insights into make-and-buy decisions, while the transaction costs economics (TCE) framework offers more specific information on ally decisions. The make-or-buy framework is valuable for understanding the triggers that influence make-and-buy decisions and identifying the relevant factors in each area. It acknowledges that organisations may not always have control over these factors, thus considering the external environment. However, for a comprehensive understanding of the influential factors, it is important to also consider other factors not addressed in this framework.

By combining the determinants presented in Table 4 and the TCE framework illustrated in Figure 7, a general model can be developed, as depicted in Figure 8. This general model is derived from the literature reviewed, and based on it, the following propositions can be formulated concerning the literature and the developed model.

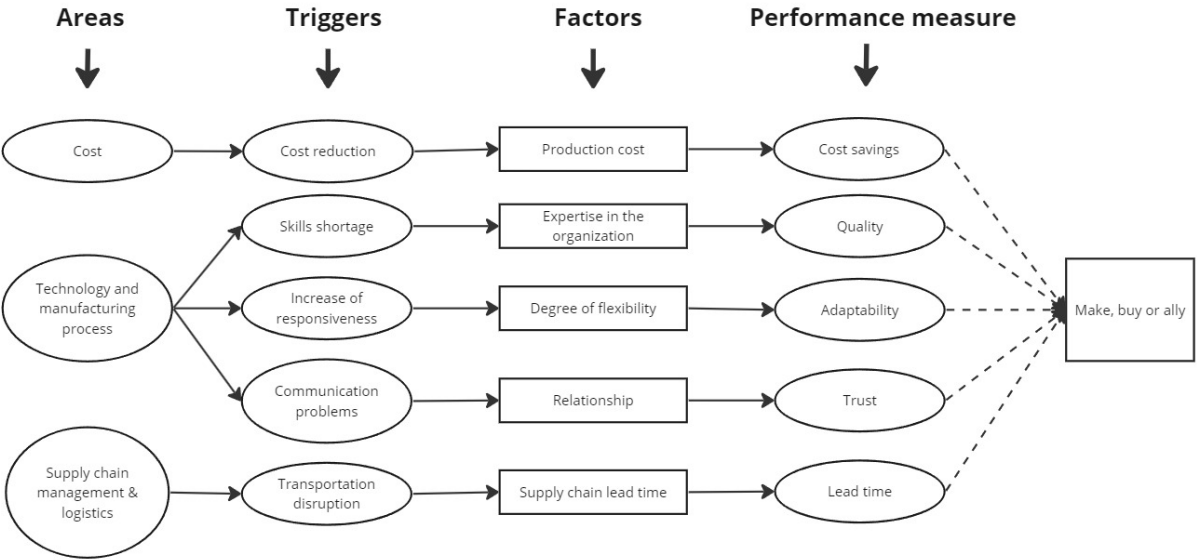


Figure 8. General model

### Make, or buy framework factors

One of the factors identified in the make-or-buy framework that can potentially influence the make, buy, and ally decisions about the Central Sterilisation Department (CSD) is production cost (Cáñez et al., n.d.). Production cost encompasses various aspects, including direct costs, material costs, and overhead costs associated with manufacturing a product or providing a service (Mcivor et al., 1997). Examples of these costs include labour costs and machine costs (Stentoft et al., 2015). The trigger for considering production costs is cost reduction. As mentioned earlier, cost reduction is often the primary trigger driving the decision to outsource rather than insource (Fan, 2000). Moreover, within the healthcare sector, production costs have significantly increased, and substantial investments in equipment, such as autoclaves, are required. Based on this information, the first proposition can be formulated:

*Proposition 1: The production costs are the most important factor and have a negative influence on the make decisions about CSD.*

The second factor addressed in the make-or-buy framework is organisational expertise, which refers to the internal knowledge and capabilities within the organisation. When there is a high level of expertise present, insourcing is generally preferred over outsourcing (Karlsbjerg et al., 2005). However, it is important to distinguish between the organisation's expertise and the potential knowledge or technology that suppliers may possess but the organisation lacks (Berry et al., 2021). In the healthcare industry, particularly in the sterilisation process, complexity is increasing, and healthcare organisations aim to prioritize their core activities. Insufficient expertise can result in a decline in quality. Additionally, Alexander & Young, (1996) highlight that the absence of well-developed monitoring in outsourced service levels can lead to compromised quality. Considering these points, the following proposition is formulated:

*Proposition 2: The internal expertise positively influences the quality of in-house production of the CSD.*

The third factor highlighted in the make-or-buy framework is the degree of flexibility, which pertains to the ability of the Central Sterilisation Department (CSD) to adapt and handle various situations. This includes how the department manages both elective and urgent sterilisation processes. The trigger for this factor is the increase in responsiveness, indicating how effectively and promptly the sterilisation team can handle urgent situations (Cáñez et al., n.d.). However, researchers have suggested that outsourcing can provide flexibility in terms of

technological performance, allowing organisations to focus more on their core activities and thereby enhancing overall flexibility (Leiblein et al., 2002; Bailey et al., 2002). Additionally, a higher degree of control within the organisation can also contribute to greater flexibility (Davids & Hendriks, 2008). In the healthcare context, organisations retain full control over the performance of activities in the CSD, enabling direct management and adjustment of planning and quality. Furthermore, flexibility in risk management involves the capacity to identify and respond to potential risks or disruptions, with effective planning playing a crucial role (Hofmann et al., 2014). Based on this information, the third proposition can be formulated as follows:

*Proposition 3: The high degree of flexibility positively influences the make decisions about the CSD.*

The fourth factor in the make-or-buy framework is the supply chain lead time, which refers to the total duration from the initial order placement to the final delivery destination. Specifically, in this study, the supply chain lead time encompasses the transportation of dirty instruments from the operation room to the Central Sterilisation Department (CSD) for sterilisation and their subsequent return to the operation room. When the supply chain lead time is uncertain, it introduces various risks and challenges that can significantly impact the decision-making process. Quality issues and supply-related risks, such as increasing delivery times and lead times, are common challenges faced by many companies (Stentoft et al., 2015). Supplier risk management, which involves collaborative efforts among supply chain partners to ensure profitability, continuity, and mitigate supply-related risks, becomes crucial in such situations (Hofmann et al., 2014). Effective production scheduling plays a vital role in managing the supply chain lead time, particularly when emergencies arise, as it poses challenges for operation room scheduling. Additionally, inventory management within the CSD also influences the supply chain lead time. Based on this information, the following proposition is formulated:

*Proposition 4: The level of high risk related to the supply chain lead time in the Central Sterilisation Department has a negative influence on the buy decisions.*

### TCE framework factors

Within the framework of Transaction Costs Economics (TCE), the factor of relationship holds significant importance in alliance decisions. According to TCE, the partner with greater power tends to dominate the relationship and prefers insourcing to minimize dependency, making a strong relationship critical in outsourcing scenarios (Frazier & Rody, 1991). By employing TCE, firms can make make-or-buy decisions by minimizing transaction costs. However, an excessive concentration of power is undesirable. Optimal adaptive behaviour and trust between both parties are achieved when there is low oppositional intensity and high directness (Pulles & Loohuis, 2020). Communication problems between the Operation Room (OR) and the Central Sterilisation Department (CSD) can pose risks to the organisation, such as delays in instrument availability, which in turn can disrupt surgical procedures and jeopardize patient safety (Vermeir et al., 2015). Additionally, communication problems between the OR and CSD can lead to the use of incorrect instruments during surgery. If the CSD is unaware of such issues, there is a high risk of incorrect instrument provision, further impacting patient safety (Bruce Hugman, 2013).

It is assumed that the risks are lower and therefore the transaction costs are reduced when activities are conducted in-house due to the increased direct contact between the OR and CSD (O. D. Hart, 2016; Davids & Hendriks, 2008). Direct communication is regarded as a primary advantage of insourcing, as employees situated in the same location and time zone can effectively communicate, minimizing misunderstandings and saving time in problem resolution within the organisation (Stentoft et al., 2015).

In summary, by establishing a strong relationship and effective communication between the OR and CSD, healthcare organizations can reduce transaction costs, minimize dependency, and mitigate risks associated with communication problems. This can lead to improved operational efficiency, better patient safety, and overall cost savings in make and ally decisions. Furthermore, reduced cultural differences within the company can also help prevent misunderstandings. Based on this information, the following proposition is developed as the fifth proposition:

*Proposition 5: Within the framework of Transaction Cost Economics (TCE), a strong relationship between the Operation Room (OR) and the Central Sterilisation Department (CSD) with good communication reduces transaction costs in make and ally decisions.*

In the end, a comprehensive table will be constructed in the results section, presenting the outcomes of the propositions and indicating whether they have a positive or negative influence on make, buy, or ally decisions. Table 5 has been formulated by integrating all the findings from the literature review.

Table 5 Influential factors in make, buy, or ally with CSD based on the literature

<b>Influential factors in make, buy, or ally decisions about CSD</b>			
<u>Influential factors</u>	<u>Make</u>	<u>Buy</u>	<u>Ally</u>
Production costs	High	Low	Low
Internal expertise in organisation	High	Low	Low
The degree of flexibility	High	Low	High/low
Supply chain lead time	Short	Long	Long
Relationship between CSD and OR	Strong	Not strong	Not strong



## 4. METHODOLOGY

This study aims to construct a model that supports MBA decision-making by considering tangible factors. To achieve this, the current state of healthcare in the Netherlands, specifically focusing on sterilisation, is examined, and factors relevant to these decisions are explored. This chapter outlines the research methodology, data collection methods, and data analysis techniques employed in this study.

### 4.1 QUALITATIVE RESEARCH

Research can be conducted using qualitative and quantitative data analysis methods. Qualitative research focuses on descriptive information, while quantitative research involves measurable data. Quantitative data provides numerical values, whereas qualitative data is expressed through language (LeCompte, 2000). In the context of identifying the current state of healthcare in the Netherlands regarding sterilisation for make/buy/ally decisions, qualitative research is the most appropriate data analysis technique.

To answer the Central Research Question; *“Which factors play a role in the choice of hospitals in the Netherlands to Make, Buy, and Ally decisions about the Central Sterilisation Department (CSD)?”* multiple case studies are used as a research method.

Case study research is a method that involves a systematic investigation of a specific phenomenon in real-life, focusing on the how and why questions. It is a linear and iterative process aimed at explaining and describing the phenomenon under study. According to Yin, (2013), there are two types of case study designs: single-case designs, which are suitable for unique or extreme cases, and multiple-case designs, which are used for replication purposes. In case studies, collaboration between the researcher and participants is crucial for data collection. It allows for the direct involvement of employees from sterilisation departments and other external participants in the research process.

This method is particularly suitable for gaining a deep understanding of the problem situation in real-life contexts (Tsang, 2012). Given the limited availability of information on the specific sterilisation part in make/buy/ally decisions, the flexibility of case studies aligns well with this research. It provides an opportunity to explore new and complex information that emerges from the research (Bennett, n.d.).

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#### 4.2 DATA COLLECTION METHOD

In case studies, interviews with multiple interviewers are commonly used as a data collection method to gather accurate information about people's experiences. Therefore, interviews are the most suitable way to collect data for this research. In case studies, interviewers ask open-ended questions to elicit the interviewee's perceptions. Open-ended questions allow individuals to freely express their opinions, providing valuable insights into their perspectives, opinions, and experiences (Vinten, 1995). Semi-structured interviews, known for their flexibility, are widely used as a data collection method. In this study, semi-structured interviews are employed to identify potential factors that play a role in MBA decisions. Surveys are not applicable in this study because the factors at play are not yet clear, and surveys typically follow a structured approach (Hallberg, n.d.). Furthermore, observations are not suitable for this study as the focus is on identifying factors, not observing behaviours that could potentially influence the study.

The unit of analysis refers to the individuals or entities being studied (Bernardez, 2007). In this research, the unit of analysis consists of hospitals and private clinics in the Netherlands that have a sterilisation department. The study specifically focuses on the sterilisation process, thus involving heads of the Central Sterilisation Department (CSD), managers, and CSD outsourcing parties. The questionnaire covers various topics, including personal-related questions, the sterilisation process, the goals of make, buy, and ally decisions in the CSD, influential factors, advantages, and barriers.

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#### 4.3 SAMPLE DEFINITION

In case study research, the selection of cases is crucial to achieve the best possible results. Purposeful sampling is highly recommended, particularly in comparative case studies, as it ensures a diverse range of cases (Aberdeen, 2013). To ensure the willing participation and availability of participants, initial contact is made directly with relevant individuals, such as CSD managers, through established connections. External outsourcing companies for CSD are also contacted with the explicit purpose of scientific research, ensuring data accessibility. The interviews for this research were conducted between February and July. Maintaining high validity and reliability is important in scientific research to ensure high-quality results. Validity pertains to measuring the truthfulness of the data, while reliability relates to the consistency of the measurements. Ensuring validity involves selecting an appropriate sample and interviewing the right individuals for the research. Reliability is achieved by conducting consistent interviews with all participants and asking about their opinions (Moss, 1994). The sample size,

or the number of participants in the study, is an important consideration in answering the research question. In a case study, the sample size should reach saturation. Saturation is reached when no further data insights are provided in the interviews (Sebele-Mpofu, 2020). Additionally, O'Reilly & Parker, (2013) noted that saturation is achieved when the information can be reproduced. However, excessively large sample sizes should be avoided as they can be time-consuming and expensive. On the other hand, a sample size that is too small may lack sufficient reliability and statistical power to represent the larger population (Noordzij et al., 2011). The selection of participants for this study is important to ensure their alignment with the study's objectives and assumptions. The interviews will be conducted with the heads of CSDs, CSD managers, DSMHs, and directors of purchasing and logistics from various hospitals in the Netherlands, including those with their own Central Sterilisation Department and hospitals that outsource their CSD. This approach is chosen to identify influential factors in make, buy, or ally decisions related to the CSD.

In the context of the make, buy, and ally strategy, the typical location for "make" decisions is within the hospital, while "buy" decisions are made externally, and "ally" decisions can be either external or in-house. Therefore, the results are categorized based on these three scenarios. Appendix 1 presents the interview protocol.

#### 4.4 DATA ANALYSIS

The primary data for this study consists of semi-structured interviews conducted with a total of nine individuals. The interviews were conducted in six different hospitals, involving one external party and one self-employed individual who works on a project basis in different hospitals. All individuals hold positions of responsibility within the Central Sterilisation Department, but their roles vary. To ensure ease of communication for the respondents, all interviews were conducted in Dutch. It is important to note that the interviews were recorded using Teams and later transcribed into text documents. Different codes were then applied to these text documents to identify the most significant factors influencing the MBA decisions regarding parts of the CSD in hospitals in the Netherlands. The duration of the interviews ranged from 31 to 59 minutes, with some variations attributed to differences in speaking pace. Table 6 provides an overview of the sample, including information about the different respondents involved in the study.

Table 6. Qualitative sample overview

Respondent	Function	Hospital	Duration	Medium
1	Former CSD executive	A	32 min	Teams
2	Head CSD	B	33 min	Teams
3	Head CSD	-	59 min	Teams
4	Head CSD	C	34 min	Teams
5	DSMH	-	31 min	Teams
6	Manager CSD	D	52 min	Teams
7	Director Purchasing and Logistics CSD	E	39 min	Teams
8	Manager CSD	D	36 min	Teams
9	Former CSD executive	F	34 min	Teams

#### 4.5 CODING PROCEDURE

In addition to qualitative and quantitative data analysis techniques, two distinct data approaches can be identified: deductive and inductive. The deductive approach involves testing an existing theory by moving from theory to data. On the other hand, the inductive approach is utilized in situations where relevant information is scarce, and a theory is formulated based on the available data (Overmars et al., 2007). For this study, it is recommended to code the interviews shortly after they are transcribed. The coding process involves the use of eight different categories for differentiation: C1: Costs, C2: Expertise, C3: Flexibility, C4: Lead time, C5: Relationship, C6: Uncertainty, C7: Other important information, and C8: Trends and developments. Once these categories have been established, the interviews are coded accordingly. The transcriptions are thoroughly reviewed multiple times to identify connections with the hypotheses, and selected quotes are used in the results section for proposition analysis.

## 5. RESULTS

In this chapter, the results of the interviews are presented, addressing the propositions that were examined. Initially, the key characteristics of each interviewed hospital are explained. The subsequent section delves into the decision-making process of the Central Sterilisation Department (CSD). Additionally, the trends and developments discussed during the interviews are elaborated upon. Finally, the results about the influential factors related to the propositions are provided. The transcriptions of the interviews can be found in Appendix 3.

Throughout the interviews, it became evident that make, buy, and ally decisions are significant topics of discussion within healthcare organisations. All the interviewed hospitals mentioned a noticeable trend of shifting from outsourcing back to insourcing the CSD. As stated by Respondent 3: *“Hospitals have been hyped for a while to outsource it, but they all come back to it”*. While approximately 90% of Dutch hospitals have an internal CSD, the interviews revealed a variety of strategies in practice.

Furthermore, the role of the CSD in hospitals is often undervalued and limited in the decision-making process regarding make, buy, or ally choices. Many respondents emphasized the importance of the knowledge possessed by the CSD staff in making these decisions. The final decision in such matters lies with the board of directors, while managers, executives, and head CSD personnel have little to no influence. Moreover, all respondents acknowledged that CSD is not officially recognized as the core business of the hospital. However, without the CSD, the operation room and other crucial clinics within the hospital would be unable to function properly. As mentioned by Respondent 4: *“The CSD is officially a secondary process, not a primary like the Ok. But without the CSD the whole process cannot run”*.

### **Strategies**

The hospitals interviewed employ various strategies for their Central Sterilisation Departments (CSD). Firstly, there is the strategy of insourcing, where the CSD is located internally within the hospital (Hospital D). Secondly, there is the option of outsourcing sterilisation activities to an external commercial party (hospital A) but it is also possible to outsource the activities but have the CSD in-house. The fourth strategy involves insourcing sterilisation activities at an external location, such as an industrial area (Hospital C). Fifthly, there is the strategy of merging hospitals, resulting in a single internal CSD serving multiple locations (Hospitals B, E, and F). Figure 9 provides a visual representation of these different strategies based on the interview

results and Table 7 presents the legend. The main characteristics of each strategy are outlined below, taking into consideration the strategy employed, the location, the type of healthcare provided, and the type of shifts implemented.

Table 7. Legend variants of MBA strategies about the CSD in Dutch hospitals

Legend variants of MBA strategies about the CSD in Dutch hospitals		
Number	Strategy	Variant
1	Make	Internal CSD location
2	Buy	Internal CSD location
3	Make	External CSD location
4	Buy	External CSD location
5	Ally	One internal CSD for several locations

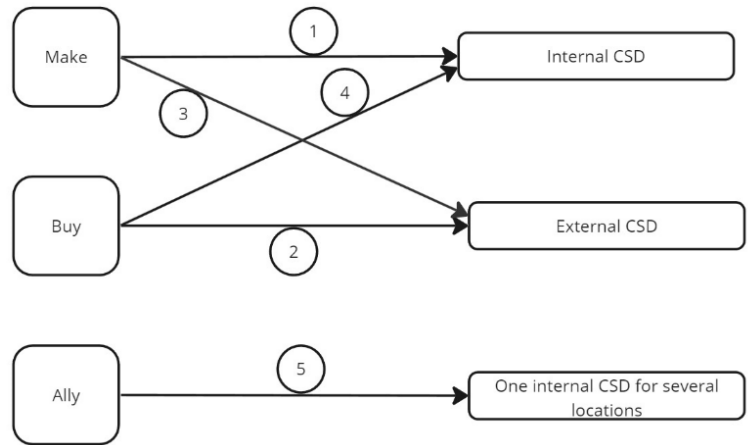


Figure 9. Strategies make, buy, or ally in Dutch hospitals CSD

Hospital A has chosen to outsource its Central Sterilisation Department (CSD) to an external party. This strategic decision has been in place for several years, primarily driven by a lack of space within the hospital premises to accommodate a CSD. The hospital operates with elective care, allowing for predictability and little urgency. By outsourcing, the hospital has established a reliable business communication system, and the external CSD can handle 24/7 service and night shifts.

Hospital B is a merged hospital with three locations, but it has a single internal location for the CSD. All medical devices used in the three locations are transported to this central CSD location. Throughout the day, trucks transport used instruments in closed carts between the locations, with pickups occurring at 7 a.m. and again at 8 a.m./8:30 a.m. The CSD is situated in the basement for cost efficiency, while the operating rooms are located on the first floor. The hospital provides both elective and urgent care, with the internal CSD primarily serving the urgent care section. The CSD operates with a 24/5 availability service and an on-call service during weekends.

Hospital C, on the other hand, maintains its own CSD at an external location, where sterilisation is conducted for its three internal locations as well as for third-party entities. Previously, the hospital had outsourced its CSD but encountered challenges in communication and other areas. For the past few years, the hospital has reverted to having its own CSD at an external site, allowing for sterilisation services across the three internal locations and third-party

arrangements. Although the three locations fall under the same hospital organisation, it is not considered a collaboration. Some locations offer both elective and emergency care, and it is noted that not having an internal CSD for emergency care can be inconvenient. Instrument management also takes place at external locations, and the staff of the internal CSD has transitioned to the external site.

Hospital D is the result of a merger between two hospitals, each having its own Central Sterilisation Department (CSD). Initially, the first hospital had outsourced its CSD to an external party but later decided to bring it back in-house due to difficulties in quality control and management. The CSD is now located internally within the hospital and is not outsourced to a commercial party. The second hospital in the merger also has an internal CSD and is currently working on a collaborative effort to consolidate the two CSDs into a single unit. The hospital provides both emergency and elective care, with a focus on serving the operating room as its largest customer.

Hospital E is the result of a merger between two hospitals. One hospital had its own CSD, while the other had outsourced the sterilisation activities. Ultimately, the decision was made to establish a single CSD at the location where it already existed, taking into account transportation time to the other location of the merged hospital. The CSD operates almost 24 hours a day, often until 01:00 at night.

Hospital F is a merger hospital comprising three locations, two of which had sterilisation departments. The objective was to merge the departments operationally and organisationally, ensuring uniform procedures such as set packing. Ultimately, the decision was made to construct a new facility at one location where elective care is provided. This means that the location with emergency care is faced with transportation and logistics considerations. Reasons for maintaining an internal CSD included staffing and cost-effectiveness in terms of equipment maintenance. The CSD is situated on the 1st and 2nd floors and operates with a 24-hour turnaround time, without night shifts. The hospital uses steam and electric-powered autoclaves and is characterized as a gasless facility. The main characteristics of the nine different hospitals, including their strategies, locations, biggest clients, and types of healthcare, are presented in Table 8.

Table 8. Main characteristics of hospitals sample

Hospital	Strategy	Location	The biggest client of the CSD	Elective or urgent care
A	Buy	Extern	Operation room and clinic	Elective care
B	Ally	One location in-house	Operation room	Elective and urgent care
C	Make	Extern	Operation room	Elective and urgent care
D	Make	Intern	Operation room	Urgent care mainly but also elective care
E	Ally	One location in-house	Operation room	Elective and urgent care
F	Ally	One location in-house	Operation room and clinic	Elective and urgent care

According to all respondents, the largest client of the Central Sterilisation Department (CSD) is the operating room (OR), accounting for approximately 95% of the department's workload. This is primarily due to the high demand for sterile medical instruments and equipment during surgical procedures. Respondent 1 emphasized the significance of the OR, stating: *“So the biggest customers in hospitals for the CSD department are the operating department 95-100%, where sterile work is done. But there are certainly other departments in the hospital for which the CSSD is used. Like on the policy, in treatment rooms”*. However, respondent 6 provided a different perspective, stating: *“It just depends on how you look at it if you look at it purely in terms of numbers, then the outpatient clinic and the day treatment centre are much larger. If you look at it in terms of time spent, then it is about fifty-fifty, because a small set is of course just as long as 1 large set and in terms of energy. If you look at volume, then the OR is the largest”*. Other respondents also mentioned the outpatient clinic, particularly in specialities like ophthalmology, as significant clients. However, the extent of their importance varies depending on the specific healthcare services provided in each hospital. Respondent 2 mentioned: *“The largest department is of course the OR. Then you have some great ophthalmology policies for MJA, the MJA is the mouth jaw and face. We have a very large outpatient clinic for dermatology. It is located at 3 locations and also two locations. MJA is located at two locations. So several large outpatient clinics and then the largest customers are located at this location because that is the easiest”*. Therefore, the Central Sterilisation Department serves various customers within the hospital setting, with the OR being the primary and most significant client.

### **Decision-making process Central Sterilisation Department**

According to all respondents, the decision-making process of the Central Sterilisation Department (CSD) involves various stakeholders. Respondent 1 states, *“Involved in*



*insourcing/outsourcing decisions is the board management level, the department manager of OR and also doctors. So if you involve those doctors too late, it can also work against you again. Because they are always afraid that their patient care in the OR will be jeopardized*". This highlights the importance of involving doctors early in the decision-making process. Doctors play a significant role in these decisions as they are central to the operation rooms and may be resistant to change. Respondent 7 agrees, stating, *"Doctor would prefer no change. That change also means hassle by definition. when outsourcing starts, the process of the CSD and the logistics also change for the operating room and they are not waiting for that"*. Respondent 2 mentioned: *the board of directors always have the final decision*" Respondent 3 emphasizes the importance of involving the Central Sterilisation Department, stating, *"Employees are often not involved, they are left out. Then there is a head of the department who tries to resist, who understands CSA and the OR and who tries to do that, but there is often a management layer the board of directors above that who has no expertise"*. Respondent 4 supports respondent 2 and adds, *"The OR is certainly included, but the OR then said that we didn't want it. In the end, it was decided to go to an external location. And the board of directors had the final decision."* Additionally, the purchasing department plays a role in these decisions, as mentioned by respondent 4: *"I was then in the OR as a manager, so I know that when the board of directors had a say in the decision, of course, the purchasing was very involved. At the time, it was mainly a financial issue to outsource it because a new CSD had to be built in-house."* This indicates that the Central Sterilisation Department has limited involvement in the decision-making process, which may be attributed to the department's undervaluation. Furthermore, all respondents mention that numbers often hold greater importance in practice. Table 9 presents the stakeholders and their involvement in the make, buy, or ally decisions concerning the CSD. The stakeholders are categorized as high, medium, and low based on previous rulings.

Table 9. Stakeholders' Involvement CSD make, buy, or ally decisions

<b>Stakeholder</b>	<b>Involvement decision process make, buy, or ally</b>
Board of directors	High
Doctors	Medium
Department Manager Operation Room	Medium
Purchasing department	Medium
Managers or Head CSD	Low

## Trends and developments

According to all respondents, it became evident during the interviews that there is a growing ageing workforce in the Central Sterilisation Department (CSD), which will result in a future personnel shortage. Respondent 1 stated, *“I believe that within the next 5 years, about 500 employees of the CSD will retire. And to accommodate that, we will have to look for something like 600 extra people within now and 5/6 years”*. Respondent 5 agreed with this and mentioned, *“The CSD is ageing enormously at the moment. In the future, this may play a role in the fact that the CSD can no longer get people”*. Additionally, it was noted that one of the major challenges is to ensure that employees receive proper training. Respondent 6 mentioned, In addition, it is stated that the greatest challenge is to keep employees well-trained. *“More self-employed people will start working in hospitals”*. Consequently, self-employed individuals without employees cost more than permanent CSD employees. Another prominent trend that was frequently mentioned is the focus on environmental sustainability, often referred to as the green deal. Respondent 1 stated, *“The Green Deal is an emerging trend and development. This means the mess we leave behind and the waste we leave behind as a hospital organisation on our earth. The CSD in particular naturally has a role in this, namely the type of packaging materials and the sterile tours and the washing machines”*. Hospital F is currently the only hospital in the Netherlands that exclusively utilizes steam. Respondent 9 mentioned: *“The green deal was closed during the renovation of the new CSD and the hospital. We all have electrically powered autoclaves of which there is a new version that is both electrically powered and steam-powered. If the power goes out, we still have steam at home that an autoclave can make steam at home”*. This indicates that the CSD operates entirely on steam and electricity. Furthermore, during the interviews, it was indicated that a potential future trend could involve a shift in roles between hospitals and clinics. Respondent 3 stated, *“I believe that individuals seeking planned care will increasingly turn to clinics, as clinics can provide faster, better, and more cost-effective services. People there don't feel like a number compared to hospitals, where scheduling appointments often takes a significant amount of time.”* During the interviews, it became clear that hospitals contemplate insourcing, outsourcing, or collaborating when short-term investments are required and different criteria are taken into account. Respondent 7 mentioned, *“A financial and operational business case serves as the criteria for decision-making”*. However, other influential factors play a role in these decisions.

The interviews conducted in the study revealed several key factors. Firstly, contrary to previous studies emphasizing cost reduction as a motivation for outsourcing, it was found that

outsourcing the Central Sterilisation Department (CSD) does not lead to direct cost savings due to high value-added tax (VAT) and hidden costs. This challenges the notion that conducting activities in-house incurs additional costs. Flexibility emerged as a critical factor in the healthcare industry, aligning with the study's findings. Internal CSDs were considered more flexible, leading to enhanced effectiveness. Shorter communication lines and reduced reliance on external logistics processes contributed to increased responsiveness. The study identified the "Calimero syndrome," which refers to the undervaluation of the CSD. This perception, rooted in the historical status difference between doctors and CSD employees, can negatively impact decision-making processes and future workforce motivation. Internal expertise was found to play a crucial role in the make strategy for the CSD, positively influencing quality outcomes. The study's findings also supported the argument that buying activities involving cross-border distances can introduce supply issues and increased complexity in the supply network. The lead time was highlighted as a significant factor in buy decisions, with its impact on logistics being crucial. Dependency on logistics and delays in supply or removal were identified as potential challenges for CSD operations. Additionally, the relationship between the CSD and Operating Room (OR) was described as more business-like, which can have positive implications for buying decisions. However, the study also noted that while the relationship is crucial, communication may not always be satisfactory in collaborative decision-making processes.

Overall, these factors highlight the complexities and considerations involved in CSD strategies, including cost implications, flexibility, communication, expertise, lead time, and the dynamics of the CSD-OR relationship. The following section provides more detailed insights into the factors mentioned by the respondents regarding the make, buy, and ally decisions outlined in the propositions. Each proposition concludes by indicating whether the factor is mostly positive or negative about the make, buy, and ally decisions.

The results of the study differentiate between the make and buy strategies, considering that the ally strategy includes a Central Sterilisation Department (CSD) at an internal location. To capture the complexity of these different variants, tables 10 to 15 are used to distinguish between the make and buy strategies. The findings include conclusions about the collaboration aspect, and textual explanations are provided to further clarify the results.

FINDINGS PROPOSITION 1: THE PRODUCTION COSTS ARE THE MOST IMPORTANT FACTOR AND HAVE A NEGATIVE INFLUENCE ON THE MAKE DECISIONS ABOUT THE CSD.

During the interviews, it became evident that all respondents emphasized the significance of costs in the decision-making process by the board of directors. However, they also mentioned that outsourcing the Central Sterilisation Department (CSD) is not necessarily cost-saving due to the high value-added tax (VAT) of 21% and the presence of hidden costs. Expensive square meters within the hospital, particularly when the CSD is located on a higher floor below the operating room (OR), add to the costs. These square meters could otherwise be utilized for operating rooms or outpatient clinics, generating higher revenue compared to a CSD department. Consequently, CSD departments are often hidden in the basement, which offers cheaper square footage.

Limited space in hospitals can be another factor contributing to the choice of an external location or outsourcing. Opting for an external location often proves cost-effective. However, according to the respondents, outsourcing or relocating the entire CSD requires investing in additional instrument sets, which incurs significant costs and reduces departmental flexibility. Respondent 3 stated: *“If you go external, then you have to seriously consider a minimum 50% increase in your number of nets”*. This investment cost for extra instrument sets must be considered in the financial business case.

Additionally, according to respondent 7, one of the most significant costs in outsourcing is the high VAT (21%) imposed on personnel costs when outsourcing personnel and mentioned: *“the Value added Tax on personnel costs when outsourcing personnel, which is 21% is extremely high”*. Before making a decision, a business case is prepared, where investments, such as machinery (e.g., autoclaves), infrastructure, and steam generation, represent substantial costs. Demi water installations and relocating power lines, for instance, incur substantial expenses.

Collaboration between different hospitals (e.g., hospitals B, E, and F) can lead to cost savings, as it involves reduced personnel costs, payment for only one room, and lower equipment requirements. Some hospitals (e.g., hospital C) in the Netherlands already collaborate at external locations, such as industrial estates, which offer cheaper property and location options compared to hospital premises. These external locations are often near the hospitals and provide more space, making it easier for personnel to park their vehicles. However, transportation and delivery reliability become important considerations in outsourcing, as additional investments

in instruments and transportation costs must be accounted for. Respondent 4 mentioned, *“There is often more space around the property extern which parking is easier for the personnel”*.

Timely delivery of specialized instrument sets to the hospital's OR is crucial, as delays due to traffic congestion, for example, can result in costly surgical procedure failures respondent 4 mentioned: *“In the transport process the extra carts that have to be purchased with an average price of 3,000 euros must also be taken into account”*. If special sets of instruments are not at the right time in the operation room in the hospital due to traffic jams for example then it costs a lot of money that operations fail.

Additionally, the shortage of packaging materials for polypropylene raw materials, the need to purchase expensive cleaning chemicals, and fluctuating energy prices contribute to unforeseen costs. These extra costs, coupled with uncertainties and disruptions, may deter hospitals from pursuing alliance or outsourcing options. However, as previously mentioned, outsourcing and collaboration can also yield cost savings, necessitating a comprehensive business case to provide an accurate assessment. Another noteworthy aspect, as mentioned by respondent 3: is *“outsourcing to third parties from an intern CSD in the hospital, which can all be planned electively and where earnings can be derived from”*. This means the opportunity for hospitals with an in-house CSD to generate earnings by providing sterilisation services to smaller elective healthcare organisations. This introduces an alternative revenue model.

Based on the different statements and information provided by the respondents, Table 10 highlights the most significant costs associated with insourcing and outsourcing. Collaboration costs depend on the location of the CSD and agreements between the involved parties.

Table 10. Cost differentiation make and buy decision Dutch hospital's CSD

<b>Factor 1. Production cost</b>	
<u>CSD in-house location</u>	<u>CSD outsourced location</u>
Square meters in the hospital	Value added Tax on personnel costs
Investment in machinery	Costs for extra sets of instruments
Infrastructure	Transportation costs

It became evident that most respondents acknowledged that costs alone do not determine the feasibility of having an in-house Central Sterilisation Department (CSD) in hospitals. The decision depends on the specific circumstances of each hospital. Similarly, costs associated with the buy and ally decisions were not universally viewed as negative but could have positive

implications. Furthermore, collaboration between hospitals was recognized as a potential cost-saving measure, as mentioned earlier. According to all respondents, practical experience demonstrates that the board of directors often prioritizes costs over other factors when deciding whether to outsource, insource, or collaborate. Ultimately, as a CSD, you are entirely dependent on the board of directors' decision. However, it is important to note that while costs are a significant consideration, other important factors will be discussed later. As a result, Proposition 1 is rejected, and Figure 10 illustrates the positive relationships, although the ultimate determination depends on the financial business case of each hospital.

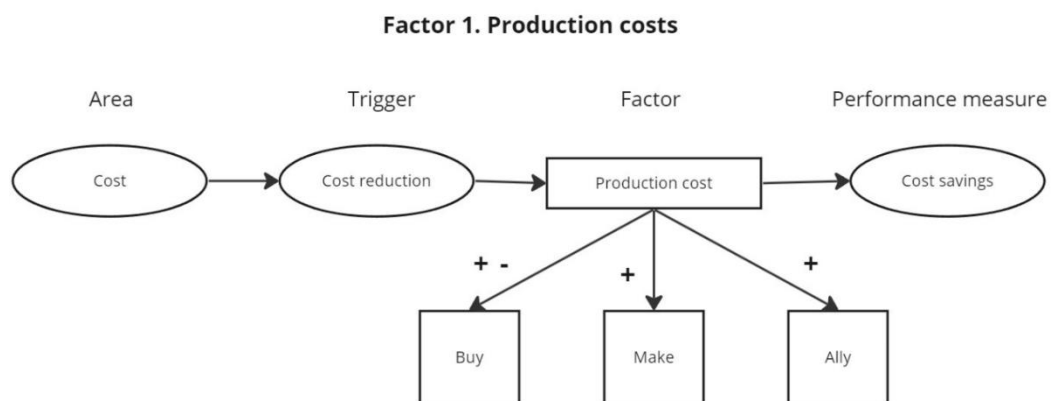


Figure 10. Model relationship factor 1. Production cost

**FINDINGS PROPOSITION 2: THE INTERNAL EXPERTISE POSITIVELY INFLUENCES THE QUALITY OF IN-HOUSE PRODUCTION OF THE CSD.**

The respondents unanimously emphasized that expertise has a positive impact on the quality of having an in-house Central Sterilisation Department (CSD). Respondent 8 mentioned: *“I think that if you outsource it and are far from this process, you will look at the need for sterile instruments in ORs differently or maybe not at all and then the quality will also decrease”*. However, having an external location for the CSD with its expertise is crucial, even though communication may be slower. Respondent 3 highlighted that hospital personnel have extensive knowledge of instruments both inside and outside the hospital, which is advantageous. It was also mentioned that commercial parties, driven by profit motives, may compromise quality, unlike hospitals that prioritize patient care. Respondent 6 expressed the view that establishing an in-house CSD provides better control over instrument quality and maintenance and mentioned: *“really think that the moment you set it up yourself, you have a better grip on the quality of your instrument, so you can do much more in your maintenance, you can take back”*. However, respondents agreed that sterility-related quality should not differ significantly between outsourcing and insourcing.

On the other hand, respondents pointed out certain challenges and respondent 4 mentioned: *“We sometimes get instruments on our nets, which are not ours at all and which also clearly contain a different name and then you think, yes, you are missing the point completely. And if such an optics return broke, then it is always the customer's fault”*. In outsourcing, expertise may be lacking in planning clarity, leading to issues such as instruments not belonging to the hospital being included in their sets. Nevertheless, not all hospitals can attract the necessary expertise in-house to establish a safe and efficient CSD, which is why outsourcing becomes a consideration. Respondent 1 mentioned the following about that: *“The CSD successfully outsourced in strategic issues where the hospital doesn't have the right expertise and knowledge in-house because of the complexity of the CSD”*. Additionally, according to the respondent 8 advancements in equipment require knowledge and skills, although the respondents acknowledged that current CSD employees have good expertise due to their education.

The interviews also shed light on Key Performance Indicators (KPIs) and their potential impact on quality. KPIs set for the CSD, such as a 24-hour turnaround time, can inadvertently lead to a decline in quality as the focus becomes meeting the deadline rather than demand-driven practices. The discussion on whether hospitals should prioritize day shifts and demand-driven operations, instead of night shifts, is ongoing and warrants further research. Respondent 9 mentioned the following about the KPIs: *“What we do find important in a qualitative sense is that our employees can fully focus on what they are doing. If you are sitting behind an object table and you have to put together sets, then that is your core business”*. The information systems used in hospitals vary, with some based on track and trace aligned with OR programs. The level of detail in the information process is a topic of debate. Outsourcing to external parties results in less insight into each other's information compared to an in-house system, where information is typically stored within the hospital's system. The OR's expectations were noted to sometimes be unrealistic.

The information system is in most hospitals based on track and trace aligned with the OR programs and the information system in a hospital may consist of several components. These components often include inventory management, planning, traceability, sterilisation processes, quality management, and other analytical capabilities. There is a discussion going on currently in hospitals on how detailed the information process should be and respondent 6 stated: *“In an outsourcing system there is less insight into each other's information because within a hospital it is often completely stored in their system”*. Respondent 2 mentioned: *“Some hospitals already*

do OR planning, which means that the OR indicates which operations will take place the next day and which sets are needed for this and then the CSD sees this is sterile and is already there and this is still dirty with us and still needs to be done and quickly to the OR department”. However, OR's expectations were noted to sometimes be unrealistic.

Another crucial aspect highlighted by respondent 6 is *"there is often mistrust in the organisation in a hospital and that is a very perverse basis to work from"*. This means the presence of mistrust within hospital organisations, which can lead to incorrect instrument supply from the OR to the CSD and vice versa. In such cases, the CSD is often blamed for any quality issues, emphasizing the importance of effective instrumentation management. Respondent 7 suggested that the CSD should have a formal mandate to manage instrument stocks, enabling accountability within the operating budget and mentioned: *"The CSD should have a more formal mandate to hold and manage stocks of instruments and to replenish sets then we can then be accounted for on our operating budget and responsibility"*.

Based on the different statements and information provided by the respondents, Table 11 highlights the key findings of this proposition.

Table 11. Highlights proposition 2 differentiated in make and buy strategy

<b>Factor 2. Internal expertise</b>	
<u>CSD in-house location</u>	<u>CSD outsourced location</u>
Higher quality (due to internal expertise)	Communication may be slower
Better control of instrument quality and maintenance	Compromise quality is driven by the profit motive
Mistrust within organisations	Lack of planning clarity
Need for greater recognition in the CSD	Successful outsourced when there is no internal expertise
	Less insight into each other's information



Furthermore, the Head of CSDs expressed that the CSD is significantly undervalued, with respondent 6 emphasizing the need for greater recognition of the available expertise and stated: *More appreciation should be expressed about the available expertise*". Internal expertise plays a vital role in make strategy decisions regarding the CSD's quality. While outsourcing can leverage expertise, the lack of direct involvement in the process may impact quality. Proposition 2 is supported, and Figure 11 illustrates a positive relationship between expertise and quality in making decisions.

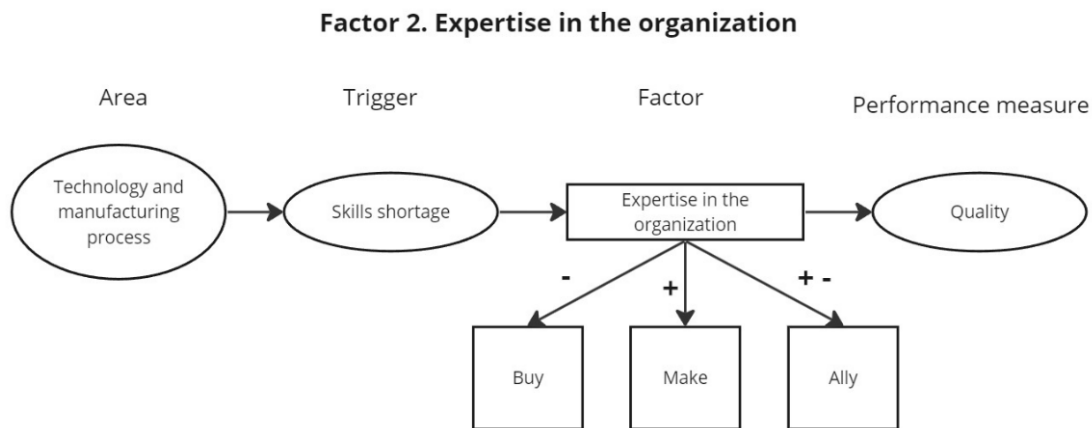


Figure 11. Model relationship factor 2. Expertise in the organisation

**FINDINGS PROPOSITION 3: THE HIGH DEGREE OF FLEXIBILITY POSITIVELY INFLUENCES THE MAKE DECISIONS ABOUT THE CSD**

The degree of flexibility emerged as a highly significant factor in the interviews. According to the Head of CSDs, flexibility is essential for accommodating unexpected changes or emergencies in operating rooms where sterile instruments are urgently required. It became evident that a high degree of flexibility has a positive influence on an in-house Central Sterilisation Department (CSD) due to shorter lines of communication within the hospital. Additionally, the CSD's dependency on logistics flows is reduced, resulting in increased departmental flexibility. The plannability of care provided in the operating room, its predictability, and the availability of instrument sets are closely related to flexibility. A flexible CSD can effectively support OR planning by promptly and efficiently providing medical instruments and equipment as needed. Flexibility enables hospitals to utilize their resources more efficiently, allowing for reduced operational costs and increased productivity. As a result, necessary care can be provided without unnecessary expenses or waste.

The respondents provided various examples highlighting the internal flexibility experienced by the CSD. Respondent 1 stated, " *If a CSD is at home and close to the operating theatre and unexpected things happen in the operating room, the CSD closes all gaps*". Respondent 2

concurrent with the importance of flexibility and stated, *“With your own CSD, the flexibility is great, because you simply walk past it every hour, collect your stuff and take the dirty immediately to the department. Afterwards, you can grab a cart with clean items that will then go through the hospital again, so you are more flexible”*. This flexibility, particularly in responsive actions, ensures continuity of care and efficient handling of emergencies. Respondent 3 also acknowledged the tremendous flexibility of having an in-house CSD team, mentioning: *“There is enormous flexibility of having your own CSD team. Of course, they also feel that if the nets are not on time (are ready at the CSSD department), then sometimes a patient cannot continue, or whatever. So they are going to work very hard, aren't they, to get that done”*. Moreover, the lead time benefits from internal flexibility, as transportation factors do not play a role in insourcing the CSD. Respondent 4 highlighted the complexities associated with external logistics, involving multiple parties and transportation, which can limit flexibility in lead time. Respondent 4 stated, *“We deal with each other, logistics, people who are OR with logistics, internal transport from OR to goods transport and you have to deal with road transport. So I already have 3 logistics parties that have to merge seamlessly to get it here on time”*.

Another additional advantage mentioned during the interviews is that the lead time is shorter if there is flexibility internally because if something goes wrong the lead time is shorter to solve it. Furthermore, the relationship between the OR and CSD is highly accessible in an in-house setup, allowing for direct communication and collaboration. Respondent 6 stated, *“What is, of course, easy is if you organize it internally yourself so that the OR can walk in and discuss and say about a certain set that is needed. Then you arrange that together and it is very accessible. That is pure profit for the OR and flexibility”*. The flexibility is also related to the flexibility to adjust the planning, which is not possible with a commercial external party. The external commercial party has already set the planning for several customers and this can no longer be adjusted.

However, when outsourcing to a commercial external party, the relationship becomes more business-oriented, focusing on predictability and meeting predefined planning. Respondent 3 emphasized and mentioned: *“The flexibility has to do with the agreements you make with your party. You can also conclude SLAs internally and look, every hospital naturally has its departments where they must always have priority”*. The issue of having the right people and a compatible culture was also raised. Respondent 6 stated: *“You have to make sure you have the right people on board and you have to make sure you understand a certain culture”*. Flexibility

can facilitate smoother operations, but there is a risk of the OR overlooking the CSD accountability when things go wrong. Also respondent 8 agreed on this and stated: “look the closer everything is and the more readily available the worse the process is set up”. Based on the different statements and information provided by the respondents, Table 12 highlights the key findings of this proposition.

Table 12. Highlights proposition 3 differentiated in make and buy strategy

Factor 3. Degree of Flexibility	
<u>CSD in-house</u>	<u>CSD outsourced</u>
The high degree of flexibility	Low degree of flexibility
Shorter lines of communication	Complexities with external logistics limit flexibility in lead time
Dependency on logistics is reduced	High dependency on logistics
Efficient handling in unexpected situations	Less efficient handling in urgent situations
Shorter lead time	Longer lead time
Adaptable environment	

It became evident that the degree of flexibility is a significant factor in most hospitals concerning CSD. Hospitals with their own CSDs generally exhibit higher levels of flexibility due to shorter lines of communication and a more adaptable environment. Therefore, a high degree of flexibility positively impacts the make strategy in hospitals regarding Central Sterilisation Departments. Proposition 3 is supported based on the statements of the respondents, and Figure 12 illustrates a positive relationship between the degree of flexibility and decision-making.

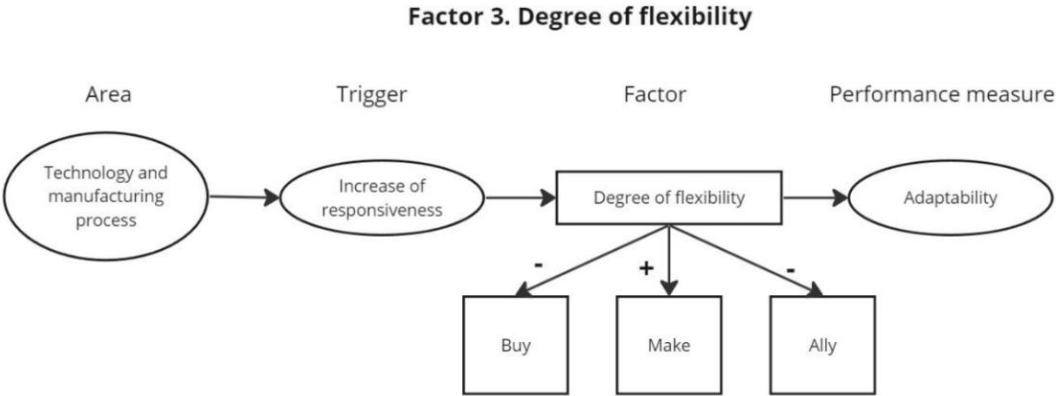


Figure 12. Model relationship factor 3. High degree of flexibility

FINDINGS PROPOSITION 4: THE LEVEL OF RISK RELATED TO THE SUPPLY CHAIN LEAD TIME IN THE CENTRAL STERILISATION DEPARTMENT HAS A NEGATIVE INFLUENCE ON THE BUY DECISIONS.

During the interviews, it became evident that lead time plays a crucial role in buying decisions, particularly due to the logistical aspects involved. If the lead time in the Central Sterilisation Department exceeds expectations or experiences delays, it can result in a delay in the availability of sterilized equipment. External or outsourced CSDs are impacted by logistics, as they are not located within the hospital premises. Respondent 5 highlighted: *“In hospitals, the lead time is shorter because you don't have the logistics processes”*. Conversely, in an in-house sterilisation department, the hospital can prioritize urgently needed instruments for emergency procedures or specific operations, thereby reducing the lead time for these critical items.

Respondent 4 mentioned: *“The lead time of the sets of instruments is a major challenge from a logistical point of view and we as CSD are also extremely dependent on logistics, because both the supply and removal are dependent on when something arrives or something is taken away from you”*. The dependency on logistics is primarily associated with buy and ally decisions rather than make decisions. Moreover, an internal sterilisation department facilitates direct communication and collaboration between the sterilisation team and the departments utilizing the instruments. Respondent 1 noted, *“The external department is remote, so with an external department they have to do it purely with communication as it is in the system”*. Respondent 1 noted that external departments rely purely on communication through the system, lacking direct interaction, which can lead to misinterpretation. However, the same respondent pointed stated, *“If you have an external CSD and you just have travel time back and forth and the logistical delays therein, all hubs where that comes to a standstill. It is then much more structured and that is all fine, but you will need a little more tools in an external CSD and you have longer logistics times with an external CSD”*. So, external CSDs involve additional tools and longer logistics times due to transportation, although they offer a more structured approach. Uncertainties and unexpected rushes can contribute to longer lead times, as mentioned by Respondent 9. Additionally, the previously mentioned factor of flexibility plays a role in reducing lead times, as a higher degree of flexibility enables greater organisational adaptability.

Key performance indicators (KPIs) also play a vital role in the lead time within the supply chain. KPIs often focus on achieving a specific number of sets within a given turnaround time for Central Sterilisation Departments. Respondent 6 highlighted, *“Well what you get then and we just saw that it is said of well, this set is complete, does not function for a meter, but send it*

*out the door because then we will reach our KPIs and it will be on time*". So, in pursuit of meeting KPIs and maintaining a positive perception, there can be a tendency to prioritize quantity over quality. This underscores the business administration aspect and commitment to meeting supply chain lead time goals, potentially at the expense of quality.

Furthermore, effective planning is essential for managing lead times. If the operating room (OR) schedules are tight, the sterilisation process in the CSD must be accelerated, introducing risks. Respondent 4 mentioned: *"But so that whole plan story is of course also very essential for us, because the tighter they plan Yes, the more often we have to go through it a little faster, and that makes it complex."* The inclusion of day shifts and evening shifts in the discussions revealed their impact on instrument lead times. Respondents generally expressed reservations about night shifts, noting that little activity occurs during those hours and mistakes are more likely, thereby introducing additional risks. Respondent 4 says the following: *"Most hospitals with internal CSD do not work night shifts and ensure that everything planned for the next day is ready and night shifts are done more like outsourcing"*. Moreover, when an OR outsources its CSD, it must improve its planning abilities, which can be challenging as ORs generally struggle with effective planning. Respondent 7 mentioned the following about that: *"This is a major challenge because many ORs do not want to let go of the CSD. Because they know about themselves, we can't plan very well and we cause chaos ourselves and therefore it has to be close by"*. This means that ultimately risks can also arise if there is no proper planning for an outsourced CSD because if there are errors in the schedules and the outsourced party does not receive it on time or the wrong sets are received and the outsourced party has many customers then it will go wrong.

Also, respondent 2 mentioned the following about that: *"And of course, there is a ride schedule that is very nicely put together on paper. Only if, for example, the Ok does not put down its dirty things or does not leave the cart in time, or thinks, well, you know, it will come along in the next ride, then we are suddenly waiting. And then a lot comes at the same time in the ride afterwards"*. The presence of external suppliers can introduce delays if instruments cannot be received immediately. Conversely, a well-organized plan and competent management can mitigate risks associated with outsourcing. Respondent 1 stated: *"If you want to avoid risks then your own internal CSD is the best, where the flexibility is key"*. Therefore, outsourcing the CSD or having an external sterilisation location entails higher risks. If the planning is well-structured, transportation should not be a significant issue in the supply chain lead time. However, this aspect is contingent upon the location of the external CSD, as mentioned by

respondent 6: “Files are there daily so you can simply organize around them”. However, this is dependent on the location of the external CSD. Based on the different statements and information provided by the respondents, Table 13 highlights the key findings of this proposition.

Table 13. Highlights proposition 4 differentiated in make and buy strategy

<b>Factor 4. Supply Chain Lead time</b>	
<u>CSD in-house</u>	<u>CSD outsourced</u>
Shorter lead time	Extremely dependent on logistics
Direct communication	Lack of direct interaction can lead to misinterpretation
KPI’s internal can be a problem	Entails higher risks
Effective planning is essential	Effective planning is essential,
Day shifts	Day and night shifts
	The presence of external suppliers can introduce delays if instruments cannot be received immediately

It became evident that the supply chain lead time significantly influences Central Sterilisation Departments (CSDs) in almost all hospitals. Moreover, hospitals with their CSDs tend to have shorter lead times compared to those involving external logistic processes. The presence of more risks, such as transportation delays, further complicates buy decisions related to the supply chain lead time. Therefore, it can be concluded that the level of risk associated with the supply chain lead time has a negative impact on buy decisions in hospitals regarding CSDs. Proposition 4, supported by the statements of the respondents, confirms this relationship, as depicted in Figure 13. The model in Figure 13 is true as long as making takes less time than the strategies buy or ally.

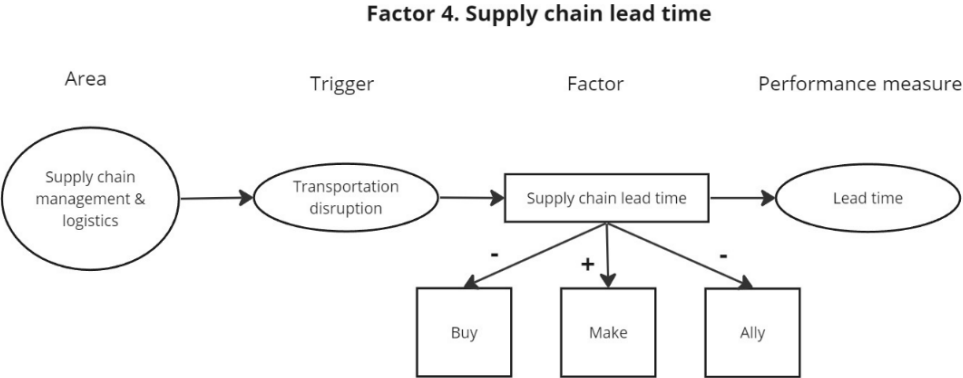


Figure 13. Model relationship factor 4. Supply chain lead time

FINDINGS PROPOSITION 5: WITHIN THE FRAMEWORK OF TRANSACTION COST ECONOMICS (TCE), A STRONG RELATIONSHIP BETWEEN THE OPERATION ROOM (OR) AND THE CENTRAL STERILISATION DEPARTMENT (CSD) WITH GOOD COMMUNICATION REDUCES TRANSACTION COSTS IN MAKE AND ALLY DECISIONS.

During the interviews, it became evident that the Central Sterilisation Department (CSD) is often undervalued, leading to a sense of inferiority and what the respondents referred to as the "Calimero syndrome." This undervaluation can be traced back to the past when doctors were held in higher regard due to their advanced education. Additionally, the CSD is not officially recognized as the core business of a hospital, although the opinions of the respondents differ on this matter. Respondent 3 stated: *"In very black and white terms, the Ok looks down on such a sterilisation department. And such a sterilisation department always feels very small"*. However, it is multiple times mentioned that the CSD adopts a similar attitude. Respondent 6 mentioned: *"What you often see is that many managers go along with the Calimero syndrome. But you have to fight for your department and give the employees more confidence"*.

Furthermore, education plays a role in perpetuating the discrepancy, as the CSD is often associated with lower pay scales compared to the OR and respondent 3 mentioned: *"A lot of people just think of an OR and CSD in pay scales, in which the CSD has lower pay scales"*. The relationship between the OR and CSD is not always harmonious, and the level of responsibility varies among CSDs in different hospitals. However, the working environment for doctors is highly stressful, and any dysfunction in the OR can cause panic. Respondent 7 stated: *"Because working in the OR is a stressful environment. Sometimes it is about life and death. And that is of course quite stressful, also for the employees. And if things don't go the way you want, that will add to the stress"*. Respondents emphasized the importance of improving the relationship between the OR and CSD.

The interviews made it clear that the relationship is typically closer in hospitals with an internal CSD compared to those with an external CSD. This is because CSD employees in internal departments are more directly involved in the hospital's processes. Respondent 2 mentioned: *"The biggest advantage is that you all work for the same goal. With outsourcing, you are simply not involved in the hospital's process. We are simply part of the process and you do a task together and have a goal together"*. On the other hand, in outsourced sterilisation companies, CSD employees deal with different customers daily and are not integrated into the hospital's processes. Additionally, respondent 3 mentioned: *"The interaction is much easier and the relationship is much warmer than as you sit in an external organisation where they are commercial-oriented"*. This means that interaction and communication are smoother within an

internal CSD, while externally located but insourced CSDs face more challenges due to physical distance from the process. However, it is worth mentioning that communication with an external CSD tends to be more business-like. Respondent 1 stated: *“With your own CSD it's all a bit better, it's kept a hand above the head and yes, then it just becomes a bit with the mantle of love problems are solved”*. This indicates that external sterilisation departments rely solely on communication within the established systems. Respondent 2 mentioned: *“What I notice with an external CSD is that much more business-like and clearer work agreements are made when you simply have your own CSD”*. But the main challenge lies in the lack of visibility of the CSD employees according to the respondents.

In a collaborative strategy, maintaining a strong relationship is crucial, especially when multiple hospitals with different perspectives come together. Effective communication plays a key role in this regard. However, respondent 3 mentioned: *“If there is a collaboration between several hospitals of which a CSD comes to 1 hospital, conflict can arise in the other hospital because they do not like it to go to another hospital”*. This means that conflicts can arise in hospitals where the CSD is required to relocate to another facility. This can lead to disappointment among employees and doctors in the affected hospital. On the other hand, successful alliances require a strong relationship built on mutual respect, shared interests, and common goals. Respondent 3 mentioned: *“At another location, you are not much in the picture and there will be less confidence”*. On top of that, respondents mentioned the negative relationship between the different hospitals in alliances. Respondent 9 stated, *“In collaborations between hospitals, disagreements may arise about the use of the shared CSA and the division of resources and responsibilities. This can lead to disagreements and tensions between hospitals”*. Respondent 7 concurs with this viewpoint and expands on highlighting the potential loss of autonomy and control experienced by individual hospitals in a collaborative relationship and stated, *“Individual hospitals in a collaborative relationship may experience a sense of loss of autonomy and control, as they depend on a central facility that may not always meet their specific needs”*. Based on these statements, it is inferred that ally strategies are more prone to result in negative relationships. Typically, the CSD is part of the operating room (OR) but it can also fall under the purview of purchasing and logistics. The head of the CSD is primarily responsible for ensuring the timely delivery, proper functioning, cleanliness, and maintenance of equipment used by various parties. Respondent 5 stated: *“Usually CSD fall under facility services in a hospital. Sometimes they also fall under the Ok, but that is often undesirable because you could have conflicting interests”*. Moreover, doctors often oppose outsourcing the



CSD or relocating it to another facility, which introduces additional complexities and tensions in the process. Based on the different statements and information provided by the respondents, Table 14 highlights the key findings of this proposition.

Table 14. Highlights proposition 5 differentiated in make and buy strategy

<b>Factor 5. Relationship between the CSD and the clients of the CSD</b>	
<u>CSD in-house location</u>	<u>CSD outsourced location</u>
CSD is undervalued (Calimero syndrome)	CSD is undervalued (Calimero syndrome)
Close relationship	Less close relationship
Employees internally are more directly involved in the CSD process	The lack of visibility of the CSD employees
	Rely solely on communication within the established systems
	More business-like relationship

Besides, there is a relationship between the different hospitals that work in collaboration. Table 15 indicated the key findings.

Table 15. Highlights proposition 5 differentiated in ally strategy

<b>Factor 5. Relationship between the different hospitals in collaborations</b>
Conflicts can arise between the hospitals
Disappointments of employees due to new circumstances
Less confidence in another location
Disagreements may arise
Loss of autonomy and control

It was evident that a strong relationship and effective communication play a pivotal role in decision-making processes between the Central Sterilisation Department (CSD) and the operation room (OR). Additionally, the CSD is significantly undervalued within hospitals, emphasizing the need for strong management to address this issue and improve confidence in the department. Moreover, the relationship between the CSD and OR tends to be more business-like, which can have positive implications for buying decisions. However, in collaborative decision-making, the relationship is crucial but the communication aspect may not always be satisfactory. As a result, it can be concluded that proposition 5, about collaboration decisions, is rejected based on the communication aspect, while the significance of a strong relationship

is affirmed for make and buy decisions. On the other hand, the ally strategy is associated with a negative relationship, primarily due to the potential loss of autonomy and control experienced by individual hospitals in a collaborative relationship, as well as the likelihood of disagreements concerning the utilization of the shared CSD and the allocation of resources and responsibilities. The findings from the respondents' statements reject proposition 5, and Figure 14 illustrates a positive relationship with make and buy decisions and a negative relationship with ally decisions.

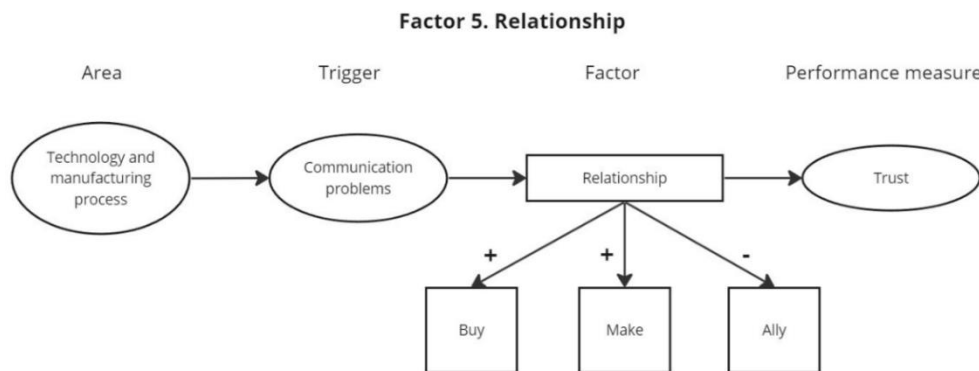


Figure 14. Model relationship factor 5. Relationship between the OR and CSD

Table 16 presents the influential factors with the positive or negative relationship to make, buy, or ally decisions.

Table 16. Positive or negative relationships in influential factors make, buy, or ally in CSD

<b>Influential factors in make, buy, or ally decisions about CSD</b>			
<i>Influential factors</i>	<i>Strategy</i>		
	<i>Make</i>	<i>Buy</i>	<i>Ally</i>
Production costs	Low	High/low	Low
Internal expertise in organisation	High	Low	High/low
The degree of flexibility	High	Low	Low
Supply chain lead time	Short	Long	Long
Relationship between CSD and OR	Strong	Not strong	Less strong

The decision-making process in Central Sterilisation Departments (CSDs) within hospitals is influenced by various factors. Two primary considerations are the type of healthcare organisation, such as whether it is a large or small hospital, and the nature of care provided, whether it is elective or urgent care. Once these factors are assessed, it is important to examine the different elements that impact the strategies of make, buy, or ally, and how they are interconnected. The final model, depicted in Figure 15, is derived from the propositions and findings of the interviews, encompassing emerging trends and developments, triggers, hospital size, healthcare type, and the influential factors associated with CSDs in Dutch hospitals.

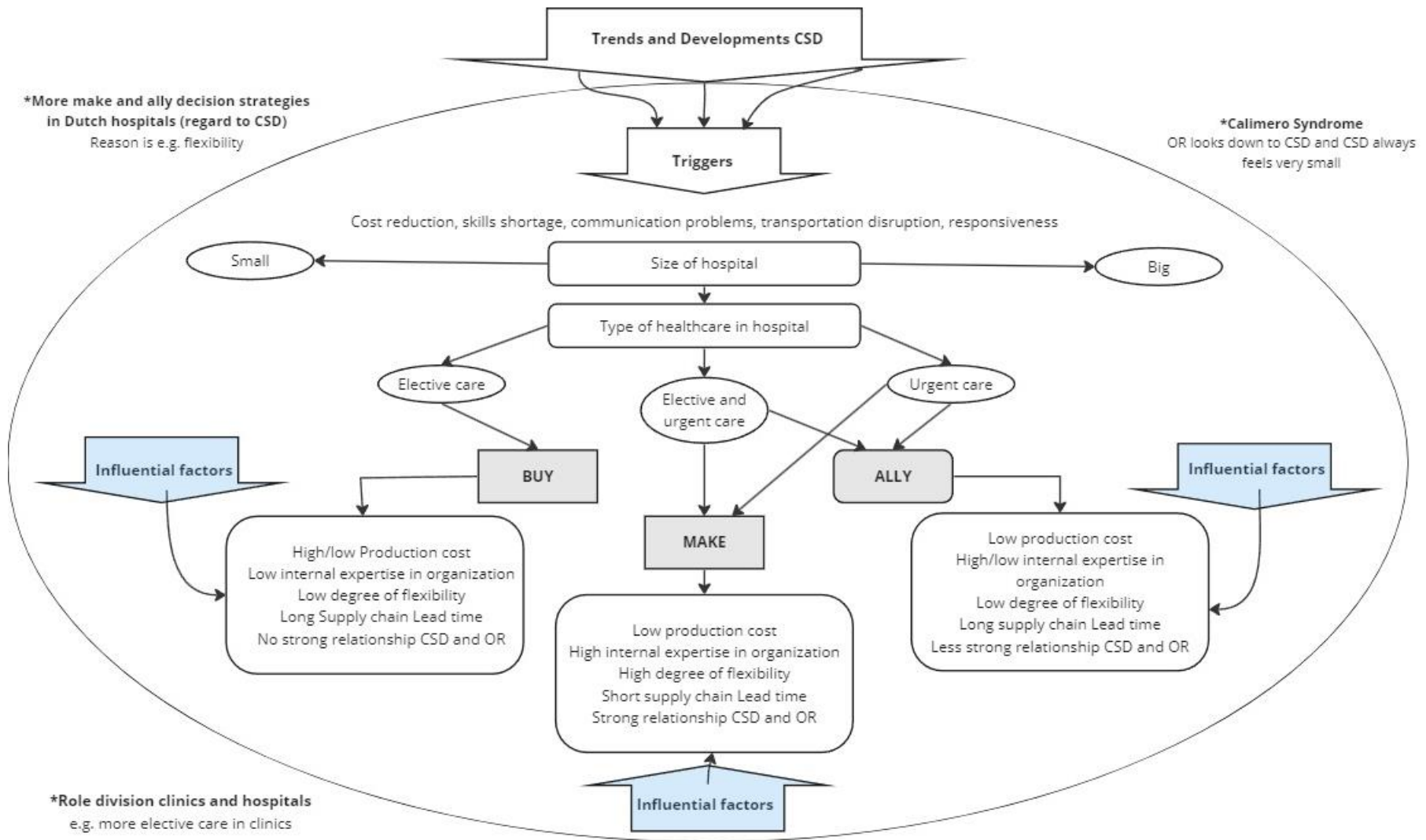


Figure 15. Final model

## DISCUSSION, IMPLICATIONS, LIMITATIONS AND FURTHER RESEARCH

To enhance healthcare organisations' effectiveness and cost-efficiency, this research aimed to gain deeper insights and develop a theoretical understanding of the make, buy, and ally choices in the context of Central Sterilisation Departments (CSDs). The main objective was to establish a comprehensive model that can support decision-making regarding the adoption of make, buy, or ally strategies based on influential factors related to CSDs. Factors that became particularly relevant in this study are the costs and the degree of flexibility which are further discussed in this section.

The sourcing matrix, introduced by Savelkoul, (2008), categorizes four sourcing strategies based on the level of competitiveness relative to suppliers and core or non-core business. In this study, interviews conducted with hospitals revealed that they consider insourcing, outsourcing, or collaborating when short-term investments are required such as upgrading outdated machinery or acquiring new instruments. For example, respondent 7 highlighted that autoclaves, with an average lifespan of 15 years, are depreciated accordingly. It is important to note that within the three strategies (make, buy, or ally), there are five variants. This study explores these strategies in the existing literature to determine when each strategy should be adopted and which factors positively or negatively influence them.

The make strategy is suitable for situations involving urgent care, elective care, or both. Besides, in a make strategy, it is preferred to have a big hospital size. It is essential to examine the various influential factors in make decisions and their positive or negative relationships. While previous studies have emphasized cost reduction as a primary motivation for outsourcing activities or production (Fan, 2000) the interviews revealed that outsourcing the CSD does not directly achieve cost-saving due to high value-added tax (VAT) and hidden costs. This finding contradicts the literature, which suggests that conducting activities in-house incurs additional costs (Stentoft et al., 2015). Furthermore, the literature, by Mota et al. (2005) highlights the importance of considering factors beyond cost reduction, such as quality, when allocating activities. This aligns with the study's outcomes, which suggest that the expensive space occupied by the CSD within hospitals, especially if located beneath the Operating Room (OR) on higher floors, could be better utilized for revenue-generating areas. According to (Shook et al., 2009) by bringing activities in-house, firms reduce their reliance on suppliers and enhance their internal resources, thereby potentially improving quality. This is aligned with the outcomes of this study where the respondents emphasized that having an in-house CSD allows

for better control and understanding of the need for sterile instruments in Operating Rooms (ORs), which could lead to improved quality.

Additionally, it became evident that most respondents acknowledged that costs alone do not determine the feasibility of having an in-house Central Sterilisation Department (CSD) in hospitals. The decision depends on the specific circumstances of each hospital.

Flexibility is crucial in the healthcare industry, particularly for unexpected situations like emergencies, as mentioned by Ward et al. (2015). This aligns with the study's findings, where flexibility emerged as a significant factor in CSD, as highlighted in the interviews. Internal CSDs were considered more flexible, positively impacting their effectiveness. Shorter communication lines and reduced dependence on external logistics processes enhanced responsiveness. However, the notion of flexibility as an advantage for buy decisions, as suggested by Kremic et al. (2006), does not align with the study's interview outcomes, where flexibility was seen as a barrier. Overall, expertise plays a crucial role in the make strategy related to the CSD, positively influencing quality.

Sophie Lerouge and Anne Simons (2012) discuss lead time as a potential barrier. This finding aligns with the statements from respondents in the study, who mentioned that in-house CSDs enable prioritization of urgently needed instruments, reducing lead time and facilitating direct communication and collaboration between the sterilisation team and instrument-using departments. The importance of a strong buyer-supplier relationship was also highlighted, emphasizing factors such as open communication, respect, and mutual benefit (Gullett et al., 2009). The relationship between the Central Sterilisation Department (CSD) and the Operating Room (OR) is highly significant, as the OR serves as the primary client for the CSD. In addition, Foerstl et al. (2016) have noted that when employees work nearby, such as in the same location, it fosters stronger relationships, leading to higher productivity and the potential for more innovative ideas. These findings align with the outcomes of this study, which emphasize the importance of internal CSDs, compared to outsourced ones, in developing closer relationships with the OR. This proximity allows for more personal and warm interactions between the two departments.

Furthermore, the study identifies an issue called the "Calimero syndrome," which refers to the undervaluation of the CSD. This undervaluation stems from a historical perception that doctors hold higher education and status, which can negatively impact the decision-making process.

This is significant because it may lead to CSD employees no longer wanting to work for the department in the future, influencing the decide the CSD strategy.

The buy strategy should be adopted when primarily dealing with elective care and it is more commonly adopted by small hospitals compared to large hospitals, particularly due to the flexibility required in larger healthcare facilities. While previous literature by Fan (2000) and Guimarães & de Carvalho (2011) emphasizes various reasons for outsourcing, such as accessing expertise and focusing on core competencies, the interviews conducted in this study revealed that a key motive for outsourcing in hospitals is the lack of physical space. However, there is a growing trend towards insourcing in recent years, as highlighted in the literature by Bals et al. (2016) due to the potential for value creation and increased security in complex supply chains. This trend was further supported by the interview findings, with many hospitals transitioning from outsourcing to insourcing their Central Sterilisation Departments (CSDs). The primary reason for this is the lack of flexibility, which led to practical difficulties.

Furthermore, practical experience indicates that cost considerations often take precedence over other factors when hospitals' boards of directors make decisions regarding outsourcing, insourcing, or collaboration. Indirect costs, such as reduced infrastructure expenses resulting from a smaller workforce and economies of scale, as mentioned by Edvardsson & Teitsdóttir (2015) contribute to the rationale for outsourcing, which aligns with the outcomes of this study where in-house infrastructure costs were found to be high. However, Guimarães & de Carvalho (2011) argue that outsourcing provides fast adaptability to unexpected and rapid shifts in the healthcare industry. This finding is not aligned with the study's outcomes, as outsourcing was found to offer less flexibility due to longer communication lines. In contrast, outsourcing to commercial parties led to a more business-oriented relationship with limited flexibility for making adjustments to planning. The presence of the right personnel and an organisational culture conducive to flexibility were identified as crucial factors, as the Operating Room (OR) heavily relies on the support provided by the CSD, especially in challenging situations.

The study findings align with the argument by Harland et al. (2003) regarding supply issues and increased complexity in the supply network when buying activities involve distances within borders. The interviews shed light on the importance of lead time as a significant factor in buy decisions, particularly due to its impact on logistics. Dependency on logistics and delays in supply or removal can have a significant effect on CSD operations. External employees lacking familiarity with the business's know-how and delivering varying levels of quality, as mentioned

by Ye et al. (2014), can lead to reduced quality in outsourced CSDs. This finding is aligned with the study's outcomes, as in-house CSDs provide better control over instrument maintenance and quality. Key Performance Indicators (KPIs) such as a lead time of within 24 hours can also influence the quality, with targets prioritizing quick turnaround times potentially resulting in rushed operations and reduced quality. The shift towards day shifts and demand-driven operations generated differing opinions, highlighting the need for further research.

Contrary to the expectations that the business relationship would negatively impact the buy strategy, as argued by Foerstl et al. (2016), the study found that the business relationship had a positive influence, reinforcing predictability and trust. In contrast, external CSDs rely solely on communication, which can be prone to misinterpretation. Proper planning and management play crucial roles in mitigating risks associated with tight schedules and transportation issues.

The allied strategy should be adopted when dealing with urgent care, elective care, or both. The size of the hospital, whether small or large, is not a determining factor in the allied strategy as different hospitals can collaborate with one central sterilisation department (CSD). Collaboration between hospitals can lead to cost savings by reducing personnel costs, requiring payment for only one room, and lowering equipment requirements, which is consistent with the literature. Additionally, external locations, such as industrial estates, offer a cost-effective alternative, although challenges related to transport reliability, instrument investments, and fluctuating energy and material costs may result in unforeseen expenses.

Trust plays a crucial role in preventing contract breach violations, as highlighted by Eckerd et al. (2013). In the context of collaboration between hospitals, conflicts can arise when a CSD is moved from one hospital to another, leading to disappointment and mistrust, which aligns with the outcomes of this study. Ramsay (2004) explored various forms of information disclosure, including loss of image, power, tactical flexibility, and control. Loss of control and tactical flexibility particularly align with the study's outcomes when multiple hospitals collaborate as one CSD location.

Stakeholder alignment emerged as a complex issue, with varying interests among doctors, CSD employees, and other CSD roles. While higher-level management often makes decisions regarding CSD, involving doctors from the beginning is crucial to address their concerns about patient safety and potential disruptions to existing processes. Furthermore, developing a comprehensive business case that encompasses operational and financial aspects is essential for making decisions regarding the make, buy, or ally strategies. Establishing a collaboration with

a partner, as discussed by Ketchen & Hult (2007), can be a complex and time-consuming process that requires coordination and communication. This aligns with the outcomes of this study, highlighting the challenge of effectively involving stakeholders in the decision-making process and creating a guidance plan spanning at least one year to prevent tensions. However, there is still a limited understanding of how to stimulate and involve people in decisions to prevent tension.

The study validated the majority of the influential factors mentioned in the existing literature (Mota et al, 2005; Ward et al, 2015; Sophie Lerouge; Anne Simons, 2012; Gullett et al, 2010; Guimarães & de Carvalho, 2011; Harland et al, 2003), such as costs, flexibility, relationship, internal expertise, and supply chain lead time. However, it is important to note that not all of the propositions were supported in this study. Specifically, propositions 1 and 5 were rejected based on the findings, indicating a deviation from the initial expectations or assumptions. Proposition 1 is rejected because most respondents acknowledged that costs alone do not determine the feasibility of having an in-house Central Sterilisation Department (CSD) in hospitals. The decision depends on the specific circumstances of each hospital. Similarly, costs associated with the buy and ally decisions were not universally viewed as negative but could have positive implications. Proposition 5 is rejected based on the communication aspect, while the significance of a strong relationship is affirmed for make-and-buy decisions.

#### THEORETICAL AND PRACTICAL RELEVANCE

Existing literature on make, buy, or ally decisions is abundant, but it lacks focus on the healthcare sector, specifically the Central Sterilisation Department (CSD). Moreover, most literature primarily addresses make-and-buy strategies, neglecting the ally strategy as highlighted by Medina-Serrano et al, (2020). While influential factors related to make, buy, or ally decisions are found in literature, this research adds to the existing body of knowledge by providing more insights into the hybrid strategy, ally, which is increasingly adopted by hospitals. The study also identifies five distinct strategies employed by hospitals in their Central Sterilisation Departments, offering a comprehensive understanding of make, buy, or ally decisions in different forms. By conducting interviews, this research sheds light on stakeholder management and the challenges associated with decision-making in healthcare organisations, thus enhancing the theoretical understanding of the field.

There is no one-size-fits-all strategy, but it depends on the type of hospital. If it is a large organization with a focus on urgent care, I would recommend implementing an internal Central



Sterile Supply Department (CSSD), as it provides more flexibility in urgent situations. However, if it is a small organization that provides both elective and urgent care, I would suggest considering a collaboration with multiple hospitals and locating the CSSD in the hospital with the most urgent care services. Outsourcing is also an option, which I would recommend for small organizations that primarily focus on elective care and have a predictable schedule. It is important for the hospital organization to first assess which factors are most relevant to them and then determine whether they have a positive or negative impact on the chosen strategy. Here the practical relevance for healthcare organisations involves serving as a guidance tool in decision-making regarding make, buy, or ally choices for their Central Sterilisation Departments. By considering influential factors and the specific characteristics of the healthcare setting, organisations can make informed decisions. Additionally, the study addresses the cost implications of outsourcing, insourcing, or collaborating with external parties in the CSD, providing practical insights to evaluate the financial aspects of these decisions. By integrating the findings of this study with the existing literature, a comprehensive understanding of the decision-making process regarding make, buy, or ally strategies in central sterilisation departments was achieved. This led to the confirmation of existing information and the discovery of new insights. The culmination of these findings is the framework depicted in Figure 15, which serves as a guiding tool for board members, managers, and other stakeholders involved. This framework facilitates a structured decision-making process by incorporating the influential factors identified. Besides, the mentioned cost implications of outsourcing, insourcing or collaborating with external parties in the CSD provides practical contribution for healthcare organisations to evaluate the financial aspects of their CSD decisions.

The stakeholder perspective contributes also to this research and can be both a theoretical and practical contribution to a thesis. From a theoretical perspective, it provides a theoretical foundation for examining the relationships, interests, and influence of various stakeholders, and how their perspectives can shape decision-making processes and outcomes. Additionally, the practical relevance of the stakeholder's perspective offers insights and guidance for real-world applications.

In summary, this research contributes to the existing literature by delving into the ally strategy, offering insights into various make, buy, or ally approaches in the CSD. It enhances theoretical understanding and provides practical guidance for healthcare organisations in their decision-making processes for the CSD, considering influential factors and cost implications.

## LIMITATIONS AND FURTHER RESEARCH

This study offers a comprehensive exploration of the influential factors involved in make, buy, or ally decisions concerning the Central Sterilisation Department (CSD). However, it is important to acknowledge the limitations and weaknesses of this study. The research was conducted exclusively in Dutch hospitals, limiting the generalizability of the findings. To validate the results and obtain a broader perspective, further research in different countries would be valuable. Furthermore, the number of interviews was below average, with nine individuals. Additionally, including interviews with doctors would provide valuable insights as they also play a significant role in make, buy, or ally decisions. This research primarily focuses on the perspectives of Head CSDs, but considering the importance of the relationship between the operating room and the CSD, it would be interesting to explore this further. The study highlights the undervaluation of the CSD and the "Calimero syndrome," but does not provide a solution to improve this relationship. Therefore, additional research on enhancing this relationship would be beneficial, and involving doctors in the sample could offer valuable perspectives.

Another limitation of this study is the sample of hospitals in this study consisted of two hospitals that insourced the CSD, three hospitals with collaboration and insourcing, and only one hospital that outsourced the CSD. While the intention was to achieve a balanced representation of make, buy, or ally strategies, in practice, it was challenging to obtain a sufficient number of hospitals that outsourced the CSD. Including the hospitals that outsource CSD in further research would provide a more comprehensive view. As a result, the total number of interviews conducted, which amounted to nine individuals, fell below the average expectation for a master's thesis (Noordzij et al., 2011). However, it became evident during the interviews that the level of saturation has been reached, indicating that sufficient data had been gathered for analysis (O'Reilly & Parker, 2013). Moreover, the study assumes that the make strategy is in-house, the buy strategy is external, and the ally strategy can encompass both options. Including different locations with various variants of these three strategies in the preliminary research would offer valuable insights and enhance the understanding of location-specific factors.

In conclusion, while this study provides comprehensive information on the influential factors of make, buy, or ally decisions in the CSD, there are limitations to consider. Further research in different countries, including doctors in the sample, exploring the relationship between the CSD and the operation room, and involving hospitals with diverse strategies and locations would enhance the knowledge in this field.

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## APPENDICES

### APPENDIX 1. INTERVIEW PROTOCOL

#### **\* Dutch version: Hoofd CSD in ziekenhuizen (make/ inbesteden in ziekenhuizen)**

#### Factoren die een rol spelen in een make, buy, and ally beslissing in centrale sterilisatie afdelingen

##### 1. Instructie voor de interviewer

- a. Anonimiteit van de respondent wordt volledig gegarandeerd en ook het ziekenhuis zal anoniem blijven.

##### 2. Doel van het onderzoek

- a. Doel van het onderzoek-> Om te kijken welke factoren de grootste rol spelen in ziekenhuizen tijdens het maken van make, buy, ally beslissing in centrale sterilisatie afdelingen.

##### 3. Persoonlijk gerelateerde vragen

- a. Zou u uw baan kunnen omschrijven?
- b. Voor wat voor ziekenhuis werkt u?
- c. Hoe lang werkt u al voor dit ziekenhuis?
- d. Voor welke afdelingen steriliseert u?
  - \* Onder welke afdeling valt CSD?
  - \* Hoe wordt er op de afdeling omgegaan met de verschillen tussen planbare en spoedsterilisatie?
  - \* Heeft dit invloed op een besluit in- of uit te besteden?

##### 4. Sterilisatie proces

- a. Hoe is het sterilisatie proces georganiseerd?
  - \* Waar is CSD fysiek gehuisvest? (in de buurt van OK?)
- b. Steriliseren jullie voor buiten locaties of derden?
- c. Wat zijn jullie grootste afdelingen voor CSD instrumentarium (OK, dag behandeling?)
- d. Hoe is het informatie proces georganiseerd?
  - \* Bent u het met de volgende stelling eens “informatie uitwisseling is het belangrijkste bij het uitbesteden van CSD”.
- e. Hoe is de band tussen sterilisatie en de ok?
  - \* contract management, waar let je op bij de leverancier?
- f. Hebben de afdelingen in het ziekenhuis eigen autoclaven en zo ja waarom?
  - \* Hebben jullie 24/7 beschikbaarheid? (georganiseerd)

5. Wat is naar uw mening het doel van een make, buy, ally beslissing voor ziekenhuizen omtrent sterilisatie afdelingen?

\* Is het uitbesteden van CSD altijd kostenbesparend?

\* Of ben je flexibeler als je een eigen CSD hebt?

a. Wie zijn er betrokken in deze beslissingen? (purchasing, managers, directors?)

b. Wanneer worden deze beslissingen genomen?

\* wordt er überhaupt gepraat over het wisselen van de CSD naar uitbesteden bijvoorbeeld?

c. Welke criteria worden er meegenomen bij het maken van make, buy, ally beslissing?

d. Hebben jullie altijd een CSD-afdeling gehad in het ziekenhuis en op deze manier gewerkt? ( of is er eerder ook uitbesteed?)

\* Denkt u dat dit de beste manier is?

6. Waarom hebben jullie gekozen voor de strategie inbesteden? En welke factoren speelden een rol in deze beslissing?

a. Welke factoren zijn erg belangrijk voor het inbesteden?

b. Welke factoren zijn minder belangrijk voor het inbesteden?

c. Zijn er ook nog andere factoren die een rol spelen bij het maken van zo'n beslissing?

\* Risico's?

\* Kosten?

\* Mate van flexibiliteit?

\* Expertise en competenties?

\* Relatie?

\* Mate van integratie van informatiesystemen?

\*Denkt u dat kosten de grootste factor speelt hierin?

d. Denkt u dat kwaliteit verschilt tussen inbesteden en uitbesteden van CSD?

e. Hoe vaak wordt de strategie formeel overwogen?

f. Hebben andere trends en ontwikkelingen hier ook eventueel invloed op?

\* bijvoorbeeld covid-19?

g. Spelen regulaties een rol in het maken van zo'n beslissing?

\* regering?

h. Denkt u dat technologie ook een rol speelt hierin?

j. Kijkend naar de toekomst, denkt u dat de strategie hetzelfde zal blijven?

7. Wat zijn naar uw mening de voordelen en nadelen van het inbesteden, uitbesteden of samenwerken van CSD?

a. Make-gerelateerd (in-house ziekenhuizen)

\* Bijvoorbeeld; Voordeel> hoge mate van controle, minder afhankelijk van leveranciers? Nadeel->-> hoge kosten, weinig resources.

b. Buy-gerelateerd (outsourcen)

\* Bijvoorbeeld; voordeel->? Vermindering van kosten, minder risico's?, Nadeel; mindere mate van controle, leverancier afhankelijkheid

c. Ally-gerelateerd

\*Bijvoorbeeld; voordeel> risk sharing, leverancier relatie? Nadeel-> conflicten, tijd consumerend?

d. Ervaart u deze voordelen en nadelen in de praktijk?

\* Wanneer ervaart u dit?

e. Als het aan jou was om te mogen kiezen voor inbesteden of uitbesteden, waar zou u dan voor kiezen? Waarom?

8. Laatste vraag; Heeft u nog andere belangrijke informatie te vertellen?