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Factors influencing the level of purchase-to-pay and contract management maturity of Dutch hospitals

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Abstract

Throughout the years, hospitals have been dealing with annually increasing health care costs. At the same time, a limited budget and a strong focus on savings require hospitals to be efficient with their resources. Previous studies indicated that organizations with a higher level of purchasing maturity can cope more easily with cost related issues due to a higher level of efficiency. However, limited information is known about how hospitals can advance in their level of purchasing maturity. Therefore, the main goal of this study is to identify what factors influence the level of purchasing maturity, in particular purchase-to-pay and contract management maturity, of hospitals. Qualitative research has been conducted to identify the influencing factors by having twelve semi-structured interviews with purchasers, consultants, and specialists. In addition, to discover the current and desired level of maturity, a survey has been conducted with the interviewed purchasers. Overall, the results indicate that organizational factors are perceived by purchasers, consultants, and specialists to be the most influencing on the level of purchasing maturity. In particular an organizations available resources, strategy, and culture have been emphasized. In addition to the factors identified in the literature review, five new factors have been identified to be of influence on the level of purchasing maturity, namely organizational awareness, strategy, external cooperation, crisis, and location. However, the factors competitive pressure and size did not receive support from the participants, deviating from the literature review. Since the extent of the influence of the newly identified factors has not been statistically proven, the directions for future research suggest a quantitative approach.

Keywords: purchasing maturity; purchasing maturity model; purchase-to-pay; contract management; technology-organization-environment framework

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Index of abbreviations

CEP	Coppa efficient purchasing
ERP	enterprise resource planning
IT	information technology
MDR	medical devices regulation
NEVI	Dutch association for purchasing management
NfP	not for profit
P2P	purchase-to-pay
PMM	purchasing maturity model
TOE	technology-organizational-environmental

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1 Introduction: the need for the identification of factors influencing the level of purchasing maturity of hospitals

For the last decade the global healthcare sector has been facing increasing health care costs on a yearly basis (van Raaij, Schotanus, & van der Valk, 2013, p. 1115). To put this in perspective, healthcare spending has been outgrowing the growth of the gross domestic product in various European countries for the last 15 years. Due to this increase, healthcare organizations are required to become more efficient and effective (Meehan, Menzies, & Michaelides, 2017, p. 230; Piening, 2013, p. 210). Throughout the years, progress has been made by experimenting with health systems and health policies (Lister et al., 2017, p. 1). However, financial cutbacks harm this progress as “(...) declining public health resources and complex health threats may make it difficult for advances of the past century to be sustained” (Lister et al., 2017, p. 1). Patrucco, Luzzini, and Ronchi (2016, p. 754) found that healthcare procurement remains to focus primarily on price and compliance rather than on innovation and sustainability. Hospitals have an average purchasing ratio, as a percentage of total costs, of around 40% (van Raaij, 2016, p. 6). Schiele (2007, p. 283) found that mature purchasing organizations are more capable of identifying savings potential compared to purchasing organizations with a lower level of maturity. Therefore, an improved healthcare procurement function can play a significant role in achieving cost savings. Furthermore, hospitals tend to have a slow adoption rate of e-business technologies, such as automated P2P systems (Bhakoo & Chan, 2011, p. 184). However, an automated P2P process can lead to reduced administration costs and the elimination of non-value-adding activities (Hawking, Stein, Wyld, & Foster, 2004, p. 6; Piotrowicz & Irani, 2010, p. 7). Consequently, a high level of P2P maturity can aid hospitals in meeting the increasing pressure on costs reductions. Contract management is essential to hospitals as a mature contract management process can lead to cost reductions in the supply chain (Young, Nyaga, & Zepeda, 2016, p. 250). Therefore, a mature P2P and contract management process can aid hospitals in coping with the financial pressures.

Limited information is available on the level of purchasing maturity of hospitals. However, one study found that English hospitals struggle in identifying cost savings as procurement teams “lack strategic maturity, notably in relation to sourcing and contract management” (Menzies & Meehan, 2016, p. 1). Plomp and Batenburg (2009, p. 210) conducted a research on the level of procurement maturity of Dutch hospitals and found that

larger hospitals had a higher level of maturity compared to smaller ones. However, the study contained a small sample size of three hospitals, which is not representative for Dutch hospitals in general. Thus, it is unclear whether this is the case for a larger number of Dutch hospitals.

The objective of this study is to investigate what factors influence the level of maturity of Dutch hospitals. To investigate the factors influencing the level of maturity, the level of maturity needs to be determined. Therefore, this research focuses first on gathering a general impression of the current and desired level of maturity of Dutch hospitals followed by the main objective of analyzing which factors influence this level. This objective led to the following research question:

RQ: 'What factors influence the level of purchasing maturity of Dutch hospitals?'

In addition, the research question gets aided by the following sub-questions:

SQ1: 'What is the current and desired level of purchasing maturity at hospitals'

SQ2: 'What is the importance of technological, organizational, and environmental factors?'

SQ3: 'What benefits and challenges are associated with achieving a higher level of maturity'

For the first part, which is aimed at answering the first sub-question, the maturity level of hospitals will be analyzed based on the purchasing maturity model (PMM) of Snijders (2020). Several PMM's have been created in the past. However, the majority of the models are created solely for industrial procurement, do not focus on purchase-to-pay (P2P) and contract management, or are too broad for this research. Therefore, the Coppa Efficient Purchasing (CEP) model by Snijders (2020) will be used for this research. This model had originally been created for assessing the maturity of municipalities, but is also applicable to the healthcare sector. The model covers the purchasing maturity in general, with a specific focus on P2P and contract management. For the second part, which is aimed at answering the second and third sub-question, and ultimately the research question, the technology-organization-environment (TOE) framework by Tornatzky and Fleischer (1990) will be used as a starting point for investigating which factors influence the level of purchasing maturity. The TOE framework allows to classify the factors according to three main context, namely technological, organizational and environmental.

This research contributes to the existing literature in the following ways. First, it adds to the scarce literature on purchasing maturity in healthcare context. In particular, this research contributes to the sub dimensions purchase-to-pay- and contract management maturity of purchasing maturity. In addition, the research provides information on the effect of technological, organizational, and environmental factors on purchasing maturity. This is done by assessing the importance of factors identified in the literature review as well as the importance of the newly identified factors. Next to this, this research adds to the validity of the CEP model by Snijders (2020) as well as to the TOE framework by Tornatzky and Fleischer (1990), showing their applicability to the healthcare sector, in particular hospitals. In addition, two modifications are suggested to the CEP model to make it more suitable for the healthcare context. From a practical perspective, this research provides hospitals with an impression of the average maturity level of Dutch hospitals, which can be used as a benchmark. In addition, this study provides validity to the CEP model, meaning that hospitals can identify their own level of maturity, along with insights on practices to reach a higher level of maturity. Furthermore, this research provides insights to hospitals on the effect technological, organizational, and environmental factors have on their level of purchasing maturity. Lastly, a matrix is provided with on the X axis the level of support found for the influencing factors and on the Y axis the level of influence that can be exerted over the factor. Based on this matrix, managers can easily identify which factors are supported as well as which factors they can influence.

The structure of this study is as follows. A theoretical framework will be given in chapter two, which presents the purchasing process, compares PMM's, and provides a conceptual model including the potential influencing factors along with nine propositions. The third chapter will present the methodology of this research. The results of the survey and the interviews will be presented in the fourth chapter. This chapter provides insights on what the purchasing maturity level is of Dutch hospitals, what factors influence the level of purchasing maturity, and what benefits and challenges are associated with achieving a higher level of P2P and contract management maturity. The fifth chapter presents the discussion, covering the theoretical and practical implications along with the limitations of this research and the directions for future research. In addition, a concluding summary will be presented in the fifth chapter.

2 Theoretical framework: connecting the TOE framework to the CEP model

2.1 Lack of legitimacy and authority acting as barriers in purchasing for care

Purchasing in the healthcare industry can be divided into two streams, namely purchasing for care and purchasing of care (van Raaij, 2016, p. 17). Purchasing for care can be described as “(...) the process through which healthcare providers select, contract and manage relationships with suppliers of clinical and non-clinical inputs” (van Raaij, 2016, p. 15). An example of purchasing for care can be a hospital purchasing face masks or disinfectants from a supplier. Purchasing of care relates to the interaction between healthcare providers, such as hospitals, and healthcare financiers, such as health insurers. The focus of this research is on the interaction between hospitals and suppliers, thus on purchasing for care. Therefore, purchasing activities related to purchasing for care will be explained, with in particular a focus on P2P and contract management.

Purchasing activities can be classified into different stages. Bäckstrand, Suurmond, van Raaij, and Chen (2019, p. 4) divided the purchasing activities into two set of activities, namely tactical and operational. Supplier selection and contracting are considered tactical activities, whereas ordering and monitoring are considered as operational (Bäckstrand et al., 2019, p. 4). In addition to tactical and operational activities, strategic purchasing activities have been identified by van Raaij (2016, p. 14), such as specification of needs and creating a purchasing strategy. It becomes clear that there are different classifications for tactical and strategic activities. Nevertheless, the activities within the different classifications of the purchasing process are almost identical to each other and follows the purchasing process as described by van Weele (2018, p. 9). Van Weele’s (2018, p. 9) model stems back to 1988 and is an widely copied and accepted linear purchasing model (Bäckstrand et al., 2019, p. 4). van Weele (2018) defines the purchasing process according to three tactical and three operational stages. Figure 1 presents the purchasing process as identified by van Weele (2018, p. 9).

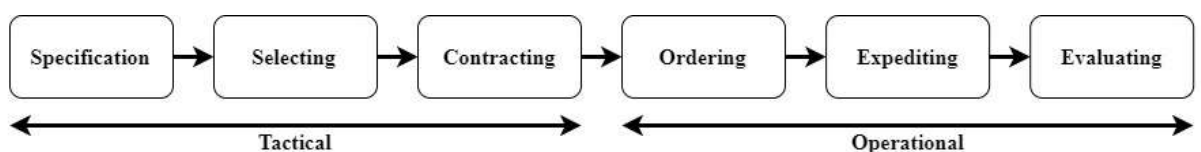


Figure 1. The purchasing process (based on van Weele, 2018, p. 9).

The P2P process can be seen as the executing part of the purchasing process and covers the core activities of operative procurement (Schiele, 2019, p. 58). This process contains four activities, namely creating a purchase order, order fulfilment, invoice processing, and payment (van Raaij, 2016, p. 14). “Organizations devote significant resources to staffing in support of the sourcing, contracting, ordering, receiving, inspecting, and paying for goods and services” (Palmer & Gupta, 2011, p. 66). In response to this, many organizations have started to experiment with different e-procurement tools to reduce the staffing costs (Palmer & Gupta, 2011, p. 66). A mature P2P process is capable of automating these operational activities, lowering the need for additional staffing. In addition, a mature P2P process can lead to improved contract compliance, improved visibility, enhanced decision making, and reduced administration costs (Hawking et al., 2004, p. 6). Piotrowicz and Irani (2010, p. 7) found that the successful implementation of e-procurement tools, such as P2P, also leads to improved cooperation with other business units and can lead to the elimination of non-value added activities. Besides, the implementation of a P2P system allows for continuous monitoring and auditing, which can serve as an anti-fraud mechanism (Faye Borthick, 2012, p. 160). To conclude, a successful P2P implementation makes sure that the right quantity with the right quality for the right costs is ordered (Dachyar & Praharani, 2016, p. 215).

The operational activities, ordering, expediting, and evaluating, are linked to contract management (Van der Valk & Rozemeijer, 2009, p. 5). The contract management process covers “(...) how contracts are planned, structured, awarded, administered, and closed out (...)” (Rendon, 2015, p. 1484). Lowe (2007, p. 320) defines contracts as “(...) legally binding agreements for the supply of goods and/or services in return for some form of remuneration”. Contracts can serve as a safety net from bad performing suppliers, which is of importance as the performance of suppliers directly impacts the end customer’s satisfaction (van der Valk & van Iwaarden, 2011, p. 204). A matured level of contract management is essential for hospitals, as healthcare products tend to have long development life cycles which requires active management of external relationships (Bhakoo & Chan, 2011, p. 185). In addition, Young et al. (2016, p. 250) found that hospitals with solid contract management practices “were significantly associated with lower medical supply expenses”. Besides, Muhammad, Saoula, Issa, and Ahmed (2019, p. 1290) argue that a matured contract management system is a requisite for operational efficiency in a business. A high level of maturity in contract management enhances the overall success of the procurement function as it provides reliable information about specifications, schedules, and performances of the

contractor (Muhammad et al., 2019, p. 1290). To conclude, a matured contract management process ensures stability and safety through active risk- and relationship management (Lowe, 2007, p. 317).

Whilst the activities of purchasing for care show overlap with the traditional purchasing process as described by van Weele (2018, p. 9) the importance of stakeholders tend to differ. According to van Raaij (2016, p. 19) purchasing for care includes four main stakeholders, namely the supplier, the purchaser, the physician, and the board of management. In theory, “(...) purchasing has a relationship of mutual respect with the medical professional, and works in cross-functional teams with the medical professional where appropriate” (van Raaij, 2016, p. 20). However, in practice this does not seem to be the case as physicians tend to possess higher levels of legitimacy and authority compared to purchasers (Menzie & Meehan, 2016, p. 12). This leads to several challenges for purchasers. One of the challenges being that the management board tends to favor the opinion of the physician rather than the opinion of the purchaser (van Raaij, 2016, p. 20). Another challenge is that purchasers tend to be neglected in the identification phase as physicians often undertake the purchasing activity within hospitals (Menzie & Meehan, 2016, p. 8). To conclude, purchasing activities related to purchasing for care show overlap with the purchasing process of van Weele (2018, p. 9). However, purchasing personnel is faced with internal barriers regarding the legitimacy and authority of the purchasing function in hospitals.

2.2 Purchasing maturity models; transforming the purchasing function towards a cross-functional, strategic, and cooperative function

2.2.1 *Comparison of traditional purchasing maturity models*

Enhanced global competition, a growing focus on cost savings, and greater customer demands are some of the leading factors that changed the traditional administrative role of purchasing towards a strategic role within organizations (Úbeda, Alsua, & Carrasco, 2015, p. 177). A core responsibility of the updated purchasing role is “(...) the management of external resources (suppliers) to obtain value and innovation from them while reducing costs” (Úbeda et al., 2015, p. 177). A firm’s success in the implementation of the new purchasing practices may be affected by their level of purchasing maturity (Schiele, 2007,

p. 274). Rozemeijer, Van Weele, and Weggeman (2003) provide a broad definition of purchasing maturity as:

(...) the level of professionalism in the purchasing function as expressed in status of the function, role and organizational status of the purchasing department, availability of purchasing information systems, quality of the people involved in purchasing, and level of collaboration of suppliers. (p. 5)

A high level of purchasing maturity is related to a sophisticated purchasing function which uses advanced purchasing approaches and has access to integrated information systems, whereas a low level of purchasing maturity is related to the opposite (Rozemeijer et al., 2003, p. 10; Van Lith, Voordijk, Castano, & Vos, 2015, p. 1035). Literature suggests that a higher level of purchasing maturity can result in higher levels of purchasing and firm performance (Foerstl, Hartmann, Wynstra, & Moser, 2013, p. 709; Schiele, 2007, p. 274).

PMM's have been developed in order to measure the current maturity level of the purchasing function and provide guidance initiatives on how to reach a more sophisticated stage (Menzies & Meehan, 2016, p. 2). Throughout the years many PMM's have been created. PMM's are often presented in a matrix, where one axis presents the level of maturity and the other the dimension which is analyzed (Schiele, 2007, p. 276). A study on PMM by Schweiger (2014, p. 537) found that PMM's commonly vary between three to ten stages, whereas Schiele (2007, p. 275) found that PMM's usually vary from three to five stages. An agreed upon notion in the different models is that the completion of a stage is the baseline of the next stage (Andreasen & Gammelgaard, 2018, p. 153). This notion is in line with the finding of Schiele (2007, p. 275) who identified the transition in maturity stages as an evolutionary process in which "skipping stages is associated with major difficulties (...)". By comparing several PMM's it becomes clear that the overlapping theme in the evolution of stages is that the purchasing function starts out as an unstructured function existing out of operational activities and evolves to a cross-functional, strategic, and coordinated function. Table 1 provides an overview of the stages in five maturity models which have been selected out of a pool of maturity models which have been cited at least 100 times.

Identifying the maturity stages represent only one axis on the PMM matrix. On the other axis "(...) are the dimensions used to measure the level of maturity, that is, the content to be analysed" (Schiele, 2007, p. 276). An overview of the different dimensions of maturity

Table 1. Overview of stages in maturity models (based on Menzies & Meehan, 2016, p. 3).

Source	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Freeman and Cavinato (1990)	Buying	Purchasing	Procurement	Supply	
Keough (1993)	Serve the factory	Lowest unit cost	Coordinated purchasing	Cross-functional	World-class supply management
Cousins et al. (2006)	Celebrity	Undeveloped	Capable	Strategic	
Paulraj et al. (2006)	Nascent	Tactical	Strategic		
Schiele (2007)	Best-practice	Person assigned	Documented	Cross-functional	

in the literature has been provided in the study by Schiele (2007, p. 277), showing that the most common dimensions are planning, organizational structure, process organization,

human resources and leading, controlling, and supplier collaboration. Previously mentioned dimensions allow for a widely covering maturity assessment. However, Schweiger (2014, p. 541) argues that due to the widely covering maturity dimensions “(...) the strategic, the innovative as well as the talent management and sustainable aspects are not sufficiently emphasized (...)”. Nevertheless, these points of emphasis are partly embedded in the PMM of Schiele (2007, pp. 284-291). Table 2 provides an overview of the dimensions used in the study by Schiele (2007) and its application in the previously analyzed maturity models. A more detailed version of Table 2 can be found in Appendix A.

Table 2. Overview of dimensions in maturity models (based on Schiele, 2007, p. 277-278).

Source	Dimensions					
	Planning	Organisational structure	Process organisation	HR and leading	Controlling	Supplier collaboration
Freeman and Cavinato (1990)	✓			✓	✓	
Keough (1993)	✓	✓	✓	✓		
Cousins et al. (2006)				✓	✓	✓
Paulraj et al. (2006)					✓	✓
Schiele (2007)	✓	✓	✓	✓	✓	

Tontini, de Carvalho, Schlindwein, and Tomarevski (2016, p. 317) as well as Schweiger (2014, p. 544) argue that the idea of developing a ‘one size fits all’ PMM, which could be applied to all companies in all industries, is from a practical point of view unrealistic, as it neglects company characteristics such as size and geography. PMM’s provide guidance on how to advance to a higher level of maturity, however for smaller companies the implementation of processes related to higher levels of maturity, such as IT tools, are expensive and might not be financially feasible (Tontini et al., 2016, p. 316). Therefore, “it is important that the assessment of the degree of maturity of a given company is not individual but makes a comparison between companies in the same segment and sizes, or ‘benchmarking’” (Tontini et al., 2016, p. 317).

To conclude, literature has put forward several PMM’s. However, these PMM’s tend to not emphasize on P2P and contract management. For example, the PMM by Schiele (2007) contains elements of P2P and contract management, yet is focused on a broader range of topics. At the same time, there are several maturity models which solely focus on P2P or contract management, for example the P2P maturity model by Scotmadden (2018) or the contract management maturity model by Rendon (2015). However, these models do not focus on purchasing maturity in general.

2.2.2 Overlapping dimensions and stages between industrial and healthcare purchasing maturity models

The majority of PMM’s have been developed for the private sector. The creation and “(...) use of maturity models to benchmark procurement and contracting processes has seen some, albeit limited, application in the public sector.” (Rendon, 2015, p. 1487). This chapter will elaborate on two PMM models, which are applicable to hospitals, to compare them to the previously mentioned models in order to discover whether healthcare PMM differ from industrial PMM.

The first PMM that will be discussed is by Lichtenberger, Neal, and Ungerman (2010), commissioned by the consultancy company McKinsey. Lichtenberger et al. (2010, p. 20) have created an evolution model, which can be seen as a maturity model, toward sourcing excellence in hospitals. This model exists out of three stages. The first stage ‘basic indirects’ focuses on creating the infrastructure for efficient purchasing by introducing a

central procurement group and in case an organization already has a central procurement group on enhancing the basic skills of the personnel. In this stage the procurement group starts to experiment with sourcing levers on low-preference products, such as computer hardware and office equipment, hence the name ‘basic indirects’ (Lichtenberger et al., 2010, p. 19). A procurement group can be classified in the ‘basic indirects’ stage if it “(...) relies on standard industry contracts and actively manages only a small fraction of the hospital’s spending” (Lichtenberger et al., 2010, p. 23).

The second stage is called ‘clinical preference’. In this stage the procurement group matured to the degree that it is capable of applying pre-determined sourcing strategies to products of higher importance, such as implants and capital equipment. Procurement groups in this stage are collaborating frequently with physicians on purchasing decisions by creating joint teams, make higher use of IT support, and make decisions based on the total cost of ownership rather than solely the volume or price (Lichtenberger et al., 2010, p. 24).

The final stage ‘strategic-alliance’ presents a situation in which “(...) procurement groups develop advanced sourcing techniques and create a portfolio of strategic alliances.” (Lichtenberger et al., 2010, p. 25). In this stage, procurement groups are capable of reaping benefits such as reduced lead times and access to supplier innovations as a result of actively managing suppliers (Lichtenberger et al., 2010, p. 25). Lichtenberger et al. (2010, p. 19) found that the majority of procurement groups in the final stage were capable of saving more than 20 percent of their supply costs. An overview of the evolution model by Lichtenberger et al. (2010) can be found in Table 3.

Table 3. Overview of the evolution model (based on Lichtenberger et al., 2010, p. 20).

	Stage 1	Stage 2	Stage 3
Classification	Basic indirects	Clinical preference	Strategic alliances
Key activities	Creating a systematic purchasing process and team, develop performance management system	Creating joint teams with physicians, introducing IT support, enhance decision making criteria	Proactive purchasing participation and integration, advanced supplier relationships, apply innovative approaches

The second model for analysis is the MSU+ 2.0 model developed by the Dutch Public Procurement Expertise Centre (PIANOo) and the Dutch Association for Purchasing Management (NEVI). The MSU+ 2.0 model is a modification made for the public sector

based on the MSU model of Monczka (1999), which has been created for the private sector. The MSU+ 2.0 model can be used to determine the maturity of the purchasing function and to benchmark against competitors (NEVI, 2014, p. 3). The model has been created “for all Not for Profit (NfP) organisations within the public sector” (NEVI, 2014, p. 3), thus is applicable for assessing the maturity of hospitals.

The MSU+ 2.0 model is based on two sets of processes. The first set exists out of eight strategic processes, the second out of six enabling processes. Table 4 presents an overview of the strategic and enabling processes.

Table 4. Overview of the strategic-and enabling processes of the MSU+ 2.0 model (based on NEVI, 2014, p. 4).

Strategic processes	Enabling processes
1. Deciding for insourcing versus outsourcing	1. Structured purchasing policy
2. Developing a commodity strategy	2. Defined purchasing organisation
3. Optimising the supply base	3. Development of purchasing procedures
4. Active management of supplier relationships	4. KPIs for purchasing
5. Optimising the product/process innovation	5. Availability of IT support
6. Supplier integration in the ordering process	6. Human resource management
7. Enhancing supplier and quality management	
8. Strategic cost management	

Each of the strategic- and enabling processes are scored on a scale from 0 to 10. A score of 0 is justified if the process does not apply to the organization, a score of 1 is given if the process applies but the organization has “zero or no evidence of the presence of a structured decision-making process” (NEVI, 2014, p. 9). The highest score, 10, would indicate world-class best practices and is classified as ‘purchasing excellence’ (NEVI, 2014, p. 26). Furthermore, in the MSU+ 2.0 model the stages are build up on each other, meaning that a higher stage includes all requirements of the previous stages with the addition of a new requirement (Van Lith et al., 2015, p. 1041). A high level of maturity for the strategic process is reliant on the maturity of the enabling processes, as without a base level of maturity in the enabling processes it becomes “impossible to reach a level of 6 or higher for the strategic processes” (NEVI, 2014, p. 26). To summarize, an overall score of 1 would indicate an organization with a low level of purchasing maturity, whereas an overall score of 10 would indicate an organization with a highly matured purchasing function.

By comparing the healthcare models to the industrial models, it becomes clear that the differences are minimal. The overlapping principle between the models is that the

purchasing function starts out as a basic function and as it matures it turns into a strategic, collaborative function. In addition, the healthcare models share similar dimensions as to the industrial models of Table 2. Therefore, it is assumed that PMM's which have originally been created for the industrial sector can also be applied to the healthcare sector.

2.2.3 The CEP model covering P2P and contract management maturity

The previous chapter concluded that there is overlap between industrial and healthcare PMM's. However, traditional PMM's do not particularly focus on P2P and contract management and are deemed too broad for this study, due to this studies particular focus on P2P and contract management. In addition, an objective of this study is to acquire a general impression of the level of purchasing maturity at Dutch hospitals, in order to determine which factors influence this level. Therefore, an in depth traditional PMM covering each dimension in detail is too broad for this research. A more applicable model is the CEP model by Snijders (2020). The CEP model has been chosen for several reasons. First, the model covers the topics that are of interest for this research, namely purchasing maturity in general along with a focus on P2P and contract management. Second, the model has been proven to be applicable in practice, as the model has been applied to assess the level of purchasing maturity of several organizations in the past year (M. Snijders, personal communication, 2021, May 3, 2021). Third, the model has been developed based on existing PMM's, P2P maturity models, and contract management maturity models of various researchers and consultancies and has therefore a reliable theoretical basis. Finally, by comparing the CEP model to the PMM's in Table 2 it becomes clear that even though its particular focus on P2P and contract management it still covers the dimensions; planning, organizational structure, process organization, controlling, and supplier collaboration. The HR and Leading dimension is not included in the model, as "the research would be made too broad by incorporating additional elements such as the recruitment of employees (...)" (Snijders, 2020, p. 6). However, it needs to be emphasized that the CEP models core focus is on P2P and contract management and is therefore not a full maturity model. Therefore, it can concluded that the dimensions as described in Table 2, with the exclusion of HR and Leading, have been included in the model, however mainly in P2P and contract management context.

The CEP model contains three main subjects, namely general, orders, and contracts which are represented in the Y-axis. The X-axis present the different stages of maturity, which are ad hoc, basic, standardized, and integration. A characteristic of the CEP model is that it measures maturity based on a profile, rather than on aggregate measures, meaning that it assumes that an organization can improve in maturity in different fields of the profile, whereas “an aggregate maturity measure assumes that the purchasing function can only develop as a whole (...)” (Søgaard, Skipworth, Bourlakis, Mena, & Wilding, 2019, p. 160). The model has originally been created for assessing the level of purchasing maturity of municipalities, however is also applicable to hospitals (M. Snijders, personal communication, 2021, May 3, 2021). The CEP model by Snijders (2020) is presented in Figure 2.

		Ad hoc	Basic	Standardised	Integration
General	Policy	The purchasing process and the importance of it are described within the policy	Besides the purchasing process and its importance, the information flows are clearly described within the policy	In addition the standards, responsibilities and evaluation methods are described within the policy	After the mentioned policy descriptions, there is enough room within the policy frameworks for continuous optimization
	Well-considered decisions 1. in/out sourcing 2. contract/order 3. supplier selection	Some awareness of the different options, but no real decision is made.	Different options were analysed for suitability, but no additional information has been collected to make a well-considered decision based on facts	A systematic approach whereby information has been collected in order to make a decision based on facts	Ongoing refinement; the necessary information for a well-considered decision has been documented and evaluated by several people (periodic approach)
Orders	Organization & ownership	Decentralised organization where business units own most processes	Clear policy describing who is authorized to purchase what and when centralized permission is necessary	Centralized organization with a clear policy which covers all responsibilities of the p2p process	Centralized organization with ownership of all key processes. All described responsibilities are actually taken
	Systems/monitoring	Rudimentary manual processes with no system support	Invoices are all registered in the same system	All products and services are purchased via the same system and the invoices are automatically saved within this system	Automatic system is available with integration of systems of main suppliers
	Process & supplier involvement/relation	It's clear where a product/service needs to be purchased	It's clear where to purchase and there are clear agreements about the delivery of the products/services	It's clear where to purchase and agreements about delivery are available. Suppliers are integrated within the order process	In addition suppliers and employees keep optimizing the process innovation and development
	Performance measuring & satisfaction	Little to no performance monitoring, tracking and reporting	Purchase orders are generally viewed and evaluated	High level of performance monitoring and reporting of suppliers	Extensive performance monitoring and reporting feedback can be discussed with supplier
Contracts	Process	Contracts have been inventoried	The contracts have been ordered and the contracts are monitored	There is a tactical planning about the actions that need to be done merged out of the monitoring of the contracts	Extensive evaluation of the tendering procedure, exception handling, market developments, involved risks and the actions taken.
	Systems	Contracts are registered	Provide digital support with manageable KPI's	The system monitors the ordered contracts and the system contains a clear dashboard with supplier performance	Integrated systems with main suppliers and there is collaboration in order to create value
	Organization, employees & collaboration	Responsibilities of contract management are centrally invested	There is sufficient qualitative capacity	Organization provides a training program and employees work extensively together	Continuous collaboration between employees and stakeholders on innovative solutions and value creation
	Supplier performance	Suppliers are contacted in case of non-compliance with agreements and when renewing or canceling a contract	Supplier performance is measured based on contract compliance	Supplier performance is reported and improved. There are fixed agreements about evaluation and remuneration	Increasing supplier involvement and encourage continuous improvement of supplier performance

Figure 2. The Coppa Efficient Purchasing model (Snijders, 2020, p. 27).

2.3 The Technology-Organization-Environment framework acting as the foundation for the identification of influencing factors

The TOE framework developed by Tornatzky and Fleischer (1990) will be used for the identification of the main factors influencing the adoption of higher maturity practices. The TOE framework is an organizational-level theory which consists of three building blocks, namely the technological context, the organizational context, and the environmental context (Borgman, Bahli, Heier, & Schewski, 2013, p. 4426). The TOE framework focuses on “(...) how the firm context influences the adoption and implementation of innovations” (Baker, 2012, p. 3). In addition, the TOE framework has a broad applicability and has been used to explain the adoption and implementation of technological innovations of e-procurement (Fu, Chang, Yeh, & Chen, 2019; Mohungoo, Brown, & Kabanda, 2020), as well as its applicability in the healthcare sector (Fu et al., 2019; Lee & Shim, 2007), which emphasizes its applicability for this research.

Table 5. Overview of factors TOE framework.

Layer	Factor	Source
Technological context	Relative advantage	Kuan and Chau (2001, p. 511); Awa, Ukoha, and Emecheta (2016, p. 7); Hwang, Huang, and Wu (2016, p. 10); Borgman, Bahli, Heier, and Schewski (2013, p. 4427)
	Technical competence	Cruz-Jesus et al. (2019, p. 4); Zhu and Kraemer (2005, p. 66)
	Compatibility	Fu and Chang (2016, p. 1749); Awa, Ukoha, and Emecheta (2016, p. 7); Hwang, Huang, and Wu (2016, p. 10); Borgman, Bahli, Heier, and Schewski (2013, p. 4427)
Organizational context	Organizational characteristics	Fu and Chang (2016, p. 1749); Awa, Ukoha, and Emecheta (2016, p. 7); Borgman, Bahli, Heier, and Schewski (2013, p. 4427); Zhu and Kraemer (2005, p. 66)
	Organizational support	Fu and Chang (2016, p. 1749); Hwang, Huang, and Wu (2016, p. 10); Borgman, Bahli, Heier, and Schewski (2013, p. 4427)
Environmental context	Competitive pressure	Fu and Chang (2016, p. 1749); Awa, Ukoha, and Emecheta (2016, p. 7); Hwang, Huang, and Wu (2016, p. 10); Borgman, Bahli, Heier, and Schewski (2013, p. 4427); Cruz-Jesus et al. (2019, p. 4); Zhu and Kraemer (2005, p. 66)
	Regulatory environment	Fu and Chang (2016, p. 1749); Kuan and Chau (2001, p. 512); Hwang, Huang, and Wu (2016, p. 10); Borgman, Bahli, Heier, and Schewski (2013, p. 4427); Zhu and Kraemer (2005, p. 66)

Literature has put forward a wide range of factors belonging to the TOE framework. The essence behind the three context remains the same, whilst “(...) for each specific technology or context that is being studied, there is a unique set of factors or measures.” (Baker, 2012, p. 7). Table 5 presents an overview of the factors that will be used for this research. These factors have selected based on their applicability and validity in other studies related to e-business, e-procurement, or hospitals.

2.3.1 Relative advantage, technical competence, and compatibility acting as pillars of the technological context

The first layer of the TOE framework is the technological context, which “(...) describes both the internal and external technologies relevant to the firm” (Zhu, Kraemer, & Dedrick, 2004, p. 20). Internal technologies can be seen as technologies which are already implemented in a firm, whereas external technologies can be seen as those that are available in the market, but which have not been implemented (Baker, 2012, p. 3; Leung, Lo, Fong, & Law, 2015, p. 393). The technological context layer has been divided into three factors, namely relative advantage, technical competence, and compatibility.

Relative advantage refers to “(...) the extent to which a potential adopter views an innovation as offering an advantage over previous ways of performing the task” (Hwang, Huang, & Wu, 2016, p. 5). As mentioned before, a higher level of purchasing maturity is associated with higher levels of purchasing and firm performance. Previous research has shown a positive association between the perception of relative advantage and the adoption of innovative technologies (Borgman et al., 2013, p. 4426). Therefore, it is expected that more advanced e-procurement tools have been implemented in hospitals in which the top management is aware of the benefits.

Proposition 1: Relative advantage has a positive influence on the level of purchasing maturity.

Technical competence describes the technological resources available in an organization to implement a technical innovation (Cruz-Jesus, Pinheiro, & Oliveira, 2019, p. 4). The two core elements of technical competence are technology infrastructure, which refer to the already available technologies in a firm, and information technology (IT) human resources, which refers to professionals which are capable of implementing new technologies (Zhu &

Kraemer, 2005, p. 68). In a previous study, Zhu and Kraemer (2005, p. 77) found technical competence to be the strongest significant factor to influence the adoption of e-business practices. Therefore, it is expected that a higher level of technical competence in hospitals leads to the adoption of e-procurement tools with higher levels of maturity.

Proposition 2: Technical competence has a positive influence on the level of purchasing maturity

The last factor of the technological context is compatibility. Compatibility can be seen as “the ease with which separate technologies are connected within and beyond firm boundaries” (Leung et al., 2015, p. 394). Lee and Shim (2007, p. 713) argue that the compatibility of a technological innovation positively influences the rate of adoption. Hence, it can be expected that e-procurement tools of higher levels of maturity will be more easily accepted if they are compatible with the organization’s current practices.

Proposition 3: The technical compatibility of e-procurement tools with a hospital’s current systems has a positive influence on the level of purchasing maturity.

2.3.2 Organizational characteristics and support as core drivers for the organizational context

Based on the definition of Tornatzky and Fleischer (1990), organizational context factors can be described as “(...) those variables affecting the organizational structure that the organization could adjust or change to suit its change environment” (Lee & Shim, 2007, p. 713). The factors belonging to the organizational context have been divided into two groups, namely organizational characteristics and organizational support.

Organizational characteristics include the organizations size (Borgman et al., 2013, p. 4427), available resources (Baker, 2012, p. 4), and culture (Awa, Ukoha, & Emecheta, 2016, p. 5). The link between an organization’s size and the level of innovation has been widely researched throughout the years. However, the studies do not present similar results. Laforet (2013, p. 491) found varying innovation types and efforts between firms of varying sizes. Larger organizations tend to possess greater access to resources, such as possibilities for risk spreading, financial resources, and human resources (Laforet, 2013, p. 491). On the other hand, “larger organizations have more internal inertia and find it more difficult to implement change than smaller organizations” (Livermore, 2008, p. 35). Smaller, most often

younger firms, tend to possess greater flexibility and agility, which is beneficial for innovation (Laforet, 2013, p. 491). At the same time, smaller organizations tend to have insufficient or constrained resources to drive innovation (Lin, Cheah, Azali, Ho, & Yip, 2019, p. 977). Different organizational sizes face different challenges. Large organizations face the challenge of combining their resources with the flexibility and agility of smaller ones (Laforet, 2013, p. 491). For smaller organizations the challenge is “to compensate some of their scale disadvantages by R&D cooperation and the development of network” (Laforet, 2013, p. 491). Based on the previous statement it could be argued that both smaller and larger hospitals possess characteristics which could aid the innovation process. Therefore, it can be assumed that medium-sized organizations are stuck in the middle, where they do not possess the agility and flexibility of smaller organizations, but also not the greater access of resources that larger organizations have. In contrary, Plomp and Batenburg (2009, p. 210) found that organizational size positively impacts the level of maturity, as they concluded in their study that “the larger hospital is far more mature and aligned than the smaller ones and hence has a higher performance”. For this research, it is assumed that organizational size positively influences the maturity level as Plomp and Batenburg (2009) research has been conducted specifically on hospitals. However, as the study of Plomp and Batenburg (2009) had a small sample size of three hospitals it would be interesting to test this proposition for a broader sample and internationally. The metric that will be used for assessing hospital size will be the amount of hospital beds. Hence, the fourth proposition;

Proposition 4: A hospital's size (in terms of hospital beds) positively influences the level of purchasing maturity.

The next influencing factor that will be discussed is available resources. As mentioned before, the implementation of processes which relate to a higher level of maturity can be an expensive process, which might not be financially feasible for smaller firms (Tontini et al., 2016, p. 316). Matunga, Nyanamba, and Okibo (2013, p. 108) discovered that inadequate funding is the greatest obstacle for public hospitals for the implementation of e-procurement practices. It is expected that this harms the level of purchasing maturity as “an adequate budget for change resources is the facilitating condition (...)” (Calvert, 2006, p. 2). Furthermore, the resources available to the purchasing function tend to be scarce resulting in a poor or even failing performance of strategic sourcing activities (Andreasen & Gammelgaard, 2018, p. 152). To further illustrate, Menzies and Meehan (2016, p. 10) found that a lack of available resources is the main reason for poor downstream contract

management in the healthcare sector. Monetary resources are required for several activities, for example employee training, hiring additional staff and introducing e-procurement tools.

In addition to monetary resources, organizational knowledge is part of the factor available resources. Organizational knowledge can be seen as “(...) a resource that is valuable to an organization’s ability to innovate and compete” (Bollinger & Smith, 2001, p. 8). Organization knowledge and individual knowledge can be seen as interdependent (Bhatt, 2002, p. 33). Therefore, enhancing the level of individual knowledge can contribute to the level of organizational knowledge. In hospital context, Bhakoo and Chan (2011, pp. 184-185) identified the limited knowledge of healthcare professionals to be a hindering factor in developing an effective procurement strategy as “decisions regarding procurement are made by clinicians who have limited knowledge of supply-chain management”. Reason for this is that in the healthcare industry the purchasing functions lacks legitimacy and authority (Menzies & Meehan, 2016, p. 10). As a result, management tend to neglect the opinion of purchasing professionals, whilst following the advice of physicians (van Raaij, 2016, p. 20). In addition to the low level of organizational influence the purchasing function possesses, purchasing is also struggling to engage with suppliers. Traditionally, clinicians conducted activities such as the selection of suppliers, as a result “the social capital invested in these supplier-clinician relationships makes it difficult for procurement to penetrate these knowledge networks.” (Menzies & Meehan, 2016, p. 10). Menzies and Meehan (2016, p. 7) found that the purchasing department often lacks knowledge on their products and/or services, which results in poor contract management and low level of customer engagement. If the procurement personnel has limited skills and capabilities and procurement has a low organizational status, purchasers “(...) may lack the willingness and the ability to translate new procurement policies into everyday practice.” (Flynn, 2018, p. 428). Employee training, on how to use certain purchasing systems or build relationships might be beneficial to overcome these issues (Matunga et al., 2013, p. 108).

To conclude, it can be expected that hospitals which have poor access to resources, either financial or human resources, score a lower level of maturity. Hence the fifth proposition;

Proposition 5: A hospital’s availability of resources positively influences the level of purchasing maturity.

The next influencing factor that will be discussed is organizational culture. According to Schein (2010, p. 17) organizational culture can be described as “(...) a pattern of shared basic assumptions that was learned by a group [organization] as it solved its problems of external adaption and internal integration (...)”. Employees’ shared values, beliefs and attitude are defining elements of an organizations culture (Martins & Terblanche, 2003, p. 65). Martins and Terblanche (2003, p. 68) found that organizational culture has an effect on the level of creativity innovation of a company. For example, employees are more likely to show creative behavior in an organizational culture which treats a mistake as an learning opportunity rather than a failure (Martins & Terblanche, 2003, p. 72). Schweiger (2014, p. 544) emphasizes the importance of the role a company’s culture has in the achievement of high level of maturity, as there needs to be a company culture which stimulates employees to take on provided trainings. Companies which fail to create such a culture risk a lower level of performance due to “(...) demotivation or overcharging the PSM personnel because of asking them to do things they are not able/trained and willing to do” (Schweiger, 2014, p. 544).

Goffee and Jones (1996, p. 134) identified four types of organizational culture, namely networked, communal, fragmented, and mercenary. An organizations culture type can be determined based on their scores on sociability and solidarity. Sociability describes to what extent employees treat each other in a friendly manner (Rashid, Sambasivan, & Rahman, 2004, p. 164). Sociability emphasizes on “(...) the genuine friendships between the members of a society, which can exist both within and beyond their working lives” (Malagas, Gritzalis, Nikitakos, & Fragoudaki, 2017, p. 228). For example, companies in which employees attend social events together or eat lunch together can be given a high score on sociability (Rashid et al., 2004, p. 165).

The second dimension, solidarity, can be described as “(...) the ability of people to pursue shared goals efficiently and effectively for the larger good of the organization without much regard for the impact on individuals (...)” (Rashid et al., 2004, pp. 164-165). In an organization with a high level of solidarity the roles and tasks of employees are formally documented (Goffee & Jones, 1996, p. 136). Furthermore, a low tolerance on poor performance, dedication, and a quick response to competitive threats are characteristics of a high score of solidarity (Goffee & Jones, 1996, p. 136; Rashid et al., 2004, p. 165). Figure 3 presents an overview of the dimensions and the related culture types.

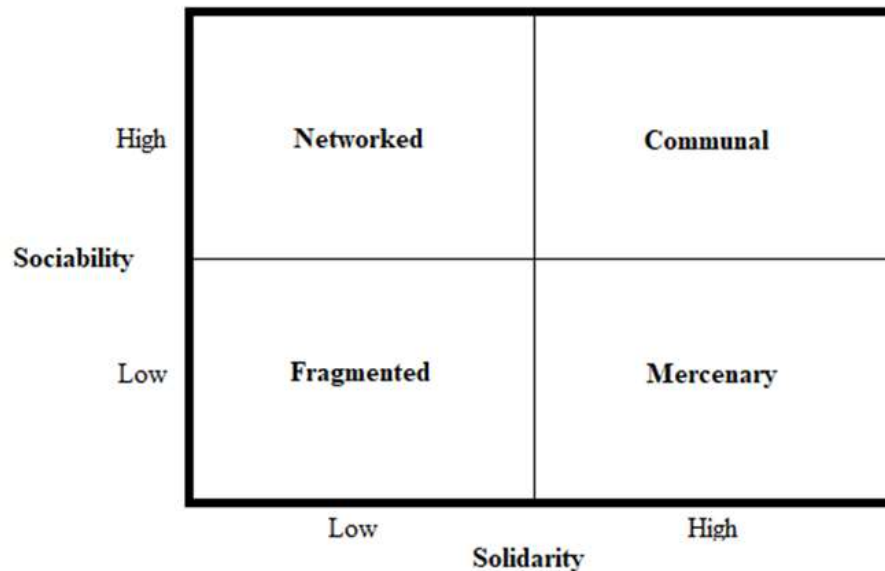


Figure 3. Overview of the cultural types and dimensions (Goffee & Jones, 1996, p. 134).

A higher level of sociability is linked to higher levels of innovation and creativity compared to a lower level (Goffee & Jones, 1996, p. 134). However, Menzies and Meehan (2016, p. 8) discovered that in the majority of hospitals a culture is present in which employees from different departments are reluctant to share knowledge, which is an indicator of a low level of sociability, thus hindering innovation. The lack of trust in hospitals results in slower adaptation of technological innovation due to employees not willing to share learning experiences with each other (Bhakoo & Chan, 2011, p. 191). Therefore, it is suggested that hospitals might need to adapt their culture to a culture characterised by a high level of sociability in order to successfully implement maturity practices. To summarize, a culture characterised by a high level of sociability is favorable for the adoption of purchasing practices of a higher maturity.

Proposition 6: Hospitals with a networked or communal culture possess a higher level of maturity compared to hospitals with a fragmented or mercenary culture.

Organizational support, the second part of the organizational context, includes top management support (Awa et al., 2016, p. 5; Borgman et al., 2013, p. 4427) and interdepartmental coordination (Fu & Chang, 2016, p. 1749). Fu et al. (2019, p. 12) found that top management support is the most important factor for the adoption of e-procurement systems for private hospitals. Top management support could also reduce the resistance to change in an organization by providing recognition and cooperation (Fu et al., 2019, p. 12). Fu and Chang (2016, p. 1752) argue that in order to reduce the failure rate of an implementation, top management should “(...) engage in active support, including time involvement, resource allocation and strategic support (...)”.

In this study, interdepartmental coordination refers to the coordination and cooperation of several departments and/or actors with purchasing, for example finance or physicians. Menzies and Meehan (2016, p. 8) argue that “(...) progression in procurement maturity is not feasible without the support of senior finance staff that set the savings targets (...). The purchasing department needs to actively cooperate with the finance department for setting costs and savings targets in order to create a sustainable long-term view (Menzies & Meehan, 2016, pp. 7 - 8). Therefore, it can be expected that purchasing departments in hospitals which receive organizational support, in terms of top management support as well as interdepartmental support, have a higher level of purchasing maturity.

Proposition 7: Organizational support has a positive influence on the level of purchasing maturity.

2.3.3 Competitive pressure and the regulatory environment considered as influencing factors of the environmental context

Following the definition of Leung et al. (2015, p. 395), the environmental context covers “(...) the arena in which an organization conducts its business”. Factors belonging to this context are competitive pressure and regulatory environment, acting as facilitators or inhibitors for the adoption of innovations (Awa et al., 2016, p. 5).

Competitive pressure can be described by “(...) the degree of pressure that the company feels from competitors within the industry” (Zhu & Kraemer, 2005, p. 70). Organizations which perceive a feeling of competitive pressure are more likely to recognize the need for technological innovation in order to remain competitive, thus are more likely to adopt new innovations (Leung et al., 2015, p. 395). In addition, Cruz-Jesus et al. (2019, p. 6) state that “as competition from other players in the market increases, an organization is more prone to seek ways of achieving sustainable competitive advantage, through innovative technologies”. Throughout the years, the competitive environment around hospitals has shifted towards a competitive environment, characterized by a growing level of rivalry (Plomp & Batenburg, 2009, p. 204). As a result of this shift it is likely that hospitals are experiencing competitive pressures. Based on the effect competitive pressure has on innovations it is expected that a higher level of competitive pressure in hospitals leads to the adoption of e-procurement tools of higher levels of maturity.

Proposition 8: Competitive pressure has a positive influence on the level of purchasing maturity.

The final influencing factor that will be discussed is the regulatory environment. The regulatory environments can be described as the degree to which a government encourages or discourages innovation (Baker, 2012, p. 12). Zhu and Kraemer (2005, p. 68) argue that regulatory support has an influence on the adoption rate of new technologies as governments could provide incentives for adopting new technologies, for example tax advantages, or implementing new laws to make certain technologies required for conducting business in public areas. In addition, government regulation could also have a detrimental effect on innovation by requesting too “(...) stringent safety and testing requirements (...)” (Baker, 2012, p. 12). Furthermore, Menzies and Meehan (2016, p. 7) argue that the government policy acts as a barrier for the procurement department to mature by creating short-term pressure on reducing costs. To conclude, the regulatory environment could either have a positive or negative effect on the adoption rate of new technologies required for a higher level of purchasing maturity.

Proposition 9: The regulatory environment has a significant influence on the level of purchasing maturity.

2.4 Conceptual model: the expected influence of the technological, organizational, and environmental contexts on the level of purchasing maturity.

A conceptual model has been created based on the TOE framework. The factors belonging to the technological, organizational, and environmental contexts represent the potentially influencing factors in the model, based on the propositions. Purchasing maturity presents the goal of this study, to discover what factors influence the level of purchasing maturity. Figure 4 displays the conceptual model.

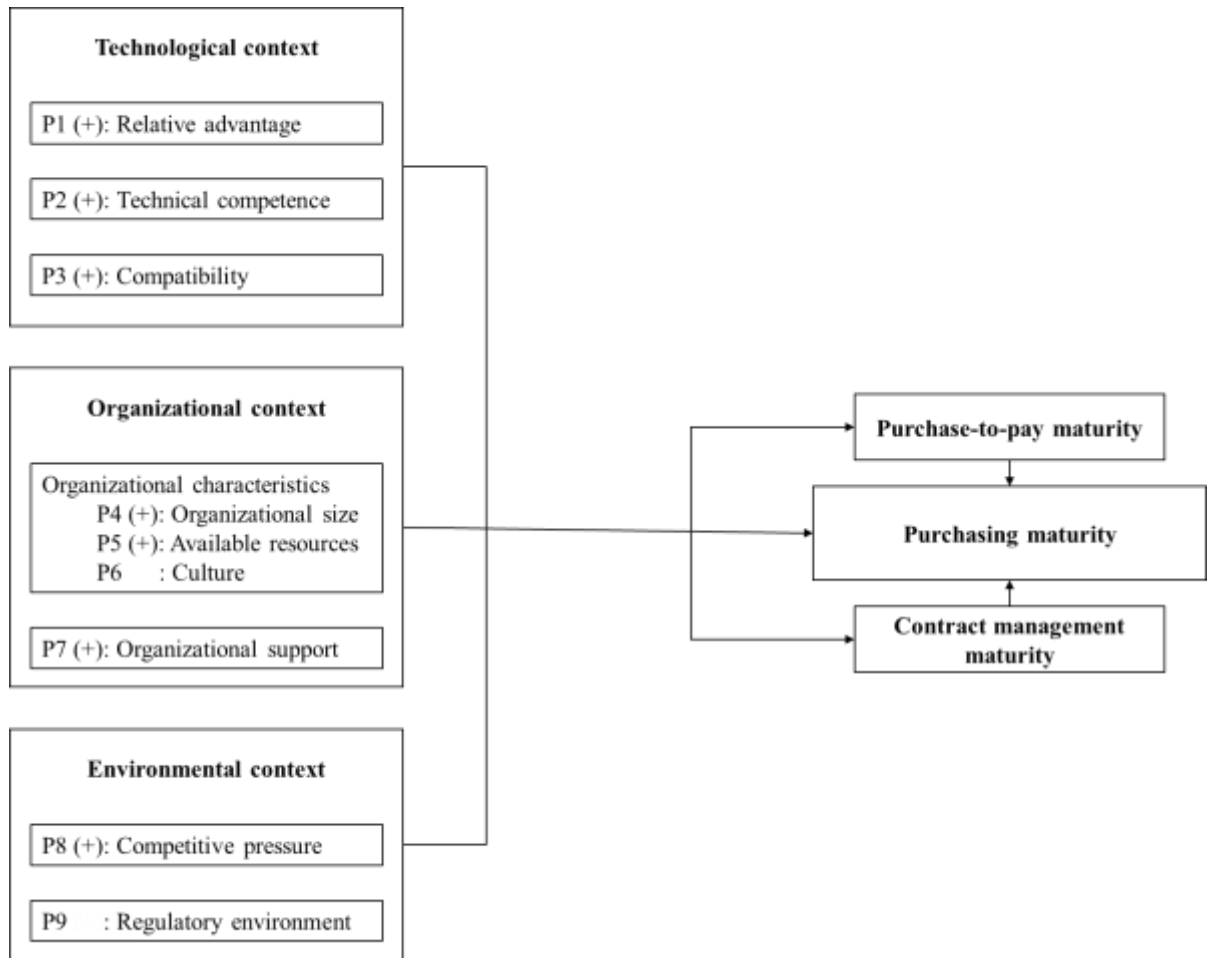


Figure 4. Conceptual model.

3 Methodology: Conducting a survey and semi-structured interviews to determine the level of purchasing maturity and the factors influencing the level of purchasing maturity

3.1 A hybrid research approach based on a survey and semi-structured interviews

3.1.1 A survey and semi-structured interviews to acquire insights on influencing factors

To investigate what factors influence the level of purchasing maturity of Dutch hospitals, a total of twelve semi-structured interviews have been conducted. In addition, a survey has been sent to purchasers working for hospitals to identify the level of purchasing maturity of Dutch hospitals.

A quantitative research approach, such as conducting a survey, allows for “(...) collecting numerical data to explain a particular phenomenon (...)” (Sukamolson, 2007, p. 3), which is in this research the factors influencing the level of maturity. Furthermore, quantitative research excels at answering research questions starting with ‘what’ or ‘how’ due to the results being quantifiable (Goertzen, 2017, p. 12). In addition, survey research can be used to compare groups or cases with each other (Sukamolson, 2007, p. 4), and is therefore suited to identify the impact of different factors on the level of purchasing maturity. The survey used for this research is a shortened version of the questionnaire belonging to the CEP model of Snijders (2020) and can be found in Appendix B.

To investigate what factors influence the level of purchasing maturity, semi-structured interviews have been conducted. Semi-structured interviews have been chosen as it “(...) allows the researcher to collect open-ended data, to explore participant thoughts, feelings and beliefs about a particular topic and to delve deeply into personal and sometimes sensitive issues” (DeJonckheere & Vaughn, 2019, p. 1). Next to this, Diccico-Bloom and Crabtree (2006, p. 315) identified semi-structured interviews to be the most common format for qualitative research. This gets also confirmed to be the case for healthcare related studies by DeJonckheere and Vaughn (2019, p. 1). In addition, the face-to-face nature of semi-structured interviews allows the researcher to perceive social cues that “(...) can give the interviewer a lot of extra information that can be added to the verbal answer of the interviewee on a question” (Opdenakker, 2006, p. 4). Due to the COVID-19 restrictions all of the interviews have been conducted online through the video conferencing applications

Microsoft Teams and Google Meet, which still allowed the researcher to interpret visual cues.

3.1.2 Experienced purchasers, consultants, and specialists questioned in twelve semi-structured interviews

For the survey, the required sample size has been calculated with the use of the Taro Yamane formula. The Taro Yamane formula is as follows: $n = N / (1 + N(e)^2)$. In this formula n denotes the required sample size, N the population size, and e the margin of error (Adam, 2020, p. 91). The Netherlands has 298 hospitals, divided over 70 organizations. For this research, it has been decided to conduct the survey with hospital organizations rather than individual hospitals as it can be expected that the purchasing process is centrally led by the organization, meaning that the population size for the survey is 70. As the population size, N , is known the minimum representative sample size for Dutch hospitals can be calculated. With a confidence level of 90%, the formula equals $n = 70 / (1 + 70(0.1)^2) = 41.18$, which means that at least 42 Dutch hospitals needed to respond in order for this research to be representative. However, after two rounds of distributions a total of seven purchasers completed the survey, meaning that the confidence level of 90% has not been reached, thus meaning that the results are not representative. Instead, the results of the seven completed surveys have been used as inspiration for the interview protocols.

In August 2021, twelve interviews have been conducted. Five of the twelve interviews have been conducted with purchasers, five with consultants, and two with specialists. In total, thirteen participants have been interviewed as there were two specialists present in one of the interviews with the specialists. The average duration of an interview was 39:21 minutes.

All of the interviewed purchasers were in strategic purchasing job functions, four as the head of purchasing and one as the purchasing coordinator of the hospital. This was an important criterium, since participants had to have sufficient knowledge on the strategical processes of the hospital, such as the long term strategy as well as insights on the availability of resources. Another criterium was that purchasers should not be working for the same hospital organization, as this could lead to outcomes which are based on a specific organization, reducing the diversity of the hospitals presented in the sample. Furthermore, each of the purchasers had to fulfill the survey prior to being interviewed, as this provided input for the questions regarding future actions for maturing. Besides, all of the purchasers

are working for non-academic hospitals. Therefore, the results present the perspective from purchasing professionals working in the non-academic hospital sector.

For the consultants it was a crucial criterium to be working for the healthcare section of the consultancy. This was important as the consultancy serves next to healthcare organizations also municipalities. Besides, the consultants needed to have at least two years of experience. Therefore, junior consultants had been excluded from the sampling process. This resulted in a sample of three senior consultants and two mid-level consultants, which was favorable as this resulted in more in-depth and detailed information regarding the factors influencing the level of purchasing maturity. In addition, the goal was to acquire multiple perspectives on maturity. Therefore, three specialists, responsible for the operational activities of the P2P and contract management process of the consultancy, have been included. Table 6 provides an overview of the interview participants. Due to confidentiality reasons, all of the participants have been anonymized.

Table 6. Overview of interview participants.

Interview	Participant	Function/Specialization	Duration
1	Purchaser A	Head of purchasing	00:38:21
2	Purchaser B	Purchasing coordinator	00:25:05
3	Purchaser C	Head of purchasing	00:32:19
4	Purchaser D	Head of purchasing	00:30:04
5	Purchaser E	Head of purchasing	00:32:53
6	Consultant A	Consultant / Healthcare	00:32:53
7	Consultant B	Consultant / Healthcare	00:48:00
8	Consultant C	Consultant / IT-Healthcare	01:01:16
9	Consultant D	Consultant / Healthcare	01:00:16
10	Consultant E	Consultant / Healthcare	00:32:49
11	Specialist F	Specialist / P2P	00:32:30
12	Specialist G	Specialist / P2P	00:45:42
	Specialist H	Specialist / Contract management	

3.1.3 Interview protocol created to reveal influencing factors along with benefits and challenges encountered in the maturing process

Two interview protocols have been created, one for the interviews with the purchasers and one for the interviews with the consultants and specialists. Both of the protocols follow the same structure, starting with an introduction of the research and the rights of the interviewee followed by three groups of questions. During the introduction the researcher explained the goal of the interview, that the answers of the interviewee will be anonymized, that the

interviewee had the right to stop the interview at any given time, and requested permission for the recording of the interview. Afterwards, the first group of questions was asked. These questions focused on acquiring information on the current job function and the years of experience of the interviewee. The second group of questions aimed at identifying factors influencing the level of purchasing maturity of hospitals. This has been done by dividing this topic into the three areas as presented in the CEP model by Snijders (2020), thus purchasing maturity in general, the purchasing maturity of the P2P process, and the purchasing maturity of the contract management process. The first question of this second group was to provide a definition of the respective topic in order to identify if there is a general understanding of the topic. Afterwards, the researcher provided the definitions that are being used in the research to create a common ground for the follow up questions. The rest of the questions of the second group focused on identifying benefits and challenges of maturing as well as identifying hindering and facilitating factors for maturing. For the third, final group of questions the interviewees were asked two questions, namely if there are any other factors that have not come forward throughout the interview but are deemed important as well as to provide a top three of most influencing factors on purchasing maturity. The difference between the two protocols for purchasers and for consultants and specialists is that for the purchasers the results of the survey have been used to discover what type of actions purchasers want to undertake to reach a higher level of maturity. Both of the interview protocols can be found in Appendix C.

3.2 The coding process driven by inductive and deductive coding

For the preparation of the data analysis all twelve interviews have been transcribed with the aid of Amberscript. After each interview, the audio recording has been uploaded to Amberscript, which leads to a rough transcription of the audio. Afterwards, the transcripts have been revised manually to filter out machine-made errors in order for the data to be ready for coding.

The coding process has been based on inductive and deductive coding and has been executed with the use of Excel. Initially, the coding process started in a deductive manner based on the factors belonging to the TOE framework as discussed in the literature review. However, during the coding process of the first interview it became clear that more diverse

codes are required to cover the factors mentioned by the interviewees. Therefore, the factors as described in the TOE framework served as a starting point for the coding process with the addition of newly created inductive codes. Due to this, the first step of the coding process turned into open coding, in which 66 codes have been identified throughout the twelve interviews. This step has been done by highlighting and extracting sentences and summarizing it in a separate column. The second step focused on creating categories for the overlapping codes. In total, fifteen categories have been created in this step. Out of these fifteen categories, ten categories have been identified in the literature review as factors belonging to the TOE framework. Therefore, the factors presented in the TOE framework served next to individual codes also as categories. In addition, five categories have been newly created, namely strategy, awareness, external cooperation, crisis, and location. For the last step, the fifteen categories have been assigned to overlapping contexts. It turned out that all of the categories could be divided over the technological, organizational, and environmental contexts as described in the TOE framework. Therefore, no new contexts have been created. Table 7 illustrates the coding process for the environmental context to give an example. The final codebook can be found in Appendix D.

Table 7. Overview of the coding process for the environmental context.

Open coding	Category coding	Context coding
Competitive pressure	Competitive pressure	
Regulatory environment	Regulatory environment	
Supplier related		
Supplier capability	External cooperation	Environmental
Partnership		
Union		
Crisis	Crisis	
Geographical proximity	Location	

To transform the finished coding process into results two groups have been created. On one hand the purchasers, and on the other hand the consultants and specialists. For both of the groups the same process applied. First, the amount of mentions of all factors by each interviewee has been analyzed. For this, a mention represents a theme in the answer of the question, rather than the sole number of keywords mentioned. For example, if an interviewee mentioned the same keyword twice in the same sentence it only counted as one mention. By doing this it became clear what factors received recognition by the interviewees. Second, the final question of both of the interview protocols asked the interviewees to provide a ranking of the most influencing factors according to them. This allowed to discover whether there is

a link between the dominant themes in the interviews and with the importance being given to the factor. At last, the overlap of the factors as mentioned by the different interviewees has been analyzed. This provided another perspective on the importance of the factor as this does not provide insights on the importance placed by an individual interviewee on the factor but rather the consensus of the interviewees on the existence of the influencing factor.

4 Results: identifying the level of purchasing maturity, the influencing factors of purchasing maturity, and the benefits and challenges related to reaching a higher level of purchasing maturity.

The following chapter starts with providing the indicative results of the survey with the purchasers. Afterwards, the factors influencing the level of purchasing maturity will be discussed following the technological, organizational, and environmental contexts of the TOE framework based on the perspectives of purchasers, consultants and P2P/contract management specialists. Moreover, an overview summarizing the complete TOE framework is provided. At last, perceived challenges and benefits of P2P and contract management implementation are discussed from different perspectives.

4.1 Hospitals tend to score low on the current and desired level of contract management maturity

The results of the survey indicate that the purchasers desire to achieve a higher level of purchasing maturity within three years, as well as in the future. Currently, the purchasers score for the general maturity between the basic and the standardized level, with the desire to advance in three years to the standardized level and ultimately, in the future to the integration level. The same pattern can be seen in the order dimension. The area which scores the lowest is the level of contract maturity. On average, the seven purchasers assessed their hospital to represent the basic level of contract maturity, with the intention to advance to the standardized level within three years. For the future, the purchasers aim to mature towards somewhere in the middle of the standardized and integration level of contract maturity. Figure 5 provides an overview of the average scores as well as the related standard deviation, in which the X axis portrays the different elements and the Y axis the level of maturity. A detailed table covering the means and standard details of each of the elements can be found in Appendix E.

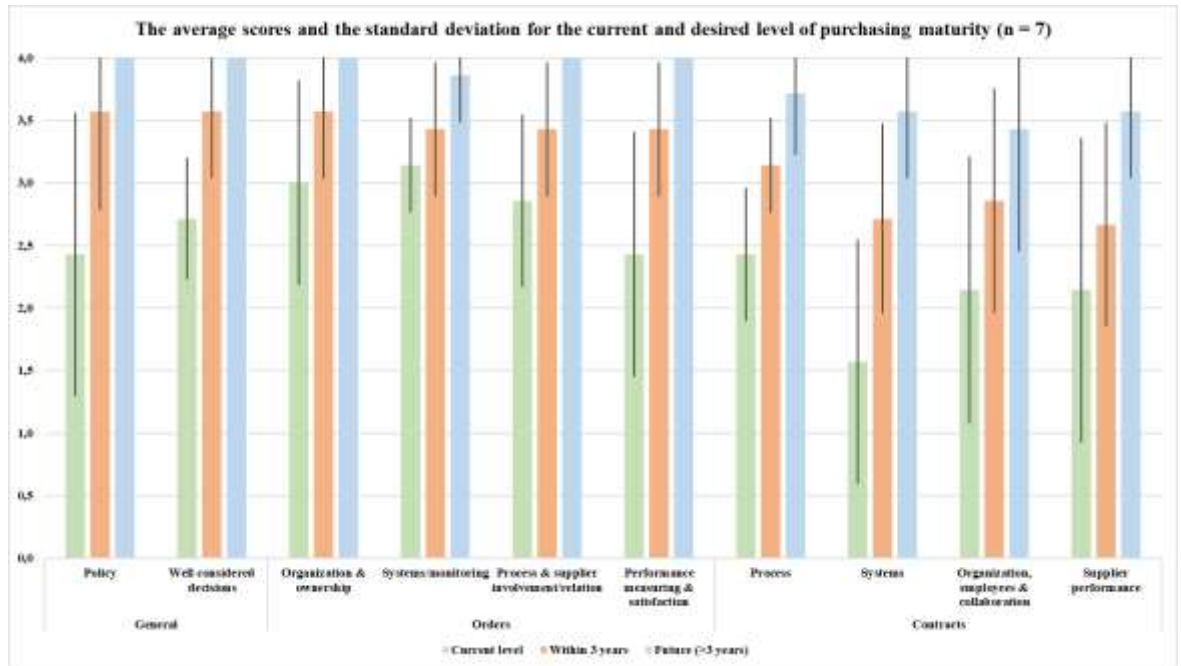


Figure 5. Overview of the average scores and the standard deviation for the current and desired level of purchasing maturity.

4.2 Technological context: technical competence as core driver for advancing in maturity

4.2.1 *Relative advantage, technical competence, and compatibility receive support from the perspective of purchasers*

Throughout the five interviews with the purchasers factors belonging to the technological context got mentioned 21 times. The most prominent factor is for the technological context is technical competence, which has been mentioned nine times. The second most frequently mentioned factor is relative advantage, which has been mentioned seven times throughout the interviews. Lastly, compatibility has been mentioned the least often with a total of five mentions.

All of the purchasers shared the opinion that technical competence has an influence on the level of purchasing maturity. Purchaser A experienced a lack of IT knowledge to be a hindering factor for advancing in purchasing maturity as due to a lack of inhouse IT knowledge “*questions do not get answered quickly or are not answered at all, resulting in the need for help from a consultant*”. In addition, Purchaser A noticed that occasionally the wrong items get ordered due to the lack of IT knowledge of the ordering system, for example tweezers that are designed for ophthalmology end up being ordered for other departments.

Another key factor has been mentioned by purchaser C, who described the importance of technological infrastructure for maturing and stated *“we need to upgrade to a better ERP system”* as a prerequisite for achieving a higher level of maturity. The importance of the technological infrastructure also gets confirmed by purchaser E, who mentioned *“I think that use of specific purchasing software is an important step of professionalizing, not only towards yourself, but also to your internal customers and suppliers”*. However, the technological infrastructure is also highly dependent on the input of organized, up-to-date data as purchaser B stated *“you need to make sure that your database is well organized, otherwise the pros will turn into cons, disrupting the purchasing process”*.

The majority of the purchasers mentioned relative advantage to have an impact on maturity. Purchasing systems, such as a P2P or contract management system, offer several advantages, one of these advantages is being able to extract solid management information from these systems, which is according to purchaser D of growing importance. In addition, purchaser A mentioned the digitalization advantage of P2P and enterprise resource planning (ERP) systems to lead to a higher level of maturity as *“(…) all data can be put in a system and you do not need to work with all kinds of excel files, lists or emails. Having all your data fully digitalized in your system and accessible is of importance”*. As a result of purchaser A’s awareness of the relative advantage a system has been implemented in 2020. According to purchaser D, the relative advantage of advanced purchasing systems should be made aware to the business, in order to secure monetary and human resources.

Three out of the five purchasers mentioned technological compatibility to be of influence on the level of maturity. A more matured system has a higher likelihood of being adopted if it is compatible with the current systems. Purchaser D finds it important that a new purchasing system is capable of cooperating with the already existing systems in the organization, for example the patient information system. In addition, a trend is becoming visible of purchasers interest in moving to one overarching system, rather than several sub-systems. For example purchaser C stated *“the key question is how well can we integrate all these sub-systems into one total integration. […] I think that that is very important towards purchasing maturity to have that figured out”*. Furthermore, it is important to assess how compatible the proposed system is with the current skill set of the employees as purchaser A mentioned that it needs to be assessed if the new system also requires new trainings or procedures for the employees.

To conclude, from the purchasers perspective, the technical competence has been mentioned most often. Table 8 provides an overview of the technological factors along with the frequency of being mentioned by each purchaser.

Table 8. Factors belonging to the technological context based on the perspective of purchasers.

Context	Factor	Purchaser					Frequency
		A	B	C	D	E	
Technological	Relative advantage	1	3	0	3	0	7 (33%)
	Technical competence	3	2	1	2	1	9 (43%)
	Compatibility	2	0	1	2	0	5 (24%)
Total:						21 (100%)	

4.2.2 Technical competence receives with almost half of the mentions of the technological context the most support from consultants and specialists

Next, the technological context will be discussed based on the view of the consultants and specialists. During the interviews, 45 times factors belonging to the technological context have been mentioned. Technical competence received the most attention, at it makes up 21 of the 45 mentions related to this context. In contrast to the purchaser perspective, compatibility has been mentioned the second most frequently, with a total of 16 mentions. Relative advantage has been mentioned nine times, which is the least often out of the technological context.

Five out of the eight participants mentioned technical competence to have an influence on purchasing maturity. For example, consultant A experienced less hindrances in implementing purchasing software when a hospital is already familiar with implementations from previous systems, referring to the technological infrastructure of the hospital. In addition, consultant C mentioned that there is a high need for purchasers with IT knowledge in hospitals, as commonly there is a lack of IT affinity in the purchasing department, hindering the maturity process. Besides, consultant C identified a link between the IT knowledge of an employee and the level of authority given to the purchasing department stating *“If you don’t speak the language of the ICT department, you will not get easily accepted”*. According to consultant C this can be considered as a hindering factor as a lack of IT knowledge can lead to the purchasing department being skipped in the process of IT related purchases. In contrary, consultant D praises the IT knowledge of hospitals by stating

“Technological aspects are in my opinion less of a concern for hospitals. However, the digital skillset of their employees is crucial”, emphasizing the importance IT knowledge has on reaching a higher level of maturity. This opinion is shared by specialist F who compliments the technical competence of hospitals *“A new system takes time for everyone to get used to, but I think that in general that goes well in hospitals, as they come from a situation in which they already used systems”*.

Five out of the eight interviewees mentioned relative advantage to have an influence on the level of maturity, and with a total of nine mentions it is the least mentioned factor of the technological context. Consultant E argued that modern technology allows for easy communication and meetings, which is beneficial for the level of maturity. However, consultant E also stated that it is important *“to have ambassadors in lower layers of the organization, who promote it to their locations, department, and employees, to explain why it is of importance”*, referring to that employees need to understand the relative advantage of the tools in order to increase the adoption rate. In addition, consultant B notes that it is not only beneficial to have organizational awareness of the relative advantage beforehand, but also during the usage phase, to also show what the advantages actually are and how they impact the business.

All of the consultants and one of the specialists identified compatibility to have an influence on the level of purchasing maturity. Consultant D mentioned *“how well and efficient the processes are designed and how well do they get supported by tooling”* to be the second most influencing factor for purchasing maturity, referring to the importance of compatibility of the systems to support the processes. In addition, consultant B emphasized the importance that compatibility plays throughout the organization as *“sometimes it is also the case that a certain department, for example pharmacy, has an own pharmacy purchasing system, which then needs to be compatible with the other systems”*, implying that a system which is capable of bringing together all the spend of an organization into one system is more likely to be adopted, thus enhancing the maturity. Specialist F emphasized the importance of the ease of use of the system, as it needs to be user friendly and thus compatible with the average skillset of hospital employees.

To conclude, technical competence has been identified as the most prominent factor belonging to the technological context with almost half of the mentions. In particular, IT knowledge received attention as being a sub factor with a direct influence on maturity. The

majority of the interviewees identified compatibility as an influencing factor, emphasizing the importance of matching the purchasing processes with the supporting tools. Relative advantage has been mentioned the least as well as by the least number of interviewees. Nevertheless, relative advantage has been identified as an influencing factor by five out of the eight participants. Table 9 provides an overview of the technological factors based on the interviews with consultants and specialists.

Table 9. Factors belonging to the technological context based on the perspective of consultants and specialists.

Context	Factor	Consultant					Specialist			Frequency
		A	B	C	D	E	F	G	H	
Technological	Relative advantage	0	1	0	1	5	0	1	1	9 (20%)
	Technical competence	10	0	5	2	3	1	0	0	21 (47%)
	Compatibility	2	6	1	3	1	2	0	0	15 (33%)
Total									45 (100%)	

4.2 Organizational context: organizational characteristics and support influence the level of purchasing maturity

4.2.1 Available resources and strategy receive the most support from the purchasers

Factors belonging to the organizational context have been mentioned a total of 133 times throughout the interviews with the purchasers, which is the highest frequency out of the three contexts. The organizational context has been divided between two factors, namely characteristics and support, with characteristics having four sub-factors and support having three sub-factors. Out of the 133 mentions, organizational characteristics have been mentioned a total of 92 times, whereas organizational support has been mentioned a total of 41 times.

The organizational characteristic factors exists out of four sub-factors, namely size, strategy, available resources, and culture. However, size has not been mentioned by any purchaser and will thus not be further discussed below. According to all of the purchasers the organizations strategy affects the level of purchasing maturity. However, a common theme during the interviews was that hospitals are occupied with dealing with the issues of the day, which hinders the maturity of the purchasing function due to lack of long term focus. Nevertheless, all purchasers are actively working on a strategy for higher maturity. For

example, purchaser A mentioned to be actively working on centralizing the purchasing function and therefore purchaser A's organization is already purchasing 90% centrally. However, purchaser A stated that *"it is important that the purchasing strategy fits the roadmap and strategy of the organization"*, otherwise you will not succeed. Purchaser B mentioned that they *"do not solely focus on savings, [...] at a certain point the savings have been optimised and you need to focus on strategic topics like innovation"*, implying that maturity goes beyond savings. In addition, purchaser E emphasized the importance standardization has on maturing the purchasing function. The majority of the interviewed hospitals do not have a job function as contract manager present in their purchasing organization. According to purchaser D the process of becoming more mature becomes slower if there is no organizational willingness to invest in a system or specific contract management job function. However, most of the purchasers mentioned that they are working on creating a job function for contract management, structuring who is responsible for what in order to increase their purchasing maturity.

The organizational sub factor available resources has been mentioned the most out of all of the factors with a total of 39 times. Available resources can be divided over monetary resources and human resources. Starting with monetary resources. There is a common understanding from the interviewed purchasers that acquiring a higher level of maturity requires time, effort and sufficient budget. For example, purchaser B mentioned that a limited budget hinders the maturity of the P2P process due to not being able to update the system on a regular basis. In addition, purchaser D stated that *"the transition from an old system towards a new system is often underestimated"*, resulting in the availability of a too low budget. Next to this, newer systems require a different skillset, which results in the need to invest in employee training, which also is dependent on the budget.

All of the purchasers agreed on the importance of available human resources for reaching a higher level of maturity. For example, purchaser D mentioned that *"highly qualified personnel is essential"* for advancing in maturity. However, acquiring skilled personnel is difficult according to purchaser A as *"there is a shortage of (skilled) purchasers in the healthcare sector, which affects the level of maturity"*. To overcome this purchaser A's hospital started to provide education for purchasers in-house and by hiring trainees. Purchaser C emphasized that the availability of time can act as a hindering factor, as purchaser C is convinced that everyone wants to help in maturing the purchasing function, but there is not sufficient time made available to commit to the process.

The last factor belonging to organizational characteristics is culture. According to all five purchasers the organizational culture is of influence on the level purchasing maturity. The most important aspects of culture that have come forward in the interviews are degree of authority and resistance to change. In hospitals, often specialists tend to take the lead in purchases as purchaser D stated *“my experience is that the more important a product becomes, the more responsibility the physician claims“*. In addition, purchaser D mentioned that the active involvement of the physician also *“depends on the level of trust the physician has in the purchaser. If he (the specialist) trusts the purchaser there will be more cooperation”*. In addition, resistance to change has been identified as a limiting factor. From purchaser E’s experience it became clear that purchasers tend to fall back into their old patterns, meaning that once management actively monitors the transition phase it goes well, but once the active involvement declines so does the purchasers effort of working according to the new processes. Besides, purchaser A emphasized that resistance to change comes from other departments, as *“you remove activities of other people, activities which they enjoyed doing”*, referring to centrally purchasing only through a purchasing department.

The factor organizational support exists out of the sub-factors support base, interdepartmental coordination, and awareness. The support base refers to top management support as well as support from other departments and the operational level of the hospital. Top management support has been identified by all purchasers as an influencing factor for maturing, as purchaser C stated *“you need to have the support of the board of directors, otherwise nothing will happen. I can assure you that”*. In addition, purchaser B highlighted that hospitals tend to be political sensitive organizations, which require top management support to assert pressure for getting changes through. However, next to top management support, support from the entire organization is required. For example, purchaser A mentioned that more matured processes requires involvement of people from other departments such as physicians. However, in practice they are occupied with providing care, and are less interested in following the formal purchasing processes.

According to all interviewees, interdepartmental coordination is of importance for implementing more matured purchasing practices. For example, purchaser C stated in relation to implementing contract management practices that *“it is certainly not only purchasing responsibility, and it should not be”*, it requires interdepartmental coordination. In addition, purchaser A argued that the purchasing department should be responsible for all of the purchasing activities, with the other departments taking an advisory role to the

purchasing department compared to making purchases themselves. Next to this, in certain cases physicians have conducted business with suppliers without the involvement of a purchasing department for years. Therefore, the physician needs to remain involved in the purchasing process to make use of the relational benefits, which requires coordination.

The last sub-factor, awareness, has been emphasized by all purchasers as it can be seen as the initial starting point for change, as purchaser B summarized “*you need to be able to show to the organization the additional value that purchasing has to offer. If you are not able to show the additional value, the story ends*”.

To conclude, from the purchasers perspective, both organizational characteristics and organizational support have an influence on the level of purchasing maturity. In particular, available resources, strategy, culture and the level of support base have been emphasized to have an impact. Table 10 provides an overview of the organizational factors along with the frequency of being mentioned by each purchaser.

Table 10. Factors belonging to the organizational context based on the perspective of purchasers.

Context	Factor	Sub-factor	Purchaser					Frequency
			A	B	C	D	E	
Organizational	Characteristics	Size	0	0	0	0	0	0 (0%)
		Strategy	6	4	5	12	4	31 (23%)
		Available resources	11	8	14	4	2	39 (29%)
	Support	Culture	5	2	2	9	4	22 (17%)
		Support base	3	7	4	5	3	22 (17%)
		Interdepartmental coordination	4	1	4	2	1	12 (9%)
		Awareness	1	2	1	2	1	7 (5%)
Total: 133 (100%)								

4.2.2 Culture as the most dominant organizational factor according to consultants and specialists

The organizational context received the most support out of the three contexts. In total, factors belonging to the organizational context have been mentioned 212 times. The largest contributors are the organizational characteristics, such as culture and strategy, which make up 132 out of the 212 mentions. Especially, the sub factors strategy, available resources, and organizational culture received support. The sub factors belonging to organizational support have also received support of the majority of the interviewed consultants and specialists.

First, the organizational characteristics will be discussed. In contrary to the interviews with the purchasers, size has been mentioned as an influencing factor. Consultant B explained the influence of size as larger hospitals have a certain volume and are able to organize their purchasing department properly, small sized hospitals can make use of their benefits of being small and having less issues with bureaucracy. Consultant B foresees the most issues for hospitals of medium size as they often *“have the purchasing department not organized properly and do also not see the benefits of it”*.

Seven out of the eight interviewees mentioned strategy to be of influence on the level of maturity. In particular, in the interviews with consultants B and C the importance of strategy was a reoccurring theme being mentioned 11 and 13 times, respectively. One of the most hindering factors according to consultant D is that hospitals are dealing with the issues of the day, which leads to the purchasing department being occupied with unplanned operational activities, where the focus should be on tactical activities. The strategic positioning of the purchasing department in the organization is also of importance according to consultant B and D, who both mentioned that the organizational aspects can make or break the maturity process. Furthermore, consultant B argued that the decision to purchase in a decentralized structure does not automatically lead to a lower level of purchasing maturity, and argues that maturity is more about implementing the right structure, which suits your organization. The challenge to keep in mind with this is to fit the goals of purchasing department with the goals of the organization. In addition, the majority of the interviewees referred to the importance a dedicated contract management job function holds for increasing the maturity of the contract management process. For example, consultant C stated that for successful contract management *“you need to do it with a team of contract managers. And that is the hindering factor, currently people need to do it on the side”*. To add to this, purchaser C stated *“if you are not trained to be a contract manager, and you also do not have time available, then it becomes impossible to deliver the required quality”*, emphasizing the importance of creating a dedicated job function.

The sub factor available resources has been mentioned 36 times. From the monetary resources perspective Consultant F experienced that *“primarily effort, available knowledge, budget, and time”* are key elements for maturing in the contract management process. Specialist F shares this perspective and mentions knowledge, time, budget and culture as the four key factors hindering the process. The importance of budget also gets confirmed by consultant C who mentioned *“Budget is always the concern, always. Money is always the*

topic of conversation, whilst you should talk about quality". Next to monetary resources, human resources have been identified by the majority of the interviewees as a key influencing factor. Consultant D mentioned highly qualified personnel to be the most influencing factor on purchasing maturity. Next to this, consultant A experienced a shortage of personnel in general to be of hinderance, especially for IT related topics. Consultant C identifies "*a lack of knowledge of the purchasing process*" as a hindering factor and predicts more purchasing trainings in the future, especially regarding tooling, to counter this.

The sub-factor culture has received the highest number of mentions during the interviews, as it has been mentioned by all interviewees adding up to a total of 53 times. The three main aspects of culture that are addressed by the interviewees are authority, resistance to change and resistance to share information. Authority, in some interviews referred to as power, is of influence according to five participants. Consultant C often experiences that physicians already engage in conversations with suppliers at tradeshow and come to oral agreements and communicate afterwards to purchasing that that particular supplier need to be contracted under these conditions. In addition, consultant B stated that "*the decision mechanisms in lots of hospitals still depend too much on name, authority, and function, rather than on substantive arguments*", referring to the lack of authority of purchasers. According to consultant A resistance to change, which can take place at the top management level as well as at the operational level, is a hindering aspect for maturing. According to consultant C especially in the operational layer of a hospital resistance to change occurs due to the tools of higher maturity not being intuitive to operate or simple too difficult to learn. The importance of information sharing has been identified by three consultants as influencing for maturing. For example, consultant D mentioned that people in the organization need to know "*when and where do we need to share information*", as solid information in and outflow allows for better communication, aiding the purchasing process.

Throughout the seven interviews organizational support has been mentioned 80 times. Six out of the eight participants mentioned the support base to be of importance for the level of purchasing maturity. Consultant D argued that for implementing purchasing tools it is important to build support throughout multiple layers in the organization, referring to acquiring support from top management as well as from the end users. Consultant E shared this vision and stated "*support should come from several layers. The top management should portray trust and commitment to the project*", and that support from the operational personal is essential as they are the ones operating the tools. Furthermore, consultant C argued that to

acquire a higher level of purchasing maturity top management support is essential, as a close connection with the board of directors makes it possible to shift the focus from cost saving towards innovation.

Seven out of the eight interviewees mentioned interdepartmental coordination to be an influencing factor. On one hand, interdepartmental coordination has been identified as an influencing factor based on situation at the hospital as for example consultant D emphasized that P2P involves cooperation from many departments, such as finance and logistics, and that coordination is important to divide tasks and responsibilities. On the other hand, specialist G and H focused on the importance of interdepartmental coordination from the implementing side and argued that the largest area of improvement remained cooperation as currently the different actors operate individually, whilst it would be beneficial to have someone from each specialism included in the implementation process. All in all, there is a shared opinion by the consultants and specialists that interdepartmental coordination influences the successful implementation of purchasing tools, thus influences the level of purchasing maturity.

The majority of the interviewees identified awareness to have an influence on the level of purchasing maturity. The reasoning behind why awareness is of importance is in line with the opinion of the purchasers as the interviewees share the idea that the additional value the purchasing department has to offer should be recognized by the organization. For example, consultant C argues as long as there is a lack of awareness of the additional value a contract management has to offer, the creation of a dedicated contract manager job function will not be priority for the organization.

To summarize, based on the perspective of the consultants and specialists, organizational characteristics as well as organizational support received recognition as being influencing factors on the level of purchasing maturity. The organizational sub-factor culture has been mentioned most often, which is mostly due to the importance of authority, resistance to change, and the resistance to share information. Table 11 provides an overview of all of the organization factors based on the perspective of consultants and specialists.

Table 11. Factors belonging to the organizational context based on the perspective of consultants and specialists.

Context	Factor	Sub-factor	Consultant					Specialist			Frequency
			A	B	C	D	E	F	G	H	
Organizational	Characteristics	Size	0	2	0	0	0	0	0	0	2 (1%)
		Strategy	3	11	13	6	4	0	2	2	41 (19%)
		Available resources	1	3	12	7	5	5	0	3	36 (17%)
		Culture	4	7	11	4	10	3	4	10	53 (25%)
	Support	Support base	0	2	8	8	6	3	0	2	29 (14%)
		Interdepartmental coordination	0	1	1	3	3	3	3	2	16 (8%)
		Awareness	5	4	7	12	4	0	1	2	35 (16%)
Total:										212 (100%)	

4.3 Environmental context: external cooperation as the most frequently mentioned influencing factor of the environmental context

4.3.1 *External cooperation and regulatory environment main drivers of the environmental context according to purchasers*

Factors belonging to the environmental context have been mentioned a total of 27 times throughout the five interviews with purchasers. The four factors that will be discussed are regulatory environment, external cooperation, crisis, and location. Literature has put forward competitive pressure as another factor belonging to the environmental context. However, none of the purchasers mentioned competitive pressure and thus it will not be further discussed below.

Purchaser A and C identified the regulatory environment to have an impact on the level of purchasing maturity. Purchaser A argued that laws and regulations can have a positive effect on purchasing maturity as well as a negative effect. The positive effect comes from the growing importance the government places on having track-and-trace implemented for medical products in hospitals. The negative effect derives from the reduced degree of freedom as the process needs to fulfill the requirements, which can be a timely process. Purchaser C emphasized mainly the positive effect of the regulatory environment as “*laws and regulations help us to reach to a higher level of maturity*”, as for example since May 2021 hospitals are required to conform to the Medical Devices Regulation (MDR).

External cooperation receives support as an influencing factor from four of the five purchasers. External cooperation refers to supplier related influences as well as cooperation

with other hospitals, for example through alliances. According to purchaser D, it is important for advancing in maturity to *“allow the supplier to play a role in your purchasing process. [...] To shift the relation from total independence to mutual dependence”*. This vision is shared by purchaser C who agrees that it is becoming a trend to move towards partnerships in order to mature as certain issues cannot be fixed in short term contracts but require long term commitments *“in order to get something done”*. A benefit perceived by purchaser B of engaging in partnerships is that you can focus on innovation compared to just prices. In addition to cooperation with suppliers, cooperation with other hospitals has been mentioned as an influencing factor by three purchasers. Purchaser A mentioned to be a member of an alliance between hospitals, which is perceived as beneficial to the long term development of the purchasing function. Purchaser D indicates cooperation with other hospitals as a sign of a higher level of purchasing maturity. Purchaser C proposes that it would be optimal to work together with other hospitals to implement the same ERP system as *“lots of money is being spilled, as we are not all on the same line”*, referring to the large amount of different ERP systems present in the healthcare sector.

Due to COVID-19 there is a growing awareness of the effect a crisis can have on the supply chain. This is also the case for advancing in maturity according to three of the purchasers. For example, purchaser C experienced that due to the impact of COVID-19 the organization was occupied with spending the available resources providing care on a day-to-day basis, shifting the priority of advancing the purchasing function to a lower level. Purchaser B experienced a similar experience due to COVID-19 *“the organization had to fight to keep the head above the water. Resulting in all the other plans being shifted to the future”*. Also purchaser A mentioned that COVID-19 had an impact on the maturity process as their project of maturing the contract management process had to be put on hold.

The last environmental factor, location, has only been mentioned by purchaser A. Purchaser A experiences difficulties in acquiring skilled, young personnel due to the aging region the hospital is located in. In addition, purchaser A puts a strong focus on operating with regional suppliers, as purchaser A mentions the organization has a social function in the aging region as it is one of the largest employers there and is *“willing to invest where possible to work with local suppliers, even if they turn out to be a bit more expensive compared to bigger suppliers. That is something we take into consideration, always”*.

To summarize, external cooperation has been identified as the most prominent factor belonging to the environmental context with 15 out of the total 27 mentions. Next to this the regulatory environment, the presence of a crisis, and the location the hospital is located in have been identified as factors influencing the maturity of the purchasing function. The factor competitive pressure did not receive support from the purchasers. Table 12 provides an overview of the environmental factors.

Table 12. Factors belonging to the environmental context based on the perspective of purchasers.

Context	Factor	Purchaser					Frequency
		A	B	C	D	E	
Environmental	Competitive pressure	0	0	0	0	0	0 (0%)
	Regulatory environment	4	0	2	0	0	6 (22%)
	External cooperation	4	1	3	7	0	15 (56%)
	Crisis	1	1	2	0	0	4 (15%)
	Location	2	0	0	0	0	2 (7%)
Total:						27 (100%)	

4.3.2 *External cooperation receives the support of five consultants while there is no support for the factor competitive pressure*

The environmental context received the least amount of mentions throughout the interviews with the consultants and specialists out of the three contexts. The context has been referred to in total 18 times. External cooperation received 12 mentions, regulatory environment four mentions, crisis and location both one mention, and competitive pressure has not been mentioned at all and thus will not be further discussed.

Three out of the eight interviewees identified the importance of the regulatory environment. Consultant D mentioned that there are certain initiatives from the government that influence the maturity tools. However, consultant D experienced in particular that due to government initiatives the market, in this case the suppliers of systems, quickly adapt to the new need, leading to more advanced purchasing tools. Specialist G shares the opinion that the introduction of the MDR had a positive effect on the level of maturity, especially the suppliers' level of maturity.

The majority of the mentions of the environmental context are related to the factor external cooperation. However, external cooperation has only been mentioned by the

consultants and not by the specialists. For example, consultant A mentioned that the degree to which a hospital can optimize their P2P process is also dependent on the suppliers' level of maturity. To further elaborate, the P2P system cannot take care of the invoice automatically, if the supplier is not capable of providing invoices digitally. For the contract management process consultants B and C argue that partnerships with suppliers are favorable, as partnerships make it possible to work together with your supplier on organizational challenges.

The factors crisis and location have both been mentioned one time. Consultant D argues that the COVID-19 crisis had a positive effect on the maturity of the purchasing function as all of a sudden a lot of materials became scarce, which lead to the recognition of the additional value the purchasing department has to offer to an organization. Location has been mentioned to be of influence on the level of maturity by consultant B. According to consultant B this is since *“hospitals in certain areas in the Netherlands are not capable of finding qualified personnel”*, referring to hospitals located in less populated provinces, such as Zeeland and Drenthe having less access to highly skilled personnel.

To conclude, out of the environmental context external cooperation and the regulatory environment received the most recognition as being influencing factors. Table 13 provides an overview of the environmental factors along with the frequencies of having been mentioned.

Table 13. Factors belonging to the environmental context based on the perspective of consultants and specialists.

Context	Factor	Consultant					Specialist			Frequency
		A	B	C	D	E	F	G	H	
Environmental	Competitive pressure	0	0	0	0	0	0	0	0	0 (0%)
	Regulatory environment	0	1	0	2	0	0	1	0	4 (22%)
	External cooperation	4	3	2	1	2	0	0	0	12 (67%)
	Crisis	0	0	0	1	0	0	0	0	1 (5,5%)
	Location	0	1	0	0	0	0	0	0	1 (5,5%)
Total									18 (100%)	

4.4 Overview: organizational context most dominant in the TOE framework

In this section, an overview will be provided of the entire TOE framework as well as the frequencies of the factors being mentioned expressed in percentages. In addition, the top five

factors, based on frequency and rank order, from the perspective of purchasers and consultants and specialists will be presented.

The purchasers' top five most frequently mentioned factors are available resources, strategy, culture, support base, and external cooperation. All in all, these five factors account for approximately 70% of all mentions. By comparing this top five to the results of the factors as described in the ranking question it becomes clear that four out of the five factors show an overlap, namely available resources, strategy, culture, and support base. Only the fifth rank shows differences, as external cooperation is ranked number five based on the number of mentions whereas technical competence is ranked number five based on the rank order question. All in all, four out of the five factors are similar indicating that more frequently mentioned factors are considered as more important by purchasers. Table 14 provides an overview of the top five factors based on the number of mentions compared to the top five factors based on the ranking question.

Table 14. Overview of purchasers' top five factors.

Number of mentions		Rank order	
Rank	Factor	Rank	Factor
1	Available resources (39)	1	Available resources
2	Strategy (31)	2	Strategy
3-4	Culture (22)	3	Culture
3-4	Support base (22)	4	Support base
5	External cooperation (15)	5	Technical competence

The top five factors from the consultants' and specialists' perspective show similarities to the top five of the purchasers. However, in the top five of the consultants and specialists, awareness has replaced external cooperation based on the number of mentions and technical competence based on the ranking question. Therefore, both the top five based on the number of mentions as well as the top five based on the ranking question possess the same five factors, only in a different order. To conclude, in both ranking systems the five ranked factors all belong the organizational context. Table 15 provides an overview of the top five factors based on the number of mentions compared to the top five factors based on the ranking question.

Table 15. Overview of consultants' and specialists' top five factors.

Number of mentions		Rank order	
Rank	Factor	Rank	Factor
1	Culture (53)	1	Available resources
2	Strategy (41)	2	Culture
3	Available resources (36)	3	Support base
4	Awareness (35)	4	Awareness
5	Support base (29)	5	Strategy

Based on the interviews with the purchasers, the technological context represents approximately 12% of the total mentions, the organizational context 73%, and the environmental context 15%. Therefore, the organizational context has been mentioned most frequently, followed by the environmental context, and lastly the technological context. In the interviews with the consultants and specialists, the technological context represents 16% of the total mentions, the organizational context 77%, and the environmental context 7%. To summarize, based on the interviews with the consultants and specialist the organization context received the most attention, then the technological context, and the environmental context received the least attention. Table 16 provides an overview of all the factors mentioned by purchasers and consultants and specialists and the according frequencies.

Table 16. Overview of mentioned factors and the according frequencies.

Context	Factor	Frequency					
		Puchasers			Consultants/Specialists		
		p	n	%	p	n	%
Technological	Relative advantage	3/5	7	3,9%	5/8	9	3,3%
	Technical competence	5/5	9	5,0%	5/8	21	7,6%
	Compatibility	3/5	5	2,8%	6/8	15	5,5%
Organizational	Size	0/5	0	0,0%	1/8	2	0,7%
	Strategy*	5/5	31	17,1%	7/8	41	14,9%
	Available resources	5/5	39	21,5%	7/8	36	13,1%
	Culture	5/5	22	12,2%	8/8	53	19,3%
	Support base	5/5	22	12,2%	6/8	29	10,5%
	Interdepartmental coordination	5/5	12	6,6%	7/8	16	5,8%
	Awareness*	5/5	7	3,9%	7/8	35	12,7%
Environmental	Competitive pressure	0/5	0	0,0%	0/8	0	0,0%
	Regulatory environment	2/5	6	3,3%	3/8	4	1,5%
	External cooperation*	4/5	15	8,3%	5/8	12	4,4%
	Crisis*	3/5	4	2,2%	1/8	1	0,4%
	Location*	1/5	2	1,1%	1/8	1	0,4%
* = newly identified factor	Total:	5	181	100%	8	275	100%

4.5 Benefits and challenges encountered in maturing the P2P process

4.5.1 *Efficiency as the main benefit and lack of knowledge as the main challenge of maturing the P2P process according to purchasers*

Maturing the P2P process has benefits as well as challenges. This section focuses on the challenges and benefits perceived by the purchasers. The benefit that has been mentioned the most by the purchasers is the efficiency a matured P2P process provides. For example, purchaser B emphasized that less human work is required due to the automation that P2P has to offer, resulting in less time and thus lower costs. In addition, purchaser A favors a matured P2P process as *“it is a lot less prone to error”*. Besides, purchaser E mentioned traceability to be an advantage of P2P as *“P2P allows for a strict division of roles, and that people within each role can take up and carry out work collectively with each other”*. The last benefit that has been mentioned is that P2P allows for digitalization of data, making it easily accessible and reducing the need to work with email or Excel.

Five challenges have been identified by the purchasers related to P2P. The largest challenge is the lack of knowledge regarding how to make use of P2P software. For example, purchaser A mentioned that in a few departments outside of purchasing employees purchase through a P2P system, however *“you notice that it does not go well, if those are people who only purchase a few times a year”*. Purchaser A concludes that *“that is a point of attention for us, that people who enter orders in the system and put in requests for departments are also skilled in this and do it frequently”*. Next to this, purchaser B perceived a challenge in shifting towards a system of higher maturity due to it requiring a change in the data used, which resulted in the need for additional data and the cleaning of existing data. Purchaser A also argues that a P2P system requires up-to-date and clean data in order to be able to act pro-actively. Another challenge has been identified by purchaser D, namely the quality of the system. Purchaser D argued that a system of lower quality *“is complicated, resulting in struggles for the user, the applicant, and the purchaser, which leads to more mistakes”*. Table 17 provides an overview of the benefits and challenges from the purchasers perspective.

Table 17. Overview of benefits and challenges related to maturing the P2P process according to purchasers.

Benefits	Times mentioned	Challenges	Times mentioned
Efficiency (automation)	6	Lack of knowledge	3
Less mistakes	4	Data quality	2
Traceability	2	Quality of system	2
Digitalization of data	1	Data organization	1
		Complicated to use	1

4.5.2 Efficiency, accessibility, and transparency perceived as benefits and lack of knowledge, acquiring support, resistance to change perceived as challenges of maturing the P2P process from the perspective of consultants and specialists

According to the consultants and specialists, the most prominent benefit of maturing the P2P process is increased efficiency. For example, consultant D stated that the “*administrative processes get optimally supported by the application, reducing the need for administrative tasks to a minimum*”. In addition, consultant A argued that if the right data is present in the system the invoice can be automatically matched with the order, reducing the need for human interaction. This gets supported by consultant C who mentioned “*if the process is well designed a lot can become automated*”. Accessibility has been mentioned six times as benefit. According to consultant C, accessibility is a benefit as a matured P2P tool makes it possible to get the right information to the right person at all times. Furthermore, traceability has been mentioned four times as a benefit. For example, consultant E stated that in a well-designed P2P process “*you can trace back everything, to who did what, at what time*”. Lastly, the continuation the P2P process has to offer has been mentioned by consultant B as consultant B experienced continuity to be the main advantage of P2P, especially during the COVID-19 pandemic.

Lack of knowledge has been mentioned the most often as the main challenge for maturing in P2P maturity. Consultant C argued that “*somehow it is very difficult to train hospital personnel in how to use the tools*”, referring to the experience that implementing the P2P tool is not the challenge, but transferring the knowledge on how to use the tool is the challenge. In addition, acquiring support and resistance to change have both been mentioned three times as challenges for maturing. Consultant A and E share the opinion that resistance to change is an issue as employees tend to stuck to old habits instead of adapting their working procedure to the P2P tool. At last, data quality and compatibility have both been mentioned one time. For example, consultant A experiences that in certain hospitals

systems tend to be overloaded with outdated data, such as obsolete articles or out of business suppliers, limiting the effectiveness of a P2P system. Table 18 presents the benefits and challenges from the perspective of consultants and specialists.

Table 18. Overview of benefits and challenges related to maturing the P2P process according to consultants and specialists.

Benefits	Times mentioned	Challenges	Times mentioned
Efficiency (automation)	9	Lack of knowledge	4
Accessibility	6	Acquiring support	3
Traceability	4	Resistance to change	3
Continuation	1	Data quality	1
		Compatibility	1

4.6 Benefits and challenges associated with maturing the contract management process

4.6.1 *Exploitation acting as a benefit and as a challenge for maturing the contract management process according to purchasers*

Starting with the perceived benefits of maturing the contract management process. The most frequently mentioned benefit is the enhanced exploitation of contracts. One part of exploitation is that it becomes more transparent what is agreed upon in the contract, allowing for better exploitation. Another part of this exploitation is the notification function of contract management software. Purchaser D considers getting notified by the system when an agreement ends in combination with the enhanced transparency the most important benefits related to a matured contract management process. The importance of the notification function also gets emphasized by purchase A who states “*you notice that due to the signaling function you become earlier aware of when a contract ends, allowing for earlier (re)consideration with stakeholders*”. Purchaser E emphasized the continuity benefit that contract management has to offer, as it allows for measurable quality agreements, which can be monitored and periodically evaluated. Furthermore, responsibility, accessibility, and transparency have been mentioned one time as a benefit related to a matured contract management process.

Even though the exploitation of the contract has been mentioned as a benefit above, it has also been identified as a challenge. Reason for this is that purchasers experience difficulties in fully exploiting the contract as purchaser C stated “*the challenge in the healthcare sector is that at the moment you agree on a contract and you do not exactly know*

what you will exploit, then you already paid too much". Purchaser A experiences difficulties from older contracts, which had not been registered anywhere, as these show up sporadically and require action to be transitioned towards the newer blanked orders, meaning that still not all contracts have been stored in the contract management system. Another challenge has been identified by purchaser C, who mentioned that since there is not a dedicated job function for contract management, contract management gets designated to regular purchasing staff or employees who lack time to do it or *"do not find it very interesting, resulting in it being ignored and not managed"*. Furthermore, data quality and lack of knowledge have been mentioned one time to be a challenge for maturing. Table 19 provides an overview of the benefits and challenges related to contract management from the purchasers perspective.

Table 19. Overview of benefits and challenges related to maturing the contract management process according to purchasers.

Benefits	Times mentioned	Challenges	Times mentioned
Exploitation of contract	3	Exploitation of contract	2
Continuity	1	Defining responsibility	1
Responsibility	1	Lack of knowledge	1
Accessibility	1	Lack of interest	1
Transparency	1	Data quality	1

4.6.2 *Exploitation acting as the main benefit and defining responsibility as the main challenge for maturing the contract management process according to consultants and specialists*

Exploitation has been mentioned the most often as a benefit from contract management by the consultants and specialists. According to consultant A exploitation is the most important benefit as it makes sure *"that you get what you paid for"*. Consultant B shared this vision and argued that proper contract management enhances the quality and the service of the contract after the quotation, making sure that you receive what is agreed upon. Next to this, consultant B mentioned cooperation with suppliers to be a benefit, especially in the case of long term agreements. Consultants C emphasized the proactivity that contract management has to offer as a benefit, as currently in hospitals contract management *"is more reactive than proactive"*. According to consultant E, this is important to reduce the chance of contracts being tacitly renewed. In addition, consultant E mentioned accessibility to be a benefit as contract management tools provide easy access to information such as price

agreement, duration, and indexation. Lastly, responsibility has been mentioned one time as a benefit of contract management as a hospital with a high level of maturity has dedicated contracted managers assigned to contracts.

Five challenges have been identified by the interviewees. Consultant B mentions that the biggest challenge by far is that no one takes the responsibility for taking care of a contract. Consultant D argues that an important challenge for hospitals will be to define how they want to shape their contract management process and identify who will be responsible for it. Capacity has been mentioned three times as a challenge for maturing the contract management process. For example, consultant C stated that a single contract manager will not solve the issue as it is not possible for one contract manager to manage hundreds of contracts. The lack of capacity gets also identified by consultant C as there is not sufficient personnel available resulting in employees getting assigned to do contract management as an add on. Lack of knowledge, communication and data quality have all been mentioned one time as a challenge for maturing. Table 20 provides an overview of the benefits and challenges related to contract management from the perspective of consultants and specialists.

Table 20. Overview of the benefits and challenges related to maturing the contract management process according to consultants and specialists.

Benefits	Times mentioned	Challenges	Times mentioned
Exploitation of contract	3	Defining responsibility	4
Cooperation with supplier	2	Capacity	3
Proactive	2	Lack of knowledge	1
Accessibility	1	Communication	1
Responsibility	1	Data quality	1

5 Discussion: six of the nine propositions receive support from the interviewees

5.1 Theoretical contributions: strategy, awareness, external cooperation, crisis, and location identified as new influencing factors.

The main objective of this research was to identify what factors influence the level of purchasing maturity of Dutch hospitals. The related sub-questions aided this goal by researching what the current and desired level of purchasing maturity is at hospitals, what the importance of technological, organizational, and environmental factors is, and what benefits and challenges are associated with achieving a higher level of maturity.

Starting with the current and desired level of purchasing maturity. Unfortunately, due to a low response rate on the survey the 90% confidence interval has not been reached. Therefore, the results regarding the current and desired level of purchasing maturity at Dutch hospitals cannot be generalized. However, the current level can serve as an indication of the importance placed by hospitals P2P and contract management. On average, the purchasers assessed their current P2P level to be at the third level of the CEP model by Snijders (2020), whilst they assessed their contract management level is to be at the second level. This indicates, based on the sample of seven hospitals, that the contract management process is less matured compared to the P2P process. This is in line with the finding of Menzies and Meehan (2016, p. 1), who identified hospitals to be in particular lacking in the contract management maturity. In addition, the survey showed that the CEP model by Snijders (2020) is also applicable to the healthcare sector.

In the conducted literature review, automation, compliance, visibility, enhanced decision making, reduced administrative costs, enhanced cooperation, elimination of non-value added activities, and continuous monitoring have been identified as benefits related to a matured P2P process. Throughout the twelve interviews, enhanced efficiency, less mistakes, accessibility, traceability, continuation, and digitalization have been identified as benefits. Therefore, it can be concluded that the benefits identified in the literature review show similarities to those that are perceived in practice by the purchasers, consultants, and specialists. This is also the case for contract management as the literature review identified active management, enhanced supplier satisfaction, reduced costs, stability, and improved information quality, whilst the interviewees identified exploitation, continuity,

responsibility, accessibility, transparency, enhanced proactivity and improved cooperation as benefits of a matured contract management process.

The sub question ‘What is the importance of technological, organizational, and environmental factors?’ and ultimately the main research question ‘What factors influence the level of purchasing maturity of Dutch hospitals?’ will be discussed based on the relation between the propositions as stated in the literature review and the results. Starting with the propositions belonging to the technological context. In a study by Borgman et al. (2013, p. 4426) a positive relation had been identified between the perceived relative advantage and the adoption of new technologies, which resulted in the first proposition of this research: *‘Relative advantage has a positive influence on the level of purchasing maturity’*. This proposition received the support in the majority of the interviews with the purchasers as well as in the majority of the interviews with the consultants and specialists. Therefore, it can be concluded that the relative advantage indeed has a positive influence on the purchasing maturity of the participating hospitals. The second proposition *‘technical competence has a positive influence on the level of purchasing maturity’* has been created based on the premise that an organizations is reliant on their technological infrastructure and their IT human resources. This proposition has received support to be positively related to the level of purchasing maturity by all purchasers and five of the eight consultants and specialists, which shows that the participating hospitals consider a higher technical competence to be important for their purchasing maturity. The final proposition belonging to the technological context has been based on a study by Lee and Shim (2007, p. 713), who identified a positive relation between compatibility and the rate of adoption, hence the proposition *‘technical compatibility has a positive influence on the level of purchasing maturity’*. This proposition received support from purchasers, consultants, and specialists. In particular, this proposition received support from the consultants who experienced less issues when implementing P2P and/or contract management tools when a hospital has already been through an implementation before. To summarize, from the technological context all propositions have received support from the interviewees.

Four propositions have been created in the literature review for the organizational context. The fourth proposition of this study *‘a hospital’s size (in terms of hospital beds) positively influence the level of purchasing maturity’* does not get supported by the results. None of the purchasers identified size to be a hindering or facilitating factor for maturing and only one consultant identified the size of a hospital to be of influence. However, the

consultant expected an U-shaped relationship between hospital size and the influence on maturity, arguing that small and large hospitals experience less difficulties compared to medium sized hospitals, showing a mismatch with the fourth proposition. The fifth proposition '*A hospital's availability of resources positively influences the level of purchasing maturity*' received with 39 mentions by purchasers and 34 mentions by consultants and specialists support. Especially the purchasers experienced availability of resources to be positively influencing the purchasing maturity, as without a sufficient budget a more mature tool could not be implemented. This shows that it is crucial for hospitals to allocate sufficient budgets to their purchasing department so that the purchasing maturity can increase in the future. The proposition regarding culture, '*hospitals with a networked or communal culture possess a higher level of maturity compared to hospitals with a fragmented or mercenary culture*', could not be confirmed due to the small sample size. However, elements belonging to a culture with a high level of sociability, such as willingness to share information, have been perceived by all of the interviewees to be positively related to the level of purchasing maturity, which indicates that a networked and communal culture can be a help in maturing the purchasing of a hospital. The last proposition belonging to the organizational context, '*organizational support has a positive influence on the level of purchasing maturity*', covers the factors support base and interdepartmental coordination. All of the purchasers and the majority of the consultants and specialists support this confirmation as lots of emphasis has been placed on the importance of top management support and interdepartmental coordination in order to make implementations a success. Thus, it gets clear that it is important for hospitals that the top management supports the purchasing department and is involved in their plans and strategies. The results have also identified two additional organizational factors compared to the ones identified in the literature, namely strategy and awareness. Strategy has been identified as an influencing factor for purchasing maturity by all of the purchasers and seven out of the eight consultants and specialists. Reason for the importance placed on strategy is mostly due to need for the creation of a dedicated contract manager job function to mature in the contract management field. Awareness has been identified by all but one of the interviewees to be a positively influencing factor as awareness can be seen as the starting point for change. The shared view of the interviewees was that if the organization is aware of the additional value that the purchasing department has to offer, the willingness to invest resources will increase and will thus positively influence the level of purchasing maturity.

Based on the theoretical framework, two propositions had been created for the environmental context. The first proposition, *'competitive pressure has a positive influence on the level of purchasing maturity'*, received no support from the interviewees, as it had not been mentioned in any interview. Hence, competitive pressure does seem to have an influence on the purchasing maturity of the participating hospitals. The second proposition *'the regulatory environment has an influence on the level of purchasing maturity'* received moderate attention from the interviewees as less than half of the purchasers, consultants and specialists mentioned this to be the case. However, there are experiences of the interviewees emphasizing the positive as well as negative influence the regulatory environment can have on the level of purchasing maturity. On one hand, a positive influence has been experienced as the regulatory environment can enforce hospitals to implement practices which lead to a higher level of maturity. On the other hand, a negative influence has been experienced due the reduced degree of freedom deriving from meeting the government requirements. Therefore, the proposition for the regulatory environment seems to be true. In addition, three new factors for the environmental context have been identified in the interviews, namely external cooperation, crisis, and location. External cooperation refers to the cooperation with suppliers, the suppliers capabilities, as well as the cooperation with other hospitals for example by being in a union. This factor received support from the majority of the interviewees and is considered to be positively related to purchasing maturity. It can be concluded that external cooperation can increase the purchasing maturity of hospitals. Crisis has been identified by four of the interviewees to be of influence. However, there does not seem to be a consensus between the interviewees of the effect it has on the level of purchasing maturity. Some of the interviewees argue that COVID-19 resulted in the need for a higher level of purchasing maturity and positively influenced this process, whilst other interviewees argue that the efforts for maturing have been put on hold as a result of COVID-19. The new factor location has been identified by one purchaser and one consultant to be of influence on the level of purchasing maturity. Both shared the opinion that rural areas have less access to highly qualified personnel, thus being of hindrance for advancing in maturity. Therefore, it can be beneficial for a hospital's purchasing maturity to be located in a more urban area.

All in all, six of the nine propositions have received support in the interviews. In addition, strategy and awareness have been newly identified as influencing factors belonging to the organizational context, whilst external cooperation, crisis, and location have been

identified as influencing factors belonging to the environmental context. Table 21 provides an overview of the factors mentioned throughout the interviews and the links with the theory.

Table 21. Comparison of the factors identified by the participants and by theory.

Context	(Sub-)Factor	Purchasers	Consultants /specialists	Source in theory
Technological	Relative advantage	3/5	5/8	Borgman, Bahli, Heier, and Schewski (2013, p. 4426)
	Technical competence	5/5	5/8	Zhu and Kraemer (2005, p. 66)
	Compatibility	3/5	6/8	Lee and Shim (2007, p. 713)
Organizational	Size	0/5	1/8	Borgman, Bahli, Heier, and Schewski (2013, p. 4427); Laforet (2013, p. 491)
	Strategy	5/5	7/8	-
	Available resources	5/5	7/8	Baker (2021, p. 4); Matunga, Nyanamba, and Okibo (2013, p. 108)
	Culture	5/5	8/8	Awa, Ukoha, and Emecheta (2016, p. 5); Schweiger (2014, p. 544)
	Support base	5/5	6/8	Awa, Ukoha, and Emecheta (2016, p. 5); Borgman, Bahli, Heier, and Schewski (2013, p. 4427)
	Interdepartmental coordination	5/5	7/8	Menzies and Meehan (2016, p. 8)
	Awareness	5/5	7/8	-
	Competitive pressure	0/5	0/8	Leung, Lo, Fong, and Law (2015, p. 395); Cruz-Jesus et al. (2019, p. 4); Plomp and Batenburg (2009, p. 204)
Environmental	Regulatory environment	2/5	3/8	Zhu and Kraemer (2005, p. 66); Meziez and Meehan (2016, p. 7); Baker (2012, p. 12)
	External cooperation	4/5	5/8	-
	Crisis	3/5	1/8	-
	Location	1/5	1/8	-

5.2 Practical implications for hospitals

In addition to theoretical implications, this research provides practical implications for hospitals that want to advance in purchasing maturity, by for example implementing advanced P2P or contract management tools. In particular, the practical implications are directed towards the top management of hospitals. Figure 6 portrays a support – influence matrix presenting the degree of support from the interviewees for the factor on the X axis and the degree of influence that can be exerted on the factor on the Y axis. Based on this figure it is recommended to primarily focus on the factors belonging in the top right, high-high, quadrant.

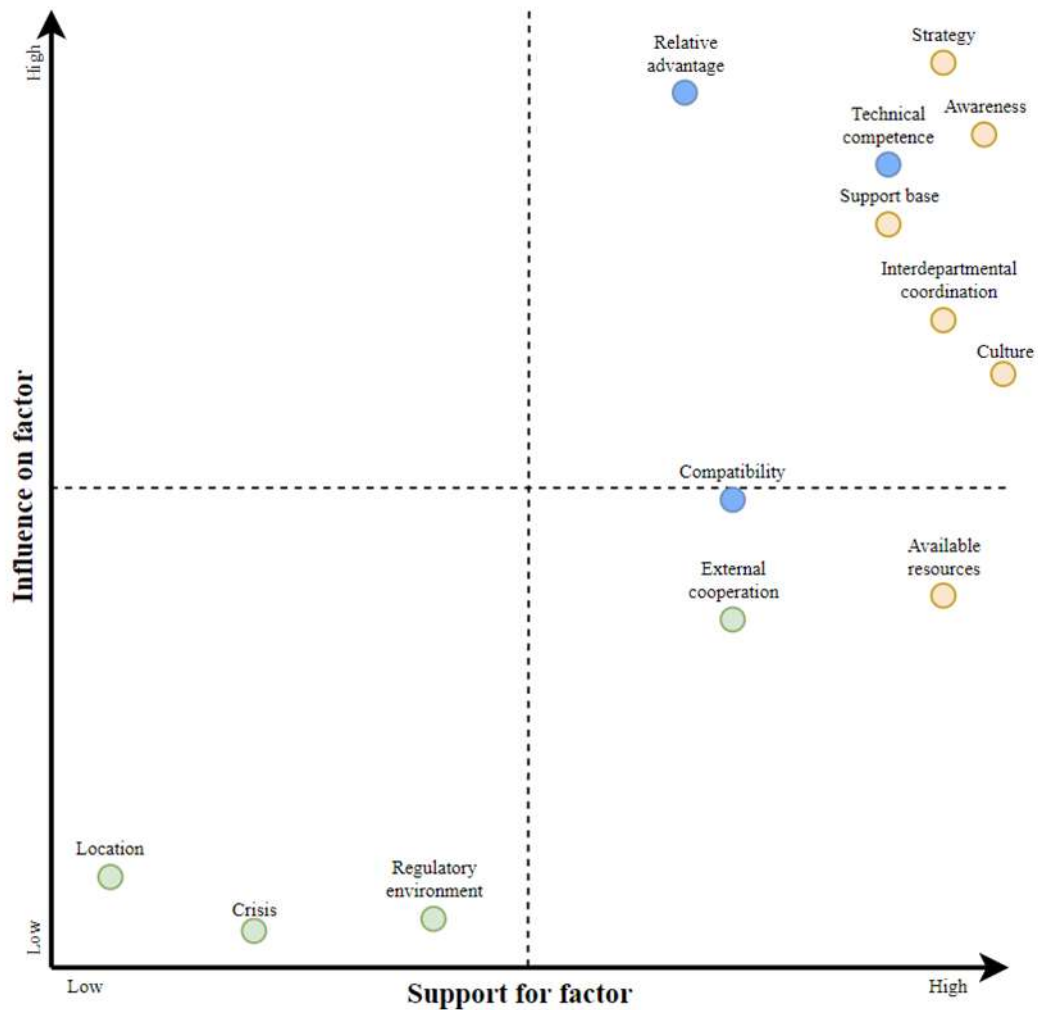


Figure 6. Support – Influence matrix.

The two technological factors positioned in the high-high quadrant are relative advantage and technical competence. It can make sense for the top management to interact more frequently with the operational and supervisory personnel on the advantages of e-procurement tools to overcome the resistance to change towards the implementation of new P2P and contract management tools. By convincing the employees of the relative advantage an implementation has to offer, less resistance is expected. Regarding technical competence, it is advised to provide IT trainings to the personnel on how to use e-procurement tools, for example by involving a consultancy in this process.

From the organizational context, five factors have been included in the high-high quadrant, namely culture, interdepartmental coordination, support base, awareness, and strategy. Regarding culture, it is advised to be actively working on creating a culture which supports information sharing. Reluctance of physicians to share information with the purchasing department has been identified by both purchasers as well as consultants and

specialists as an issue for maturing. Therefore, it would be beneficial if the management shows recognition to the purchasing department, by for example shifting purchasing to a higher hierarchical level in the organization. This is in line with the recommendation for increasing the interdepartmental coordination as it is expected that an increased willingness to share information leads to a higher level of cooperation between several departments. Regarding support base, top management support has been mentioned by literature, all of the purchasers and the majority of the consultants and specialists to be of influence for maturing. Therefore, a proactive, supporting stance from top management towards achieving a higher level of maturity and implementing e-procurement tools is desired. Moreover, it is advised to top management to create more awareness of the additional value the purchasing department, and in particular contract management, has to offer. It is expected that the factors interdepartmental coordination and support base also profit from an increased level of organizational awareness. Furthermore, it is recommended to the management of hospitals to implement a purchasing strategy which is more oriented towards innovation rather than savings as literature as well as the participants identified the strong focus on savings to be a hindering factor for maturing. In addition, whilst not belonging to the high-high quadrant, it can make sense for the top management to provide sufficient resources, both monetary as well as human resources, towards the purchasing department as this has been identified to be the most influencing factor for maturing by purchasers.

In addition, this research has shown the applicability of the CEP model of Snijders (2020) on hospitals. However, in order to make the CEP model more specialized for the healthcare sector two modifications are suggested. First, a stronger emphasis on the degree of authority of the purchasing department is suggested. In the current model, the order dimension ‘organization & ownership’ recognizes the importance to have a clear policy which describes who is authorized to purchase what, but does not emphasize that the authority should be placed on the purchasing department. The second suggestion is related to the contract dimension ‘organization, employees & collaboration’. Currently, the dimension refers to educating the current staff on how to perform contract management activities, rather than creating a job function for contract management. Therefore, the suggestion is to modify the dimension to represent having a dedicated contract manager as an indication of a higher level of maturity. With these adaptations, purchasing managers of hospitals can use this model to gain knowledge on their current level of maturity along with information on what steps need to be taken in order to advance to a higher level of maturity.

Next to this, this research provides insights on the influence of technological, organizational, and environmental factors on the level of purchasing maturity from the perspective of purchasers, consultants, and specialists. Therefore, this research also provides consultants with what is important according to the perspective of purchasers and vice versa.

5.3 Limitations and directions for future research: lack of generalizability and distinguishment of influencing factors offers opportunities for future quantitative research

The research also has some limitations. The first limitation that needs to be acknowledged is the sample size. In total, twelve interviews have been conducted of which five with purchasers, five with consultants, and two with specialists. Whilst the approach to interview several smaller group of participants allows for different perspectives on the topics it does not allow for generalization of the findings. Therefore, the results of this research do not represent the perspective of other purchasers, consultants, and specialists. In addition, all of the consultants and the specialist are working for the same consultancy and thus do not represent the perspective of other consultancies. The second limitation relates to the potential for the social desirability bias. Whilst all of the participants have been informed that the results will be anonymized it might be that the questions have been answered in a socially preferable way. In particular, this is a risk for the interviews with the consultants and specialists as they are working for the same consultancy, and thus have a higher likelihood of being recognized by each other. The third limitation refers to the qualitative nature of this research. Whilst this research identified factors influencing the level of purchasing maturity it does not allow to make a distinguishment between the relative importance of each factor as it would be possible in a quantitative research.

Future venues of research can be divided into qualitative and quantitative approaches. From a qualitative perspective it would be interesting to conduct the research in countries with a different healthcare system, for example a public healthcare system, to discover whether different factors are of influence for public hospitals. This would be interesting as in the current research, the factors belonging to the organizational context took a dominant role, whereas environmental factors, such as regulatory environment, received less recognition. As public hospitals are funded and owned by the government it can be expected that different factors, such as the regulatory environment, are of a higher influence. Next to this, the sample of the current study existed solely of purchasers working for non-

academic hospitals. For future research it would be interesting to see if there are differences between academic and non-academic hospitals.

From a quantitative perspective it would be interesting to conduct the survey on a larger scale in order to be able to generalize the results of the current and desired level of purchasing maturity of hospitals. In addition, it would be interesting to repeat the survey after three years with the purchasers who completed the survey to discover whether they have reached their desired level of purchasing maturity in the different areas and what factors they considered as hindering and facilitating in the process. Furthermore, conducting a new survey, including the newly identified factors, could be useful for testing the relationship of the factors and to be able to make a distinction of the relative importance. This would be interesting as the participants indicated certain factors to be positively influencing, but this has not been proven statistically.

5.4 Concluding summary: factors belonging to the organizational context most emphasized

The goal of this study was to identify what factors influence the level of purchasing maturity of Dutch hospitals. In order to discover this, a total of twelve semi-structured interviews have been conducted with purchasers, consultants, and specialists. In addition, a survey has been conducted with the purchasers to discover their current and desired level of maturity. The results of this study present that both the purchasers as well as the consultants and specialists put the most emphasis on the influence of organizational aspects. In particular the hospital's culture, available resources, and strategy have received the most attention. In addition, this study discovered five new influencing factors, which have not been identified in the literature review, namely strategy, awareness, external cooperation, crisis, and location. On the contrary, the factors size and competitive pressure received no support from the participants, whilst being identified as being influencing factors in the literature review. Furthermore, benefits and challenges related to maturing the P2P and contract management process have been identified. However, as mentioned in the limitations and directions for future research section, future research with a larger sample is required in order to make the results more generalizable.

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Appendix

Appendix A: Table 1 including sources with page numbers.

Source	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Freeman and Cavinato (1990, p. n.d.)	Buying	Purchasing	Procurement	Supply	
Keough (1993, pp. 3-4)	Serve the factory	Lowest unit cost	Coordinated purchasing	Cross-functional	World-class supply management
Cousins, Lawson, and Squire (2006, p. 776)	Celebrity	Undeveloped	Capable	Strategic	
Paulraj, Chen, and Flynn (2006, pp. 115-116)	Nascent	Tactical	Strategic		
Schiele (2007, p. 278)	Best-practice	Person assigned	Documented	Cross-functional	

Appendix B: Questionnaire.

The first part of the survey is about the purchasing policy and potential decisions which need to be taken within the purchasing department.

A maturity model with regard to the policy of the purchasing organisation is described below.

	Ad hoc	Basic	Standardised	Integration
Policy	The purchasing process and the importance of it are described within the policy	Besides the purchasing process and its importance, the information flows are clearly described within the policy	In addition the standards, responsibilities and evaluation methods are described within the policy	After the mentioned policy descriptions, there is enough room within the policy frameworks for continuous optimization

Policy:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Imagine:

A new product or service has to be purchased in your organisation. There are a number of decisions that have to be considered regarding this purchase.

The following questions are about:

- The decision whether to insource or outsource a product or service
- The decision to purchase based on a contract or without relying on a contract
- The decision regarding supplier selection

	Ad hoc	Basic	Standardised	Integration
Well-considered decisions 1. <i>in/out sourcing</i> 2. <i>contract/order</i> 3. <i>supplier selection</i>	Some awareness of the different options, but no real decision is made.	Different options were analysed for suitability, but no additional information has been collected to make a well-considered decision based on facts	A systematic approach whereby information has been collected in order to make a decision based on facts	Ongoing refinement; the necessary information for a well-considered decision has been documented and evaluated by several people (periodic approach)

Please complete the following questions regarding making a **decision to insource/outsource** a product/service

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please complete the following questions regarding making a **decision between purchasing through contract or without a contract**

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please complete the following questions regarding making a **decision on the supplier selection process**

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Orders

The following questions are focused on the **order** dimension (purchase-to-pay)

A maturity model with regard to the purchase-to-pay (p2p) process is described below.

	Ad hoc	Basic	Standardised	Integration
Organization & ownership	Decentralised organization where business units own most processes	Clear policy describing who is authorized to purchase what and when centralized permission is necessary	Centralized organization with a clear policy which covers all responsibilities of the p2p process	Centralized organization with ownership of all key processes. All described responsibilities are actually taken

Organisation & ownership:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which system does your purchasing organisation use to support this process?

A maturity model with regard to system support of the purchase-to-pay (p2p) process is described below.

	Ad hoc	Basic	Standardised	Integration
Systems/ monitoring	Rudimentary manual processes with no system support	Invoices are all registered in the same system	All products and services are purchased via the same system and the invoices are automatically saved within this system	Automatic system is available with integration of systems of main suppliers

Systems/monitoring:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A maturity model with regard to the supplier relation/involvement is described below.

	Ad hoc	Basic	Standardised	Integration
Process & supplier involvement/ relation	It's clear where a product/service needs to be purchased	It's clear where to purchase and there are clear agreements about the delivery of the products/services	It's clear where to purchase and agreements about delivery are available. Suppliers are integrated within the order process	In addition suppliers and employees keep optimizing the process innovation and development

Process & supplier involvement/relation:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A maturity model with regard to supplier performance is described below.

	Ad hoc	Basic	Standardised	Integration
Performance measuring & satisfaction	Little to no performance monitoring, tracking and reporting	Purchase orders are generally viewed and evaluated	High level of performance monitoring and reporting of suppliers	Extensive performance monitoring and reporting feedback can be discussed with supplier

Performance measuring & satisfaction:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Contracts

The following questions are about the ongoing purchase **contracts** within your hospital(organisation) (contract management)

A maturity model with regard to the contract management process is described below.

	Ad hoc	Basic	Standardised	Integration
Process	Contracts have been inventoried	The contracts have been ordered and the contracts are monitored	There is a tactical planning about the actions that need to be done merged out of the monitoring of the contracts	Extensive evaluation of the tendering procedure, exception handling, market developments, involved risks and the actions taken.

Process:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In which system are the contracts registered?

Is this the same system in which the orders are registered?

- Yes
 No

A maturity model with regard to the system support of the contract management process is described below.

	Ad hoc	Basic	Standardised	Integration
Systems	Contracts are registered	Provide digital support with manageable KPI's	The system monitors the ordered contracts and the system contains a clear dashboard with supplier performance	Integrated systems with main suppliers and there is collaboration in order to create value

Systems:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Are you currently implementing a system within your purchasing organisation? If so, which system?

Yes, namely

No

A maturity model with regard to the organisation, employees and collaboration within the contract management process is described below.

	Ad hoc	Basic	Standardised	Integration
Organization, employees & collaboration	Responsibilities of contract management are centrally invested	There is sufficient qualitative capacity	Organization provides a training program and employees work extensively together	Continuous collaboration between employees and stakeholders on innovative solutions and value creation

organisation, employees & collaboration:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A maturity model with regard to supplier performance within the contract management process is described below.

	Ad hoc	Basic	Standardised	Integration
Supplier performance	Suppliers are contacted in case of non-compliance with agreements and when renewing or canceling a contract	Supplier performance is measured based on contract compliance	Supplier performance is reported and improved. There are fixed agreements about evaluation and remuneration	Increasing supplier involvement and encourage continuous improvement of supplier performance

Supplier performance:

	Level 1: Ad hoc	Level 2: Basic	Level 3: Standardised	Level 4: Integration
Which level is currently the most applicable at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve within 3 years at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which level would you like to achieve in the future (>3 years) at your purchasing organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix C: Interview protocols.

Interview protocol: purchasers

Before start of interview the goal of the interview and the rights of the interviewee will be explained.

1 Participant

- What is your current position in the company?
- What are your responsibilities (in short)?
- Since when are you in this position?

2 Purchasing maturity (current, future, desired)

The participant is requested to fill in a maturity self-assessment based on the CEP model before participating in the interview. The following questions use the answers of the self-assessment as the foundation for the questions below. In case the participant has not filled in the self-assessment the interview will start by conducting it verbally together.

2. General

- How would you define “purchasing maturity”? *Afterwards the interviewer mentions the official definition for uniformity*
- Is your organization actively working towards reaching a higher level of purchasing maturity? If so, how?
- What do you think are factors hindering to reach a higher level of purchasing maturity?
- What do you think are factors facilitating to reach a higher level of purchasing maturity?

2.1 P2P

- How would you define the P2P process? *Afterwards the interviewer mentions the official definition for uniformity*
- Do you currently make use of P2P software/tools? If yes, which? If not, are you planning to do so? (ask this question in case participants did not fill in the questionnaire prior to the interview)
- Why do you (consider to) use P2P software? Why don't?
 - o What type of benefits do you experience or expect?
 - o What type of challenges do you experience or expect?
- In the questionnaire you mentioned to aim to reach the *XXX* maturity level for the P2P/Orders process within three years and the *XXX* maturity level in the future.
 - o What actions will you be taking to meet these goals?
 - o What factors/criteria do you think will hinder in the process of reaching a more matured P2P process?
 - o What factors/criteria do you think will facilitate in the process of reaching a more matured P2P process?

2.2 Contract

- How would you define contract management? *Afterwards the interviewer mentions the official definition for uniformity*
- Do you currently make use of contract management software/tools? If not, are you planning to do so? (ask this question in case participants did not fill in the questionnaire prior to the interview)
- Why do you (consider to) use contract management software? Why don't?

- What type of benefits do you experience or expect?
- What type of challenges do you experience or expect?
- In the questionnaire you mentioned to aim to reach the *XXX* maturity level for contract management within three years and the *XXX* maturity level in the future.
 - What actions will you be taking to meet these goals?
 - What factors/criteria do you think will hinder or in the process of reaching a more matured contract management process?
 - What factors/criteria do you think will facilitate in the process of reaching a more matured contract management process?
 - Do these factors/criteria differ for the upcoming three years and beyond?

3 Factors influencing purchasing maturity

- 3.1 Are there any other barriers/facilitators that we did not discuss in the interview but are considered worth mentioning?
- 3.2 Can you provide a top three (ranking from most to less important) of factors influencing the level of purchasing maturity in your opinion?

Interview protocol: consultants and specialists

Before start of interview the goal of the interview and the rights of the interviewee will be explained.

1. Participant

- What is your current position in the company?
- What are your responsibilities (in short)?
- Since when are you in this position?

2 Maturity

- How would you define “purchasing maturity”? *Afterwards the interviewer mentions the official definition for uniformity*
- Do you make use of a purchasing maturity model in assessing the current status of the purchasing function of hospitals? If so, which one?
- If you look at the purchasing function in Dutch hospitals. What do you think that could be improved?
- From your perspective/experience. What do you think are hindering factors hospitals face in reaching a higher level of purchasing maturity?
- What do you think are facilitating factors hospitals face in reaching a higher level of purchasing maturity?
- What kind of future trends are you expecting for the purchasing function at hospitals?

2.1 P2P

- How would you define the P2P process? *Afterwards the interviewer mentions the official definition for uniformity*
- What are benefits of professionalizing the P2P process of hospitals?
- What are challenges you face in professionalizing the P2P process of hospitals?
- What are hindering factors you come across in professionalizing the P2P process of hospitals?
- What are facilitating factors you come across in professionalizing the P2P process of hospitals?

2.2 Contract management

- How would you define contract management? *Afterwards the interviewer mentions the official definition for uniformity*
- What are challenges you come across in professionalizing the contract management process at hospitals?
- What are hindering factors you come across in professionalizing the contract management process at hospitals?
- What are facilitating factors you come across in professionalizing the contract management process at hospitals?

3 Factors influencing maturity

- 3.1 Are there any other barriers/facilitators that we did not discuss in the interview but are considered worth mentioning?
- 3.2 Can you provide a top three (ranking from most to less important) of factors influencing the level of purchasing maturity in your opinion?

Appendix D: Codebook.

Open coding	Category coding	Context coding	
Reduction of systems			
Advancements	Relative advantage		
Completeness			
Relative advantage			
IT Knowledge			
Training	Competence	Technological	
Infrastructure			
Organized data			
Competence			
Compatibility			
Process	Compatibility		
Requirement			
Digitalisation			
Data driven			
Ease of use			
Size	Size		
Strategy			
Lack of strategy	Strategy		
Responsibility			
Vision/strategy			
Savings			
Amount of spend			
Job function			
Category			
Structure (de-centralised)			
Standardisation			
Willingness to invest			
Available resources	Available resources		
Time			
Capacity			
Budget			
Human resources			
Education			
Knowledge			
Familiarity			
Training			
Skilled personnel			Organizational
Culture			
Interest	Culture		
Willingness to change			
Politics			
Hierarchy			
Motivation			
Power			
Trust			
Authority			
Information sharing			
Involvement			
Ambition			
Communication			
Top management support	Support base		
Support base			
Interdepartmental coordination	Interdepartmental coordination		
Awareness	Awareness		
Convenience			
Urgency			
Perception			
Underestimation			
Competitive pressure	Competitive pressure		
Regulatory environment	Regulatory environment		
Supplier related	External cooperation	Environmental	
Supplier capability			
Partnership			
Union			
Crisis	Crisis		
Geographical proximity	Location		

Appendix E: Overview of the average scores and the standard deviation for the current and desired level of purchasing maturity.

		Current level		Within 3 years		Future (>3 years)	
		<i>Average</i>	<i>SD</i>	<i>Average</i>	<i>SD</i>	<i>Average</i>	<i>SD</i>
General	Policy	2,4	1,1	3,6	0,8	4,0	0,0
	Well considered decisions	2,7	0,5	3,6	0,5	4,0	0,0
Orders	Organization & ownership	3,0	0,8	3,6	0,5	4,0	0,0
	Systems/monitoring	3,1	0,4	3,4	0,5	3,9	0,4
	Process & supplier involvement/relation	2,9	0,7	3,4	0,5	4,0	0,0
	Performance measuring & satisfaction	2,4	1,0	3,4	0,5	4,0	0,0
	Process	2,4	0,5	3,1	0,4	3,7	0,5
Contracts	Systems	1,6	1,0	2,7	0,8	3,6	0,5
	Organization, employees & collaboration	2,1	1,1	2,9	0,9	3,4	1,0
	Supplier performance	2,1	1,2	2,7	0,8	3,6	0,5

Appendix F: Method: Literature review approach.

Keywords	Initial hits	Publication years (2007-2021)	Hint in selected subject areas	Usable and assessed papers	Search key
Purchasing maturity	143	102	42	10	TITLE-ABS-KEY (purchasing AND maturity) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009) OR LIMIT-TO (PUBYEAR, 2008) OR LIMIT-TO (PUBYEAR, 2007)) AND (LIMIT-TO (SUBAREA, "BUSI"))
Procurement maturity	216	182	62	8	TITLE-ABS-KEY (procurement AND maturity) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009) OR LIMIT-TO (PUBYEAR, 2008) OR LIMIT-TO (PUBYEAR, 2007)) AND (LIMIT-TO (SUBAREA, "BUSI"))
Purchase to pay	13	11	3	0	TITLE-ABS-KEY ("purchase to pay") AND (LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2008) OR LIMIT-TO (PUBYEAR, 2007)) AND (LIMIT-TO (SUBAREA, "BUSI"))
Procure to pay	19	17	8	3	TITLE-ABS-KEY ("procure to pay") AND (LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2010)) AND (LIMIT-TO (SUBAREA, "BUSI"))
Contract management maturity	224	176	49	2	TITLE-ABS-KEY (contract AND management AND maturity) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009) OR LIMIT-TO (PUBYEAR, 2008) OR LIMIT-TO (PUBYEAR, 2007)) AND (LIMIT-TO (SUBAREA, "BUSI"))
Purchasing process	789	582	263	6	TITLE-ABS-KEY ("purchasing process") AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009) OR LIMIT-TO (PUBYEAR, 2008) OR LIMIT-TO (PUBYEAR, 2007)) AND (LIMIT-TO (SUBAREA, "BUSI"))
Healthcare procurement	1271	1096	105	12	TITLE-ABS-KEY (healthcare AND procurement) AND (LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009) OR LIMIT-TO (PUBYEAR, 2008) OR LIMIT-TO (PUBYEAR, 2007)) AND (LIMIT-TO (SUBAREA, "BUSI"))