A guide to ERP strategy selection

A design study for a decision support tool

Master's Thesis

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TUDelft

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A guide to ERP strategy selection

A design study for a decision support tool

By

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Preface and acknowledgements

This thesis symbolises the end of my academic adventure, which began with Applied Mathematics and continued with Supply Chain Management before ending at Delft University of Technology, specialising in Management of Technology. Throughout this journey, I have not only gained academic knowledge but also important life lessons that have impacted me both personally and professionally. This study has been an amazing chapter in my life, with plenty of ups and downs. It's been an experience of self-discovery, development, and transformation. The study has been extremely beneficial, from teaching me how to study academics successfully to widening my perspective beyond technical problem solving. This is also reflected in this thesis, as I conducted a purely qualitative investigation despite my background being more quantitative.

I am deeply appreciative for the opportunity to pursue this thesis project, and I am especially grateful to my managers, Ricardo, and Vera. Ricardo deserves special recognition for his continuous leadership, understanding, and support during the completion of this thesis. His encouragement and belief in me have helped me navigate the project. I would also like to express my heartfelt gratitude to Vera for her assistance and counsel throughout this process. Her knowledge and effort have been invaluable, and I am very thankful for her contributions. Not to mention my fellow colleagues, who made my internship enjoyable and provided me strength and inspiration to continue. Even though a thesis is an independent project, I always felt like a member of the team.

Next to that, I'd like to thank my TU Delft supervisors, Marcel, and Marijn, for their assistance and support. Your mentorship and dedication have been essential throughout this journey, and I am truly grateful for both the time and work you have invested in me. Marcel, I am grateful for your patience and instructions, especially when I felt lost navigating the complexities of qualitative research and design methodologies. Your skills and mentorship were essential during those times. Marijn, I am thankful for your critical feedback and important suggestions during this journey. Your observations and constructive feedback helped me fine-tune my ideas and increase the quality of my work.

Furthermore, I am grateful for the support and encouragement I have gotten along the way, particularly the friends I made at this study. I wish to express my heartfelt gratitude to Saskia, Fin, Renzo, Thomas, Julia, Stanley, Masa, Marleen, Niklas, Felix, and Ellen. Your friendship, support, and shared laughter have made this journey even more memorable and important. Without your presence, this experience would not have been the same, and I am thankful for the friendships we have created. The amazing trips and vacations will forever be in my memories, and I know there will be many more to come!

Finally, I want to thank my mother and father for their constant love, support, and understanding during this journey. While some may emphasise the significance of rapidly finding a career, they have always encouraged me to take my time and explore my interests. Their support in me and willingness to let me choose my own path have been extremely inspiring. My sister, even while separated by miles, we will always be there for one other. Thank you for always being there, willing to share or just enjoy each other's company on the phone in silence. I value our relationship and hope to share many more moments of fun and love with you.

To sum up, I am grateful for the opportunity to have grown, learned, and prospered under the direction of such amazing people. This accomplishment is a result of everyone who has supported me along the way, as well as my own diligence. I can't wait to start the next chapter of my life with the skills and understanding this master's degree has given me.

Nikki Seepers
Delft, March 2024

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Summary

This thesis project covers the challenge of selecting a suitable Enterprise Resource Planning (ERP) strategy in an ever-changing corporate landscape. ERP systems are critical for integrating processes and functions within enterprises, increasing efficiency, and enabling informed decision-making. ERP systems consist of application modules that are integrated across the supported functions and data involved. They can cover multiple departments such as human resources, supply chain, logistics, procurement, manufacturing, and sales departments, but they can also be specific and differ in functionalities. Selecting the most suitable ERP system or strategy is difficult due to the variety of solutions available and the changing needs of businesses. While single ERP systems have been the norm, alternative solutions such as the Two-Tier ERP strategy have emerged to address issues such as vendor dependency and restricted flexibility. A Two-Tier ERP strategy is about running one ERP system for corporate and another ERP system for other business units. There are also other IT strategies in place, such as the Best-of-Breed (BoB) strategy, which is a collection of standard software, based on the best system for specific functionalities. Despite the potential benefits of alternative strategies, there is a lack of detailed guidance and documentation, posing challenges for businesses looking to change their ERP systems. Therefore, t*he primary goal of this thesis project is to design and develop a decision support tool to guide the process towards finding a suitable ERP strategy for companies.*

The decision support tool's goal is to deliver actionable insights and recommendations targeting the specific needs of enterprises with existing ERP systems. The tool helps organisations select the most suitable ERP strategy, including the strategies single ERP strategy, Two-Tier ERP strategy, customisation, and Best-of-breed strategy. The decision support tool is designed and developed by analysing various ERP strategies, defining critical selection criteria and constraints, exploring contrasts between business and IT perspectives, and understanding change management, system integration, and competitive advantage within the context of ERP strategy selection.

This study focused on companies with manufacturing and sales operations but excluded those that have recently undergone mergers and acquisitions. The focus is on the company and its ERP system; mergers and acquisitions are a separate instance in which corporations must decide whether to keep their ERP systems or take over one of the systems. The study was confined to companies that use a single ERP system and did not include the selection or implementation of ERP systems. While costs were acknowledged, no cost analysis was performed. The study assessed topics such as change management and integration within the framework of ERP strategy, without providing formal change management plans or system integrations. The new ERP systems are assumed to be cloud-based.

The thesis project implemented the Double Diamond technique, a design thinking strategy divided into four phases: discover, define, develop, and deliver. This technique was chosen because of its organised problem-solving, user-centric focus, and iterative nature, which fits well with the intricacies of ERP strategy selection. The Double Diamond technique encourages both divergent and convergent thinking, allowing for a thorough examination of ERP strategy choices and revisions based on real-world discoveries. Unlike linear techniques, this methodology ensures a comprehensive understanding and the generation of practical outputs required for decision-making in this complex environment. The double diamond was adapted from its original source, the Design Council[1].

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[1] From: https://www.designcouncil.org.uk/our-resources/framework-for-innovation/
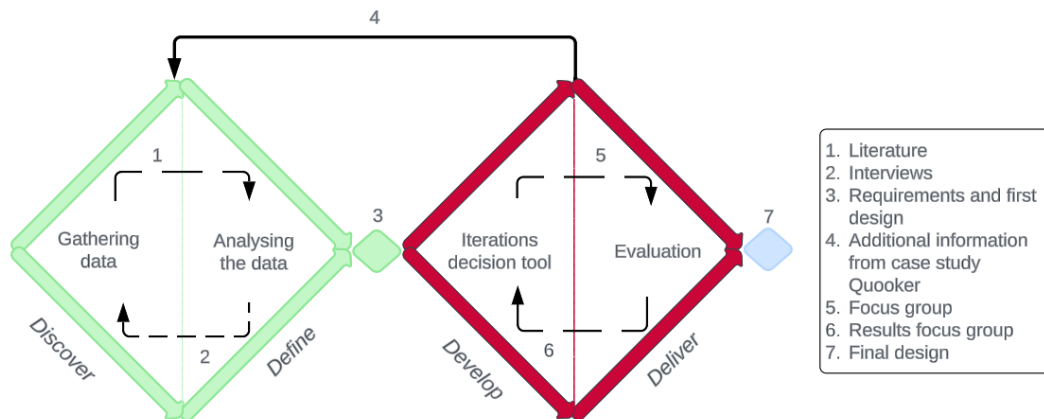
Double Diamond thesis project strategy (based on the double diamond of the Design Council)

In the first diamond phase, which included the discovery and define stages, the thesis project went into an exploratory study that included a literature review and semi-structured interviews. The insights gathered served as the foundation for the requirements that construct the initial version of the decision support tool. Subsequently, during the second diamond phase, which included the develop and deliver stages, a case study at Quooker was done to refine and evaluate the decision support tool on usability. The case study's insights were used to make iterative adjustments, ensuring alignment with real-world circumstances and stakeholder needs. Finally, the decision support tool would either have the form of a decision tree, flowchart, or multi-criteria decision analysis. Depending on the structure of the requirements.

The available literature delved deeply into the selection, benefits, and risks of the different ERP strategies. However, there was a significant gap in the literature on the decision-making process for choosing an ERP strategy, particularly in terms of when and to what extent a specific ERP strategy would be most appropriate. Furthermore, there was limited literature on the Two-Tier ERP strategy, and much of it was aimed towards firms that do not yet have an ERP system, rather to those wanting to replace outdated systems. The literature review (see chapter 3) revealed several criteria relevant for the decision support tool, such as change readiness, senior management engagement, company goals alignment, operational needs analysis, and ERP training. However, gaps in the literature necessitated interviews to further investigate the Two-Tier ERP strategy, criteria for ERP strategy selection and the differences between business and IT perspectives.

Thematic analysis of interview data provided valuable insights into ERP strategy selection and implementation (see chapter 4). For starters, while ERP systems are fundamental to organisational structures in a variety of industries, customisation has been widely discouraged due to the accompanying costs, risks, and maintenance issues. Similarly, considering only Best-of-breed techniques was deemed inefficient given the fundamental need for ERP systems. The Two-Tier ERP system emerged as a feasible solution, especially used for a transitional period when going for a single ERP system migration. Next to that, numerous elements, such as organisational complexity, differentiation aims, operational needs, synergy, and IT knowledge, were discovered to influence the ERP strategy selection decision-making process. Effective data management, prioritising the user experience, and using a complete analytical methodology for analysing operational, organisational and ERP needs, were identified as critical considerations in ERP strategy selection. Collaboration with various partners involves well-defined scopes and effective coordination systems, with both IT and business stakeholders required for informed decision-making.

The decision support tool for selecting the most suitable ERP strategy is built on a thorough understanding of requirements, constraints, and functional requirements. This organised framework, developed through comprehensive literature readings and interviews, guides the decision-making

process step by step. It starts with an examination of the company's business strategy, operational demands, and vendor analysis, and then moves on to a detailed evaluation of specific criteria in a second phase. The tool ensures a full assessment process by considering alternative ERP strategies such as single and (transitional) Two-Tier ERP strategy, as well as ERP functionality, IT expertise, business strategy alignment, organisational complexity, vendor trust, and IT flexibility. Using a flowchart structure, the decision support tool enables top managers to make educated group decisions based on a thorough study of critical issues, giving tailored suggestions that are aligned with the organisation's goals.

The Quooker case study provided insight into the challenges of choosing an ERP strategy, emphasising the significance of aligning IT systems with strategic business goals (see chapter 6). Quooker conducted considerable research and interaction with ERP vendors and partners, verifying a transitional Two-Tier ERP strategy that stakeholders endorsed for its efficiency and practicality in managing project efforts and complexity. Quooker's research included a detailed review of strategic possibilities, considering criteria such as impact, cost, schedule, and functional alignment. The case study also evaluated the decision support tool's needs, proving its relevance and usefulness in guiding the ERP strategy selection processes. The focus group feedback emphasised the tool's benefits while also suggesting areas for improvement, such as clarifying terminology and refining essential criteria. The decision support tool's iterative development established that it was in line with real-world decision-making scenarios, providing firms with a comprehensive framework for making educated ERP strategy decisions.

While the final design of the decision support tool was evaluated and refined through the Quooker case study, it remains generic because the information gained confirms existing knowledge and requirements. Despite the case study's contribution to improving clarity and understanding, the tool's essential principles and criteria are still useful across a variety of organisational situations. Furthermore, the decision support tool has been converted to a PowerPoint format to boost accessibility and user participation. This adaption improves navigation, visual clarity, and interactive features, resulting in more efficient and informed decision-making processes for firms looking to select the most suitable ERP strategy.

Thus, this thesis project used the double diamond technique to carry out project activities aimed at creating a decision support tool for selecting suitable ERP strategies. The first diamond concentrated on data collection, analysis, and initial tool design, whereas the second diamond employed a Quooker case study to improve and evaluate the tool. Data collection consisted of a literature research and interviews, as there were only a few articles accessible on the Two-Tier ERP strategy. Seven interviews were done, resulting in data saturation, but only two firms employing a Two-Tier ERP strategy were included due to constraints. To provide a thorough approach, interview data was organised using inductive coding, which was then linked to literature results, providing criteria for the decision support tool, such as functionality, IT knowledge, and organisational size. Business and IT perspectives were examined, with an emphasis on collaboration in ERP strategy selection. The tool began as a decision tree but evolved into a dynamic flowchart that prioritised criteria and provided actionable insights. Despite the extensive review and improvement provided by the case study, the decision support tool remains general, incorporating existing knowledge and requirements. While a focus group found the tool intuitive and well-constructed, it lacks validation, and its vulnerability to research bias is something to consider. The tool was improved based on feedback of the focus group, including additional introductory material and a PowerPoint format to improve clarity, usability, and interactivity.

This thesis added theoretical insights about the theoretical landscape of ERP strategy selection by defining the complexities of the Two-Tier ERP strategy, emphasising the complexity inherent in ERP strategy selection, defining criteria and restrictions, and underlining the need of IT and business alignment. Practical implications include streamlining the decision-making process, addressing ERP

strategy selection complexity, strategically aligning IT and business teams, prioritising user experience and change management, improving data management competence and limiting customisation. These insights provide actionable help for organisations navigating the intricacies of ERP strategy selection, allowing them to make educated decisions that are relevant to their specific situations and aims.

In conclusion, this thesis project investigated the issues of ERP strategy selection, with an emphasis on the Two-Tier ERP strategy in the setting of a single ERP system that may not fully suit organisational requirements. A decision support tool was created using theoretical frameworks and empirical studies, providing a systematic method to decision-making. A focus group recognised the tool's clarity and utility. The study also identified several limitations. These include a constrained scope that focuses exclusively on manufacturing and sales businesses, a small number of interview participants, and a lack of attention to financial factors and ERP system decisions. Furthermore, time and resource restrictions prevented the decision support tool from being validated, underlining the need for additional research and improvement. Despite these limitations, the study provides valuable insights into the field of ERP strategy selection and lays the groundwork for future research and decision-making improvements.

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1 Introduction

This thesis is based on a literature review, called "Literature review 4556666", that has been done by this researcher in the thesis preparation course (MOT2004). Therefore, there might be some similarities with the introduction and literature found in this thesis. This chapter will introduce the topic in section 1.1. The thesis project objective is laid out in section 1.2. Then the project activities that are needed to fulfil the objective are described in section 1.3. Next, the scope of the project is described in section 1.4 and the thesis outline is described in section 1.5.

1.1 Background ERP strategy and thesis project problem

In today's rapidly evolving business landscape, businesses face the challenge of always managing and optimising their processes to stay competitive. The Enterprise Resource Planning (ERP) system has emerged as a powerful, comprehensive business process management system that automates the majority of back-office tasks linked to technology, services and human resources, and enables the company to employ applications of the integrated business management system (Saeed et al., 2017). ERP can be defined as a computer software (product), as mapping data and processes into an integrative structure (development objective) and as a solution to a business (key element in infrastructure) (Klaus et al., 2000). According to Saeed et al., (2017) "An ERP is a computer information application that backups, coordinates numerous features of workflow, along with financial records, production strategy, material managements, trading, distribution and human resource management". It provides a company with a centralised database and real-time information, which enables the company to make informed decisions, improve efficiency and streamline operations. It can also offer increased productivity, lower costs, and easier communication between key business operations (Amini Valashani & Abukari, 2020).

The competitive environment and the expansion of organisations require that organisations alter and adapt to various scenarios. ERP system vendors are aware of the need to innovate, which is why ERP systems are updated and upgraded on a regular basis. ERP systems evolve to supporting more automated processes and integrating operational and administrative resources (Martins & Belfo, 2023). ERP systems originated from Material Requirements Planning (MRP) systems, which evolved into the Manufacturing resource planning (MRP II) systems. This system covers everything from raw material planning to the shipping of finished goods, including capacity management and scheduling (Bradford, 2020; Klaus et al., 2000). Following this, Gartner emphasises that such a system might benefit more than just industrial systems and refers to it as ERP, including customer satisfaction and profitability. Thus, ERP systems consist of application modules that are integrated across the supported functions and data involved (Klaus et al., 2000). In general, ERP systems promise to assist with all aspects of an organisation's business operations, including financial accounting, asset management, cash management, controlling, strategic planning, procurement, material management, production, logistics, maintenance, sales, and distribution (Bradford, 2020; Klaus et al., 2000). Thus, an ERP system can cover for example human resources, supply chain, logistics, procurement, manufacturing and sales departments. Even though it consists of different modules, the user perceives an ERP system as a single application (Klaus et al., 2000).

ERP systems can take various forms, mainly generic or industry specific (Klaus et al., 2000) and as there are multiple ERP systems, with different capabilities and functionalities, it is difficult to choose the appropriate ERP system. Selecting an inappropriate ERP system might cause the project to fail or seriously damage the system, which would hurt corporate performance (Haddara, 2014). Since ERP systems are standard software packages, the systems are often customised to handle specific requirements (Hustad et al., 2016; Klaus et al., 2000). It might also be the case that one ERP system is not enough, if for example it lacks desired functionalities. One ERP system can be too expensive, risky, time intensive, and unable to keep up with the rest of the organisation (Gill, 2011). It costs a lot of

money and time to implement and maintain a single ERP system (globally). That is why a Two-Tier ERP strategy was developed. A Two-Tier ERP strategy is about running one ERP system for corporate and another ERP system for other business units, that is easier to deploy and customise. This could mean that there are two full ERP systems, or some functionalities of ERP systems for specific business units. For example, an ERP system for headquarters, including all functionalities, and a separate ERP system for production. The infrastructure is standardised, just like with one ERP system, but a Two-Tier ERP strategy is agile and cost effective when deployed even in further departments of an organisation (Gill, 2011).

The use of a single ERP system has been dominant in the business world. This is because of its centralised database and standardisation (Light et al., 2001). The downside of using this strategy is that businesses are dependent on a single ERP vendor, who may control and dictate its costs and technological advancements. The loss of a significant number of additional benefits that may be offered by other ERP vendors/products but were not initially evaluated is another downside (Alshawi et al., 2004). There are also other IT strategies in place, such as the Best-of-Breed (BoB) strategy. BoB is a collection of standard software, which is selected based on the best system for specific functionalities. The software would be more flexible and closely aligned with the organisation's business operations (Light et al., 2001).

Companies can innovate, grow and change over the years. Businesses' present ERP system may become insufficient to suit their evolving needs. If this is the case, businesses might have to change their ERP system, their processes, their IT architecture and maybe even their business strategy. What they also need to think about is their ERP strategy. Difficulty lies in the alignment from business and IT, since the business decides the strategy, but IT is severely impacted. Since this topic is very important, but not thought about often, this thesis will dive deeper into ERP strategy selection. In this thesis several strategies are considered when an ERP system is no longer compatible with a business' changing needs: (1) Replacement of the ERP system, (2) Customisation of the ERP system, (3) Implementing a Two-Tier ERP strategy or (4) Implementing a Best-of-breed strategy. The difficulty is that there is little information available regarding the Two-Tier ERP strategy in existing literature, which may lead to businesses overlooking or underutilising this strategy. Firms should choose a strategy based on best-fit practices, rather than best-practice. Firms perform better when the strategy depends on the firm's organisational characteristics, capabilities, risks and trade-offs that they are willing to take (P.-F. Hsu, 2020). Furthermore, there is no comprehensive guidance or framework to assist organisations in determining which of these strategies is most suited to their specific circumstances and objectives. This lack of advice, combined with the lack of literature about the Two-Tier ERP strategy, presents a substantial challenge for firms looking to replace their current ERP system. Because an ERP system change only occurs once every decade (Li et al., 2017), businesses frequently lack experience. Addressing this issue is therefore imperative for firms to make informed decisions on ERP strategy selection.

1.2 Thesis project objective

While Enterprise Resource Planning (ERP) systems are widely used to manage a company's operations, it is becoming clear that a single ERP strategy is not necessarily the right strategy to address the different needs of a modern organisation. Although the strategy of using a single ERP system (with substantial customisation) is well-documented, there is a notable lack of understanding surrounding alternative strategies such as the Two-Tier ERP strategy or the Best-of-breed strategy. Furthermore, when it becomes clear that a companies' current ERP system is insufficient, there is a lack of information on how to choose a suitable ERP strategy. As a result,

The primary goal of this thesis project is to design and develop a decision support tool to guide the process towards finding a suitable ERP strategy for companies.

The goal of the decision support tool is to deliver actionable insights and recommendations targeted to the specific context of businesses with an existing ERP system. The tool aims to provide practical assistance and support, hence improving the decision-making process surrounding ERP strategy selection in such specific organisational settings. The optimal goal would be that the decision support tool helps companies decide on the most suitable strategy to use (like a decision tree), given certain criteria and constraints. The structure of the decision support tool will depend on the criteria. For example, if the criteria need to be ranked or scored a multi criteria decision analysis might be fitting, but if the criteria allow it, a decision tree would be the most helpful.

This study is intended for businesses and organisations who already have an ERP system in place. The goal of the thesis project is to give them a useful tool for choosing the most suitable ERP strategy that fits their unique requirements and goals. Moreover, ERP vendors acquire knowledge about the factors influencing companies' choices in selecting ERP strategies. This incentivises them to offer more informed and valuable advice to better assist their customers' varied requirements. The thesis project adds to the body of knowledge on ERP techniques, which benefits the academic community. It could be used as a starting point for additional research and discussion in the topic of Enterprise Resource Planning. Finally, the findings and the decision support tool can be used as important tools in supporting firms with their ERP strategy decisions by professionals in ERP consulting and strategy development.

1.3   Thesis project activities

It is critical to have a solid foundation of knowledge to build a complete decision support tool for choosing an appropriate ERP strategy. This foundation starts with a *full overview of various ERP strategies, including not only their inherent benefits but also the risks connected with them.* It is essential to know the differences between the strategies and what characterises them. Knowledge about the benefits and risks of the various ERP strategies, provides the necessary context for assessing the efficacy of different strategies, directing the selection process, and revealing prospective difficulties and possibilities. Since the Two-Tier ERP strategy is the least known, the focus of this study will be on this strategy.

Following the formation of a fundamental understanding of ERP strategies, the next step is to *determine the key criteria and constraints that will drive the selection of the most suitable strategy.* While there is a plenty of knowledge about the key aspects to consider when selecting a single ERP system and when to customise such systems, the same level of insight is not always available for Two-Tier ERP and Best-of-breed strategies. This difference highlights the significance of researching the distinguishing traits, specific considerations and conditions that define these different strategies, ensuring a more thorough and educated approach to ERP strategy selection.

Both business and IT perspectives are important when it comes to ERP systems and strategies. Both business and IT are severely impacted using ERP systems. While both approaches seek improved organisational performance, the business perspective emphasises functional efficiency and strategic alignment, whereas the IT perspective emphasises technical functionality and seamless integration within the existing IT ecosystem. Aligning these points of view is essential for the successful selection and implementation of an ERP strategy. Therefore, *the differences between business and IT perspectives on ERP systems and strategies are investigated.*

The criteria and constraints for the strategies will be the main source of input for the decision support tool. However, it is also important to *understand how change management, integration of systems and competitive advantage specifically emerge in the context of the different strategies.* Thus, the analysis seeks to determine the importance of including these aspects into the decision support tool framework, assessing their potential impact on ERP strategy selection in the absence of implementations or detailed plans.

Based on the findings from the preceding activities, the last stage is to *design and develop a decision support tool that will serve as a guiding framework for the process of determining the most suitable ERP strategy.* Our understanding of ERP strategies, their criteria and constraints, the differences between business and IT perspectives and the unique concerns related to the Two-Tier ERP context will inform this decision support tool. *The tool will also be evaluated*, mainly based on real world applicability and usability.

In conclusion, the following thesis project activities will take place:

1. Getting a full overview of the various ERP strategies, including not only their inherent benefits but also the risks connected with them.
2. Determination of the key criteria and constraints that will drive the selection of the most suitable strategy.
3. Examination of the differences between business and IT perspectives on ERP systems and ERP strategies.
4. Understanding of change management, integration of systems and competitive advantage specifically in the context of the different strategies.
5. Designing and developing a decision support tool that will serve as a guiding framework for the process of determining the most suitable ERP strategy.
6. Evaluation of the decision support tool that will serve as a guiding framework for the process of determining the most suitable ERP strategy.

1.4   Thesis project scope

The key limits of this thesis project define its scope. First and foremost, because this study focuses on ERP strategies and specifically aims to learn more about the Two-Tier ERP strategy, it will concentrate on situations in which organisations have already deployed an ERP system at their headquarters. Specifically, when this ERP system does not meet the (future) requirements of the organisation. This study will also focus on companies that are in the manufacturing and sales industries but did not just undergo any mergers or acquisitions. The focus is on the company and its ERP system; mergers and acquisitions are a separate instance in which corporations must decide whether to keep their ERP systems or take over one of the systems. Therefore, only companies with one ERP system are included. Furthermore, while reviewing an ERP system necessitates a variety of strategy selections, such as business strategy or ERP system, the scope of this thesis project will be limited to ERP strategy selection. The thesis project will not include the actual selection of an ERP system. Instead, the major purpose is to develop a decision support tool for selecting the most suitable ERP strategy. Next to that, it is important to emphasise that this study will not address the implementation phase of an ERP system but will instead focus entirely on the strategy selection process. The study will consider the important selection and implementation aspects that are imperative to the success of the chosen ERP strategy. Although an ERP system also affects the whole supply chain, and thus also external partners, due to collaborations, this thesis project will only limit itself to look within a company. This means that only internal company factors will be considered and not external factors such as (external) partners. Considering external partners and their ERP system/strategy or IT architecture would make this project too large for its given time frame. Because costs are often found important, this study will consider (type of) cost as an important factor. However, no cost analysis will be done. This study will evaluate change management, integration, and competitive advantage by analysing their significance within the ERP strategy environment. However, it is important to emphasise that the primary goal is to determine the value and relevance of these factors. Specifically, no formal plan for change management is created, and no integrations are made during this phase. Furthermore, due to the advising character of this study, empirical validation of competitive advantage establishment or validation of the decision support tool is not possible. Therefore, this study cannot be hold responsible for an unsatisfactory result after using the decision support tool. Finally, this study will assume that the new ERP systems would be cloud based, since this is the new normal.

1.5   Thesis outline

The thesis will have the following outline. In Chapter 2 the thesis project methodology will be described. This includes an overall strategy, and the methodologies used for a literature review, interviews, and a case study. Chapter 3 consists of a comprehensive literature review where project activities 1 until 4 are done to the best of its ability. Chapter 4 consists of the interview results, where the rest of project activities 1 until 4 are done. Defining the requirements and designing the decision support tool takes place in chapter 5. The decision support tool will be reviewed and evaluated via a case study in Chapter 6. Chapter 7 will depict the final decision support tool and Chapter 8 will discuss the thesis project findings. Chapter 9 will conclude the thesis, highlight limitations of the project and recommendations for future research. At the end of this thesis a bibliography and appendices can be found.

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2 Design & Methodology

This chapter describes the methodology that is used in this thesis project. The overall strategy is described in section 2.1. The methodology used for the literature review, including search strategies, inclusion and exclusion criteria and data extraction, is described in section 2.2. Section 2.3 describes how the interviews are conducted and how the data will be analysed. The case study protocol to evaluate and finish the decision support tool is described in section 2.5 and lastly the deliverable is described in section 2.4.

2.1 Design strategy: Double Diamond

The Double Diamond method is an often-used design thinking strategy that involves four separate phases: discover, define, develop, and deliver (Caulliraux et al., 2020). Because of its organised problem-solving, adaptability, user-centred orientation, and emphasis on real-world application, the Double Diamond approach is a highly suitable method for this thesis project. In contrast to other approaches, the Double Diamond's focus on divergent and convergent phases of thought is in perfect harmony with the iterative process of creating a successful framework for decision-making. It enables a comprehensive examination of ERP strategy choices, with the ability to change as needed and evaluate findings through a case study, making it well-suited for producing practical and meaningful results. More linear or less user-centric techniques, may lack these advantages, thereby restricting the complete and practical research required to provide actionable insights in this complicated sector. A visual overview of the double diamond in this thesis project can be seen Figure 2.1. The double diamond is adopted from the inventor, the Design Council[2]. There are also multiple iterative processes within the original double diamond, but in this version, the process goes from the develop stage back to the discovery phase, which is not explicitly mentioned in the original. The double diamond is very focused on putting people first and collaboration, however since this is a thesis project, there will be less collaboration and co-creation. Input from people is still gained through interviews and a focus group.
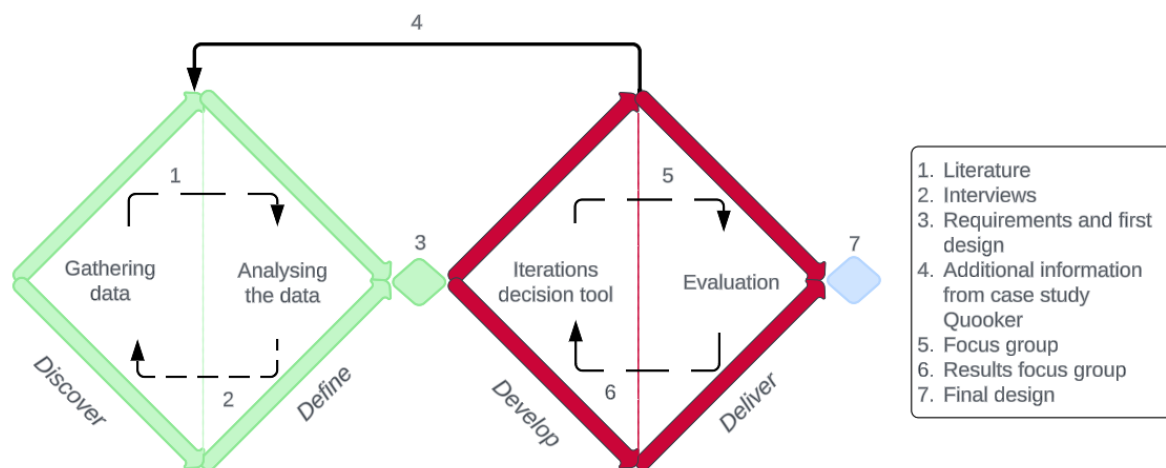
Figure 2.1: Double Diamond thesis project strategy (based on the double diamond of the Design Council[2])

2.1.1 First diamond

In this thesis project, this methodology is used for supporting the creation and development of the ERP strategy decision support tool. A thorough examination of the problem space is done during the first diamond phase, which corresponds to the "discover and define" phases. This diamond is coloured green because it represents general information. Specifically, the discovery phase is used to discover

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[2] From: https://www.designcouncil.org.uk/our-resources/framework-for-innovation/

the problem and gaining data. This part started with beginning the thesis project, the introduction and thus first chapter. The discovery phase is also about getting additional knowledge about the issue, its consequences, goals, and results. Thus, the first four project activities are a part of the first diamond. These require an explorative study, where qualitative data needs to be collected. This process entails obtaining literature and semi-structured interviews as a critical data collection approach to bridge gaps in our understanding and find missing information. The data will also be used as input for the requirements for the decision support tool. The literature will be thoroughly reviewed as part of the define phase (number 1 in Figure 2.1). In this phase the obtained data will be analysed. More about the literature review methodology will be discussed in section 2.2 and the review itself can be found in chapter 3. The findings of the literature review will lead to the questions of the interviews (number 2 in Figure 2.1). The interview methodology is further discussed in section 2.3 and the results will be discussed in chapter 4. The results of the interviews can again lead to more literature review. Thus, in the first diamond, an iterative process takes place between the discovery phase and the design phase.

2.1.2 First deliverable

The result of the first diamond is the input needed for decision support tool and the second diamond. With the results a set of requirements will be defined for the decision support tool and the first design will be made (number 3 in Figure 2.1). This is done when the first four project activities are completed. The requirements serve as a full roadmap for creating a practical and successful decision support tool customised to the difficulties of ERP strategy selection. The requirements are defined based on the results of the literature review and the interviews. The results are combined and the information that is deemed relevant for ERP strategy selection is critically reviewed based on the quality and quantity of the sources. The second diamond can be begun when there are at least five topics that can result in at least 10 criteria. This way the decision support tool will have a good foundation.

The fifth project activity, which involves designing the first iteration of the decision support tool to direct the process of identifying an appropriate ERP strategy, begins based on the requirements. Since this iteration is based on literature and interviews, it is both theoretical and empirical. It is still based on general information, which is why number 3 is still coloured green in Figure 2.1. How the decision support tool will be designed is explained in section 2.4. Both the requirements and the initial design of the decision support tool will be given in chapter 5.

2.1.3 Second diamond

The second diamond includes the phases "develop and deliver" and takes place within a case study at Quooker. Quooker is a well-known company in the sector of boiling water tap systems. Quooker uses red as their company's brand image, hence the colour red of the second diamond. In this diamond project activities five and six will be done. The case study has a dual role, first to make the decision support tool more practically founded and second to evaluate the decision support tool. To make the decision support tool more practical founded, information gained from the case study at Quooker will be used (number 4 in Figure 2.1). To gather the information, a step back into the first diamond will be made. After going back to the first diamond and gaining and analysing the additional information, another iteration of the decision support tool will be made in the develop phase of the second diamond. With this iteration the deliver phase will be touched (number 5 in Figure 2.1), where a focus group of users (decision makers) within Quooker will evaluate the tool on usability and real-world applicability. This feedback will be used to return to the development phase and create the final decision support tool (number 6 in Figure 2.1). The methods used within the case study is further explained in section 2.5 and the iterations of the decision support tool will be again done by the methodology of section 2.4. The results of the case study will be given in chapter 6.

2.1.4 Final decision support tool

The final deliverable of this thesis will be a decision support tool that guides the ERP strategy selection process. Based on the focus group the last iteration of the decision support tool will be developed according to section 2.4. This iteration is based on general theoretical and empirical information as

well as information that was gained during the case study at Quooker. The final deliverable could therefore be either still general, or it could only be applicable to Quooker. That is why number 7 in Figure 2.1 is coloured blue, the probable users are still undefined. Chapter 7 will portray the final decision support tool.

2.2 Gathering data part 1: Literature review methodology

Gathering data based on literature review is the first step of this project, as mentioned in section 2.1.1 and can be seen as number 1 in Figure 2.1. Insights are gained on ERP strategies, their impacts on issues like integration, costs, change management, and competitive advantages by delving deeply into the current body of knowledge. This fundamental insight influences the design and development of the approach used to help firms choose the most suitable ERP strategy. The literature review essentially acts as the informing foundation for the entire project, guaranteeing that the decision support tool and subsequent conclusions are solidly based in the existing landscape of ERP strategy knowledge and expertise.

2.2.1 Search strategies

Key words matching the topics for the first four project activities are used to discover suitable articles. The chosen search phrases perfectly reflect the key project-related themes, utilising synonyms and related terms to guarantee a thorough examination of the various issues. The selected articles also provided information about ERP systems in general as well as expenses on top of their specific topic. The key words and search terms can be found in Table 2.1.

Table 2.1: Key words and search terms literature review

Key words	Search terms
ERP system	Enterprise Resource Planning System, ERP
ERP adoption	ERP adoption process, ERP successful adoption process
ERP strategy	ERP strategy, ERP approach, "ERP strategy", "ERP approach", "Enterprise Resource Planning System Strategy", "Enterprise Resource Planning System approach"
ERP customisation	ERP customisation, ERP customisation vs multiple ERP systems, ERP customisation vs Two-Tier strategy
Two-Tier ERP strategy	Two Tier ERP strategy, Two-Tier ERP, Multiple ERP systems, "Multiple ERP" systems, Two ERP systems, Two ERP systems merging,
Best-of-breed	Best-of-breed architecture, Best-of-breed IT, Best-of-breed versus ERP
ERP selection	ERP selection, selection of ERP systems, ERP system selection framework
Competitive advantage	ERP competitive advantage, ERP competitive priorities
Change management	ERP change management, ERP change
ERP IT	ERP architecture, ERP integration, integration between ERP systems, integration between multiple ERP systems, Integration of "multiple ERP" systems, integration of "multiple ERP" landscape

2.2.2 Inclusion and exclusion criteria

Literature is found mainly using Scopus. When Scopus doesn't provide enough articles, the search is broadened with Google Scholar. To narrow the search further, a few inclusion and exclusion criteria are used. The review is centred on ERP (Enterprise Resource Planning) strategies, from articles published in or after 2000, as this looks to be a critical turning point in the existing literature. Notably, the quantity of articles connected to ERP strategies appears to have increased significantly following this year, indicating a growing interest and attention in this sector. In the search for relevant literature, only research articles, conference papers, and their proceedings, were evaluated as these sources often provide the most reputable and thorough views. It is important to emphasise that the studies from the biological and neuroscience fields are purposefully eliminated. The reason for this exclusion is because "ERP" is often shortened to "event-related potentials," a technique used in electroencephalography (measures electrical activity in the brain). The perspective of this literature review is narrowly focused on ERP strategies and ERP systems in the context of business and technology, without touching on unrelated topics. An ERP system is a vast system that incorporates many processes; hence, this study was limited to ERP systems and no other systems, as they are not comparable, and the scope would be too broad. Non-English written articles were also excluded.

2.2.3 Data extraction

A thorough selection procedure discovered relevant and important articles by using particular key search terms linked with the project's goal (see Table 2.1), as well as well-defined inclusion and exclusion criteria (see section 2.2.2). The number of articles used per key word are given in Table 2.2. Some articles could be used for multiple topics within the literature review; however, the table gives an overview of the articles that are found using that specific key word. The key words "ERP strategy" resulted in zero used articles. The articles that were presented by Scopus and Google Scholar were not about ERP strategy as we defined it in this thesis. They were mostly about the adoption process and its strategy and not about the use of different ERP systems. This problem also occurred for the key words "Two-Tier ERP strategy". When searching for multiple ERP systems, articles were mostly about the selection between multiple ERP systems, instead of adopting and maintaining multiple ERP systems. This was the case for most key words. Most articles, using any key word, were about selecting, implementing, the performance of an ERP system, or another specific topic or usage of ERP systems and not about ERP strategy. In total 39 articles are used for the literature review.

Table 2.2: Number of articles used per key word

Key words	Number of articles used
ERP	4
ERP adoption	5
ERP strategy	0
ERP customisation	5
Two-Tier ERP strategy	3
Best-of-breed	2
ERP selection	4
Change management	4
Competitive advantage	5
ERP IT	7

2.3   Gathering data part 2: Interviews

This study will use semi-structured interviews as a qualitative data collection approach to bridge gaps in our understanding and find missing information. This part is the second method used for gathering and analysing data in the first diamond (see Figure 2.1) These interviews will serve as a direct and

participatory way of gathering firsthand insights, experiences, and opinions, improving our understanding of how ERP strategies affect businesses and, in particular, putting light on the Two-Tier strategy's distinctive elements and best practices. Semi-structured interviews are a valuable and adaptable research tool that enables a dynamic and nuanced examination of the project problems. This method allows researchers to keep a core set of open-ended questions while also customising the conversation to the interviewee's responses. This enables for a more in-depth grasp of the topic matter because interviewees can comment on their own experiences, thoughts, and points of view. Semi-structured interviews are especially useful for uncovering diverse perspectives and filling knowledge gaps, making them a great fit for this thesis project. The interview questions are based on the literature review as explained in section 2.1.1 and Figure 2.1.

2.3.1   Participant selection

Participants will be selected based on purposive sampling, where the participants are selected based on the judgement of the researcher (Sekaran & Bougie, 2016). The main criterion for participants is that they have knowledge about the Two-Tier ERP strategy. Multiple perspectives are also desired, so either ERP vendors or partners that have knowledge from the implementation side and companies that have adopted a Two-Tier strategy, are chosen. Representatives from those companies could be anyone that has knowledge about the Two-Tier ERP strategy, for example sales executives or IT architects. This also gives more insight on the business and IT perspectives.

The number of participants is not known in advance of the interview procedure because interviews will continue until data saturation is achieved. Data saturation is an iterative research strategy in which new data is gathered and analysed repeatedly until it stops revealing any new themes or categories or offering fresh insights. By using data saturation, the researcher could guarantee a comprehensive qualitative research approach without wasting time collecting data that would not add value to the study.

2.3.2   Conducting interviews

First the participants will be contacted and informed about the thesis project via the researcher's personal and professional network. An informed consent document will be sent to the participants that is in accordance with the Human Research and Ethics Committee (HREC), with minimal information about the topic to avoid bias about what to expect from the interview. The consent form also asks for permission to record the interviews and to transcribe them. After the transcriptions are made the audio recordings will be deleted. Names and other personal details have been excluded from this thesis project. The consent form can be found in Appendix 1.

The interviews will be around 45 minutes and are all done online using Microsoft Teams. During the interview, first a set of exploratory questions will be asked, to introduce the topic and get a greater sense of the participants view of the topic. Then a set of narrower questions are asked to confirm some of the literature review findings. The questions will be based on the findings of the literature review. Exploratory questions are about the knowledge gap found in the literature review and narrower questions have the purpose of confirming findings in the literature review.

2.3.3   Data analysis

Although the interviews with the participants are transcribed, more work must be done to extract insightful information from them. Therefore, the transcribed interviews will be subjected to an inductive thematic analysis. Thematic analysis is a methodical approach to locating, evaluating, and interpreting qualitative data to derive meaning from the data in the form of themes and codes. An inductive method is chosen to conduct exploratory research where preconceived theories do not determine the outcome. Thus, even though the questions of the interviews are based on the literature, the theories found in the literature will not influence the results of the interviews. The tiniest analytical units, known as codes, are utilised to capture intriguing facets of the data that may bear on the study subject. These codes form the basis for creating themes, which are more extensive

patterns of meaning (Braun & Clarke, 2006). The coding will be done in Atlas.ti, a powerful tool for qualitative analysis. Using this tool will not only improve structure and overview, but it will also save time.

The thematic analysis follows a structured six-step process (Braun & Clarke, 2006):

1. *Familiarisation:* Transcribing and examining the interviews. The researcher gets familiar with the data while reading the transcripts multiple times. In this stage, connections are built between the interview and the significant details that are noted. To accelerate the coding phase, the transcriptions are summarised per interview question. This way the coding is only done for relevant information.
2. *Identifying codes:* Interview transcripts are read actively, with key phrases marked for emphasis. In this process, words or sentences are taken and their meaning from the data is condensed into one or two words, known as codes. Important choices are made regarding what should be coded and which codes best convey the content.
3. *Sorting codes:* Grouping codes that are similar and removing duplicate codes.
4. *Identifying themes:* Broader patterns or themes are found by utilising the codes generated in the previous step. Subthemes are developed first, and then they are combined to form larger themes.
5. *Finalising themes:* Themes are refined, and each theme must be thoroughly explained. It is imperative to verify that the theme names accurately depict their substance and that they contribute to answering the research questions.
6. *Presentation of findings:* Themes and subsequent codes, paraphrases and words from the transcripts are listed in a table. A code tree is used to summarise and visualise the themes and codes.

The study intends to use thematic analysis to systematically organise and evaluate qualitative data to derive relevant insights and themes, ultimately contributing to a greater knowledge of the subtle features of ERP methods and their influence on businesses. Finally, the method's iterative and organised coding and theme creation process makes it easier to extract useful and contextually relevant information from data, providing a solid foundation for informing the development of a decision support tool for ERP strategy selection.

2.4   Thesis project deliverable: ERP strategy decision support tool

The primary deliverable of this thesis project is a well-defined and organised decision support tool for firms to use when faced with the difficulty of selecting the most suitable ERP strategy (see section 2.1.4 and Figure 2.1). By delivering a step-by-step framework, businesses' decision-makers will be provided with the insights and criteria they need to make informed decisions about their ERP strategies, guaranteeing alignment with their specific business requirements and goals. Furthermore, the thesis project may give significant recommendations and insights related to the Two-Tier ERP strategy, where there are existing gaps in the literature.

2.4.1   Iterative process

As previously stated, the decision support tool will be developed in an iterative process, beginning with an initial design based on requirements derived from extensive literature study and interview data. This preliminary design serves as an empirical foundation, combining theoretical knowledge with practical insights gained from real-world experience (number 3 in Figure 2.1). Following that, a second design iteration arises, refining the tool to include a broader range of considerations and industry-specific nuances gained from RFIs, RFPs and an investigative paper (based on number 4 in Figure 2.1). Finally, the decision support tool is finalised through a focus group in which stakeholders interact to evaluate its usability and real-world applicability (numbers 5,6 and 7 in Figure 2.1). This iterative process ensures that the decision support tool improves gradually, including new viewpoints and

empirical data at each level, resulting in a strong framework that effectively guides enterprises through the intricacies of ERP strategy selection.

2.4.2 Decision support tool structure

The nature and qualities of the identified evaluation criteria influence the shape and structure of the decision support tool. If the criteria have hierarchical or sequential properties, a decision tree model would be the most suitable deliverable structure. In addition to the decision tree model, a flowchart can be used as a decision support tool when additional tasks are required. In contrast, a Multi-Criteria Decision Analysis (MCDA) in the form of a decision matrix analysis will be constructed when the criteria lack hierarchical links or when there is no obvious justification favouring a certain strategy. The structure of the decision support tool will be decided in section 5.2.

Decision tree

A decision tree provides a clear framework for decision-making by offering a visual and systematic depiction of options and probable outcomes. Usually, a decision tree begins with a single node and branches into other alternative outcomes. Every one of those results produces more nodes, which then branch out into different directions. Its form is treelike as a result. Nodes come in three varieties: end nodes, decision nodes, and chance nodes. The odds of various outcomes are displayed by a chance node, which is symbolised by a circle. An end node indicates the result of a decision path, while a decision node, shown by a square, indicates a decision that has to be taken. Decision trees remain popular for a variety of reasons. For starters, their intrinsic simplicity makes them incredibly simple to understand, promoting accessibility for users regardless of technical experience. Furthermore, decision trees are adaptable, demonstrating useful whether supported by solid data or used with low or incomplete information, necessitating minimal data preparation. Furthermore, their versatility is notable since new options or considerations can be smoothly introduced into existing tree structures. Notably, decision trees excel at determining the best option from a set of alternatives, facilitating unambiguous decision-making procedures (Jimenez-Roa et al., 2023).

Flowchart

In addition to the decision tree model, a flowchart is an alternative for the decision support tool. A flowchart, with its visual clarity, provides a methodical representation of the decision-making process. This flowchart allows for the smooth incorporation of tool-specific tasks such as data gathering, analysis, and decision nodes. The design would include round nodes for beginning and ending points, square nodes for actions and functions, and diamond-shaped nodes for critical decision points or questions. This structured and intuitive flowchart design not only improves the tool's visual attractiveness, but also offers a user-friendly interface, allowing for quick and understandable navigation through the decision-making process.

Multi-Criteria Decision Analysis

In contrast, a Multi-Criteria Decision Analysis (MCDA) in the form of a decision matrix analysis will be constructed when the criteria lack hierarchical links or when there is no obvious justification favouring a certain strategy. By incorporating several criteria and circumstances, the MCDA technique allows for a comprehensive examination. The decision matrix analysis has the alternative strategies as rows and criteria as columns in a matrix. Each option is assigned a score from 0 (poor) to 5 (very good). The criteria are assigned an importance factor from 0 (not important) to 5 (very important). The scores will then be multiplied by the respective importance factors. The weighted scores of each alternative strategy will be added up, and the alternative outcome with the highest score would be the strategy to choose. In this scenario, the focus group will be essential in establishing the relative weights and scores for each criterion, ending in the determination of the best plan based on collective feedback and analysis.

2.5   Case study Quooker

After collecting data and insights during the first diamond phase and designing the initial decision support tool, the second diamond phase will take place, which includes the phases "develop and deliver" (see section 2.1.3 and Figure 2.1) and the last two project activities, developing and evaluating the decision support tool. Here, the knowledge that was gained throughout the first diamond will be applied to create a realistic and effective decision support tool to guide the process towards finding a suitable ERP strategy. The decision support tool's usability and real-world applicability will be extensively examined in a comprehensive case study done at Quooker. More insight about Quooker can be found in section 6.1.

2.5.1   Gathering data part 3: Additional information

The case study approach used in this study focuses on varied resources to achieve an in-depth analysis. It is also proven that case studies benefit from multiple sources of evidence (Yin, 2018). The resources include papers acquired from ERP vendors and partners in the form of Requests for Information (RFI) and Requests for Partnership (RFP) that Quooker received. These materials provide perspectives and views into Quooker's case. They give issues, suggestions, and solutions for Quooker's desired strategy and IT landscape. The resources also include a report from an investigation in which Quooker and an outside party assessed if their ERP system was adequate and which ERP strategy they should pursue in the future. This report explains why Quooker is looking to implement another ERP system and why they are thinking about implementing a Two-Tier ERP strategy. The decision support tool's initial version will be revised and refined based on insights obtained via the RFIs, RFPs and the investigation report. The decision support tool will be fine-tuned to incorporate a broader range of considerations by leveraging the information received from these different sources, ensuring its alignment with the specific needs, issues, and recommendations identified in the RFIs, RFPs, and investigative report.

2.5.2   Evaluation decision support tool

Furthermore, the decision support tool is evaluated within the case study. The evaluation will take form as a focus group methodology, which provides a forum for in-depth conversations and various perspectives from key stakeholders. This multimodal method seeks to elicit comprehensive and nuanced insights, hence deepening understanding of the issues underlying ERP strategy selection. The focus group's key stakeholders will be the same team that Quooker utilises to select the new ERP system, which includes the necessary management positions. Participants will have the opportunity to interact directly with the decision support tool during the focus group session, investigating its functions, techniques, and outcomes. The evaluation will include presenting the decision support tool to the participants, walking them through its components, and encouraging open discussions in order to elicit feedback, opinions, and critiques from a variety of perspectives. The tool's usability, comprehensiveness, relevance to real-world scenarios, and ability to solve the complexities and challenges of ERP strategy selection will be evaluated by participants. Furthermore, the focus group will provide an analysis of how effectively the tool matches with the stakeholders' requirements, concerns, and priorities. This collaborative review method in a focus group context will allow for iterative enhancements, ensuring that the decision support tool is modified to better match the requirements and expectations of end-users in businesses facing ERP strategy decisions. Due to privacy concerns, the positions of the members of this focus group will not be revealed.

3 Analysing data part 1: Literature review

The goal of the literature review is to define requirements for the decision support tool. In this literature review different Enterprise Resource Planning (ERP) Strategies are described (sections 3.1 until 3.4), including the benefits, risks and selection criteria. Understanding the benefits, risks, and criteria connected with ERP strategies is important to this thesis because it serves as the framework for evaluating and comparing various ERP strategies, which is why the first two project activities are dedicated to this. It provides the necessary context for assessing the efficacy of different strategies, directing the selection process, and revealing prospective difficulties and possibilities. Based on literature review the benefits, risks and criteria for each ERP strategy are mentioned in Figure 3.1 until Figure 3.5. Since the selection of an ERP system could also be relevant, this topic is reviewed in section 3.5. Other aspects such as change management (3.6), competitive advantage (3.7), ERP architecture (3.8), integration (3.9) and costs (3.10) are also investigated, covering project activities three and four. Knowledge gaps and literature take-aways are described at the end of the chapter in section 3.11. The structure of the literature review is based on the key words used for this literature review, which are again based on the project activities of this thesis. Having the literature review structure based on the key words, brings a clear and natural distinction between topics.

3.1 Enterprise Resource Planning System (ERP)

ERP software's primary goal is to streamline back-office operations and improve information flow inside an organisation, allowing for data-driven corporate decision-making (Haddara, 2014; Klaus et al., 2000). ERP systems cover the customary corporate operations, such as finance, accounting, sales, human resources, purchasing, inventory management and distribution (Haddara, 2014; Ziemba & Gago, 2022). The capacity of ERP systems to smoothly combine different functions into a cohesive system, rather than depending on separate, isolated applications, distinguishes them (Alshawi et al., 2004). By offering a complete and integrated solution for the organisation's information processing needs, ERP systems also help businesses efficiently and effectively manage and utilise their resources (materials, human resources, finance, etc.). They promote the standardisation of business processes across the firm and a process-oriented view of the business (Haddara, 2014; Yen & Sheu, 2004). A company's organisation and strategy are both impacted by its enterprise system (Yen & Sheu, 2004).

The motivation for ERP implementation varies depending on the size of the firm. Larger firms find it more profitable, but SMEs prioritise inventory management, timely delivery, and client contacts (Gessa et al., 2023). Large firms clearly stand to benefit more from ERP deployment and have a higher capacity to absorb such a comprehensive solution. This is due to the intricate structure of ERP systems, which include integrating organisational operations and thereby increasing organisational complexity (Elbertsen et al., 2006).

Elbertsen et al. (2006) found some surprising results where managers who see ERP systems as more complex and less compatible tend to implement a greater number of ERP modules, most likely because they believe that implementing an ERP system leads to improved business processes aligned with more efficient operational procedures. This corresponds with their other results that users who consider themselves less competent tend to have more ERP modules than their more knowledgeable counterparts. These less skilled managers are also more susceptible to ERP suppliers' marketing campaigns, which have a considerable impact on the amount of ERP modules they incorporate. This issue can be given to ERP companies' increased ability to persuade less IT-savvy managers that a conventional ERP package is the best IT solution for their individual needs. Furthermore, Elbertsen et al. (2006) found that once these customers become owners of a specific ERP platform, they are more open to embrace additional modules. Thus, ERP adoption is significantly associated with ERP complexity (positively), ERP compatibility (negatively), IT competency (negatively), and ERP vendors' marketing efforts (positively).

3.1.1 Benefits

ERP systems provide numerous advantages across multiple dimensions. The automation of cross-functional procedures yields operational benefits. Managerial benefits include better production planning and management, workforce management, inventory management, and financial performance monitoring. Strategic benefits are designed to help businesses grow. Reduced legacy system maintenance expenses result in IT infrastructure benefits. Enhancing corporate learning, staff empowerment, and employee morale and satisfaction are all organisational benefits. These advantages are closely linked to a company's business and production productivity, with ERP systems playing a key role in increasing efficiency, particularly in the context of Industry 4.0, Robotics, and Automation. ERP systems also enable the integration of different information systems, the centralisation of processes, and enterprise-wide access to shared databases, all of which contribute to cost savings and enhanced flexibility and scalability, thereby strengthening an organisation's competitive position (Chopra et al., 2022; Elbertsen et al., 2006; Hwang & Grant, 2011). The benefit of a single vendor ERP system is that only one skill set is needed, due to the common applications. Next to that, the integration is pre-coded and easily maintained via upgrades (Light et al., 2001).

3.1.2 Risks

ERP systems have been critiqued for being time-consuming, resource-intensive and costly, as well as being too massive and inflexible to accommodate the quick speed of corporate change (Bernroider, 2013; Light et al., 2001; Siau, 2004). An ERP project needs substantial resources during the planning, justification, and funding phases, and these investments continue through the execution phase. This is especially true when there are both internal and external labour time resources involved. When external information sources, generally consultants, are heavily relied on during the earlier stages of justification and funding, the amount of external support required throughout implementation tends to increase (Bernroider, 2013).

There are also numerous risks that are associated with an ERP system. Chopra et al. (2022) have done research of ERP systems in the manufacturing industry. They found that ERP system costs are related to significant initial infrastructure investments, because they require a solid IT system, a good networking system, and a dependable reporting configuration. Inadequate IT infrastructure can lead to performance concerns such as slow processing speed, which is accentuated by the inherent complexity of ERP systems, requiring collaboration with a team of experts. Next to that, there is a risk that the chosen ERP software will not meet the needs of the firm, as a result of unfavourable expert reviews during the software selection process (Chopra et al., 2022). With a single vendor, the ERP system also determines the functionality, which might not match the business processes of a company (Light et al., 2001). Furthermore, in numerous firms, ERP adoption includes heavy workloads, job-related stress, tight deadlines, a lack of team experience, and managerial inflexibility which can all contribute to a high turnover rate among team members (Al-Malaise Al-Ghamdi et al., 2013; Chopra et al., 2022). Senior management support forms also a risk, because it is required for successful IT projects, including ERP adoption. The process entails not just changing software but also repositioning the organisation and changing business processes (Chopra et al., 2022). Next to that, a company will become highly dependent on an ERP vendor for support and for upgrades (Light et al., 2001; Velcu, 2010).

Contrary to popular belief, large-scale ERP initiatives do not always result in enhanced efficiency. Instead, they are related with higher levels of resource and change conflicts, lower levels of accomplished system and integration quality, and inferior early-use performance results. These findings highlight the significance of a balanced and well-considered strategy to ERP deployment, taking into account not only the number of resources but also their quality and alignment, as highlighted in "Effective ERP Adoption Processes: The role of project activators and resource investments." (Bernroider, 2013).

3.1.3 Summary benefits, risks, and criteria for single ERP system strategy

In the last subsections the benefits and risks of a single ERP system are discussed. An overview of the benefits, risks and criteria that is found in the literature is given in Figure 3.1. Words are taken from the literature and counted, when explicitly mentioned as benefits, risks or criteria. The numbers between parentheses are the number of articles that explicitly mention these benefits, risks or criteria.

Benefits	Risks	Criteria
• Centralisation of processes (3) • Easily maintained (1) • Enterprise wide access to shared databases (3) • Increase in efficiency (5) • Operational and managerial benefits such as planning and inventory management (3) • Requires one skill set (1) • Standardisation of processes (2)	• Dependence on vendor (2) • Functional compatibility (3) • Increase in organisational complexity (1) • Inflexibility (5) • Resource intensive (5) • Senior management support (1) • Size of project and system (3) • Time consuming implementation (3)	• IT competency (1) • Number, quality and alignment of resources (1)

Figure 3.1: Benefits, risks and criteria specific to a single ERP system

3.2 ERP customisation

Customisation and the addition of add-on applications to an ERP system is a common practice. The phrase "Enterprise" does not really describe the entire organisation; it merely describes the back office procedures, and ERP products have several issues (Alshawi et al., 2004). A gap always exists between the business rules incorporated in the ERP system and the practices and processes that are used in organisations, according to existing research that has studied how ERP systems fit to various businesses (Hustad et al., 2016; Hustad & Stensholt, 2023; Parthasarathy & Daneva, 2016). Businesses would then either need to change their processes or customise the ERP system (P.-F. Hsu, 2020; Velcu, 2010). Tailoring may be a crucial step in the ERP deployment process, where the ERP is customised to meet the specific needs of the organisation and its key business activities. ERP system customisation can result in better functionality, higher user quality, and advantages for users. However, due to higher installation costs, a time-consuming implementation and increased complexity for future upgrades, customisation can also pose a serious risk to the business. According to the literature, excessive customisation causes projects to fail during implementation and makes upgrades more complex (Alshawi et al., 2004; P.-F. Hsu, 2020; Slabbert et al., 2016). Thus, ERP system customisation is a two-edged sword that offers advantages while also being costly and fraught with danger for the future (Hustad et al., 2016; Hustad & Stensholt, 2023). In this context, it's worth noting that ERP benefits are driven more directly by proper functionality than by process adaptability (Chou & Chang, 2008). While process adaption is beneficial, it is imperative to ensure that the ERP system's functionality corresponds with the organisation's specific demands. Customisation efforts should focus on modifying the system's features and capabilities to meet the business's unique requirements, since this will have a more direct and significant impact on delivering the ERP system's benefits.

Customisation is problematic in the long run from a variety of angles; (1) The majority of customisations frequently need to be done again during upgrades, despite suppliers' efforts to incorporate them in subsequent releases, (2) If business requirements change, customisations made through expensive efforts may become obsolete and (3) Over time, as undocumented assumptions

and the knowledge of seasoned engineers are involved, figuring out the architectural logic behind adaptations becomes tough. This means that customisations' relationship to the architecture is frequently not documented (Hustad & Stensholt, 2023; Parthasarathy & Daneva, 2016).

To customise or not and if so, to what degree is a difficult task for businesses. Organisations with deeper awareness of the limits of ERP software may opt for a customised solution rather than standardised software like ERP (Elbertsen et al., 2006). There are multiple frameworks and models made to help with these decisions. The framework of Hustad & Stensholt (2023) includes a board with multiple people with different roles and perspectives and suggests that they should decide if customisation is needed. Parthasarathy & Daneva (2016) made a framework where discrepancies between the customer's priority requirements and those built into the ERP software are found and makes use of the idea of requirements traceability. Another model aids in classifying the scope and complexity of potential customisations when examining requirements that cannot be immediately satisfied by the features already in place (Aires & Abrantes, 2022).

Furthermore, P.-F. Hsu (2020) found that High-Tech manufacturing firms used customisation more often than traditional manufacturing firms. He also found that the size of the firm and the level of top management involvement does not make a significant difference in the customisation decision. In Figure 3.2 an overview of the benefits, risks and criteria for the customisation of an ERP system is given. Words are taken from the literature and counted, when explicitly mentioned as benefits, risks or criteria. The numbers between parentheses are the number of articles that explicitly mention these benefits, risks or criteria.

Benefits	Risks	Criteria
•Higher user quality (2) •Increase in functionality compatibility (2)	•Costs (6) •Documentation (2) •Increased complexity (3) •Upgrades and maintenance (6) •Time consuming implementation (3)	•Functionality (3) •High Tech firms (1) •Knowledge (1)

Figure 3.2: Benefits, risks and criteria specific to customisation of ERP system

3.3   Two-Tier ERP strategy

Organisations use the Two-Tier ERP strategy as a method for efficiently managing their enterprise resource planning (ERP) systems and to overcome the gap between the business rules of an ERP and the organisations processes. It entails the establishment of two distinct ERP systems: a tier one system for critical functions, such as corporate or headquarters functions, and a tier two system for less critical functions, such as regional or subsidiary functions (Gill, 2011; Slabbert et al., 2016). The fundamental operations and processes of the entire business are normally covered by the tier one ERP system, whilst the demands of certain subsidiaries or areas are the focus of the tier two ERP system. The Two-Tier strategy gives firms the adaptability to meet the various needs of various business divisions, subsidiaries, or regions. An organisation's geographic disparities, separate divisions using distinct systems, or business mergers that brought numerous systems together are thus some of the reasons to use this strategy (Gill, 2011). It permits process localisation and modification while keeping centralised management over vital corporate-wide operations. Other reasons for adopting a Two-Tier strategy are the absence of cooperation between different business functions, absence of desired functionality in an ERP system and a limitation of resources or capacity in some business processes but not others (Slabbert et al., 2016).

The most important benefits of a Two-Tier strategy are adaptability, agility, local autonomy, scalability, simplified reporting, risk reduction and cost reduction (Gill, 2011; Sarferaz, 2022; Slabbert et al., 2016). However, there is some controversy as to if these benefits can be reached. Slabbert et al. (2016) found in a case study that in an IT architecture with several ERP systems, it is less clear which advantages can flow to organisations and whether the ERP investment is necessary. The accomplishment of strategic, organisational, and infrastructure gains can be severely hampered, even if operational and management benefits are realised. Under strategic, organisational and infrastructure gains (such as standardisation of processes), scalability and growth, increased business flexibility and innovation is understood (Sarferaz, 2022; Slabbert et al., 2016). In the case study of Slabbert et al. (2016) these benefits were not accomplished, and the multiple ERP landscape was also very expensive.

In practice, integrating several ERP systems can be a difficult undertaking (Alshawi et al., 2004). Furthermore, applying a Two-Tier strategy might mean that you could deal with multiple vendors. This creates a more complex governance of the systems and more difficulties with integration. A company must therefore have a strategy that is capable of supporting the integration of numerous ERP systems (from different vendors), each with perhaps its own database. It will be necessary to enable the sharing of information between corporate units (Alshawi et al., 2004; Siau, 2004). The downside of working with a single vendor is that they might control and dictate their costs and technological requirements. The loss of a significant number of additional benefits that may be offered by other ERP vendors/products but were not initially evaluated is another downside (Alshawi et al., 2004).

It must be mentioned that the articles mentioned here, were the only articles found on the topic of a multiple ERP landscape or the Two-Tier strategy. Figure 3.3 gives an overview of the benefits, risks and criteria for the Two-Tier ERP strategy. Words are taken from the literature and counted, when explicitly mentioned as benefits, risks or criteria. The numbers between parentheses are the number of articles that explicitly mention these benefits, risks or criteria.

Benefits	Risks	Criteria
•Adaptability (4)	•Costs increase (1)	•Adaptability (1)
•Agility (3)	•Governance of system (1)	•Business mergers (1)
•Cost reduction (3)	•Integration (2)	•Capacity of resources (1)
•Functional compatibility (2)	•Multiple vendors (2)	•Functionality (2)
•Local autonomy (3)	•Not achieving the benefits (2)	•Geographic disparities (1)
•Scalability (4)		•Separate business units (2)
•Simplified reporting (3)		

Figure 3.3: Benefits, risks and criteria specific to Two-Tier ERP strategy

3.4   Best-of-breed strategy

Best-of-breed (BoB) software integration attempts to give enterprises more flexibility and closer alignment of software with their business processes. This method aims to accomplish corporate integration and process orientation by integrating standard software modules from diverse suppliers, allowing businesses to take use of the most appropriate software functions. BoB also provides an architecture that facilitates the adoption of new or upgraded applications and business processes, ensuring that businesses retain cutting-edge capabilities (Light et al., 2001). This strategy has several advantages, including flexibility, customised functionality based on organisational objectives, quality assurance, and a lower risk of vendor reliance. However, due to the use of numerous applications and

data sources, dealing with multiple vendors and managing the complex integration process can be time-consuming and requires a wide set of IT skills (Light et al., 2001).

When ERP systems lack the essential flexibility, users often turn to alternative, more specific, software modules to improve their market competitiveness. Larger companies, in particular, use different software solutions in addition to their ERP systems. ERP's enhanced flexibility, interoperability, IT expertise, marketing efforts by ERP suppliers (negatively), and company size all have a big impact on organisations who employ both ERP and other software products (Elbertsen et al., 2006). In a study of Hyvönen (2003), it was found that BoB was chosen when motives were either strategic or technical but not both. When motives were both technical and strategic the strategy was usually ERP. It must be said that in this context it was defined that ERP adopters were "units with at least some degree of ERP system" (Hyvönen, 2003), since most companies have kept some degree of other software products.

In Figure 3.4 an overview of the benefits, risks and criteria for the Best-of-breed strategy is given. Words are taken from the literature and counted, when explicitly mentioned as benefits, risks or criteria. The numbers between parentheses are the number of articles that explicitly mention these benefits, risks or criteria.

Benefits	Risks	Criteria
•Flexibility (2) •Functionality (1) •Lower risk of vendor reliance (1) •Quallity assurance (1)	•Integration (1) •IT skills (1) •Multiple vendors (1)	•Flexibility (1) •Interoperability (1) •Size of company (1) •IT expertise (1)

Figure 3.4: Benefits, risks and criteria specific to Best-of-breed strategy

3.5   ERP selection

A successful ERP adoption project includes choosing the best ERP system and a reliable vendor, installing the system, managing organisational and business process changes, and assessing the system's compatibility. Choosing the incorrect ERP system would either result in the project failing or severely weakening the system, which would hinder business performance (Alaskari et al., 2019; Haddara, 2014; Hansen et al., 2023). Choosing an ERP is a challenging and time-consuming process. This is mostly because there aren't many resources accessible, ERP packages are complicated, and there are many different ERP system options available on the market.

Several elements play a role in the ERP choosing process. Functional compatibility of the system with the business needs is one of the most important considerations (Haddara, 2014). Analysing the business' operational needs, functional requirements, and industry-specific specifications is necessary for this. The ERP software modules that a company chooses are frequently determined by the precise business processes that it wishes to enhance, as well as whether the organisation offers products or services. Manufacturing, supply chain, and distribution functions are frequently required by businesses that sell products, and ERP modules must address these functions.

Although careful consideration must be given to the suppliers, systems, and services offered, the final choice must also consider the degree of organisational change necessary for the adoption of the chosen ERP system. Business (process) mappings, package comparisons (such as costs, support and compatibility) and market position are other selection criteria that are important (Alaskari et al., 2019; Haddara, 2014; Ziemba & Gago, 2022). However, selection criteria may vary in nature, impact, or value because ERP adoption projects are highly contextual (Hansen et al., 2023). Difficulties also lie with characteristics of the company. Firms should consider two main elements when establishing ERP

systems across numerous facilities: information centralisation and production system flexibility. Firms that require a high degree of centralisation, but little flexibility can implement a single set of standardised "best practices" across all of their facilities. Companies that have a reduced need for centralised control but a strong desire for highly adaptable systems to respond to frequent consumer changes, on the other hand, may choose to build many ERP systems, each adapted to their individual facility's needs (Yen & Sheu, 2004).

Selecting a trusted vendor is essential for a successful ERP adoption effort (Al-Malaise Al-Ghamdi et al., 2013). The choice of accompanying partners, who often perform the implementation, is a crucial component in determining the success of ERP adoption, just as the choice of supplier is. Small and medium-sized enterprises (SMEs) frequently base their vendor selection on a number of important considerations. Depending on the SME's turnover, these considerations include the vendor's reputation, which can be an important sign of their reliability and track record. Furthermore, the vendor's flexibility in serving the unique needs of the firm play an important role in the decision-making process, especially when the SME is present in international markets. The high professionalism of the partners also contributes to the success of ERP implementation (Gessa et al., 2023).

Although the selection of ERP systems is out if this study's scope, the criteria that are known might also apply with selecting an ERP strategy. Words are taken from the literature and counted, when explicitly mentioned as benefits, risks or criteria. The numbers between parentheses are the number of articles that explicitly mention these benefits, risks or criteria. The criteria that might be applicable are business activities (3), centralisation (1), degree of organisational change (3), flexibility (1), functionality (3), and a trusted vendor (5).

3.6   Change management

ERP systems are frequently linked to significant modifications to business processes involving several stakeholders. Therefore, even while ERP systems could be deployed successfully technically, employee willingness to use the system may be a determining factor in the success of the implementation (Kwahk & Lee, 2008). Change management works best as a tool for energising and including staff in a change, not merely for handling resistance when it arises. An important factor in reducing such resistance is readiness for change (Kwahk & Lee, 2008). Change management makes sure that changes to the current system and processes, which have an impact on the business processes of the organisation, individuals, and groups, happen smoothly (Al-Malaise Al-Ghamdi et al., 2013). Thus, change management is a significant challenge for ERP projects, that if done well contributes to the readiness, acceptance and success of an ERP project (Al-Malaise Al-Ghamdi et al., 2013; Haddara, 2014; Yang, 2016).

Change management involves stakeholder management, effective communication, end-user training and education and operation support. It also includes strategies and techniques to get all the stakeholders in an organisation ready to accept new technologies (Al-Malaise Al-Ghamdi et al., 2013; Lee & Lee, 2004; Yang, 2016). Hereby are top management support, proactive communication, detailed planning at every level, training that facilitates knowledge transfer and having a project champion important strategies (Al-Malaise Al-Ghamdi et al., 2013).

3.7   ERP in relation to competitive strategy

A business unit's competitive strategy refers to the framework for achieving and sustaining a competitive advantage. In order to provide a company a competitive edge in the marketplace, the competitive strategy directs the selection and development of competitive priorities. When ERP systems and strategy conflict, it is more likely for the implementation to go over budget, to take longer and to not be successful in the end (Law & Ngai, 2007; Velcu, 2010; Yen & Sheu, 2004). This is also strengthened by the definition of an ERP project by Millet (2013) : "An ERP project is a process of

alignment that rests on a comparison between the model of a system, based on possible solutions, and the model of a need, established by the company".

A firm with an ERP performs worse when the focus is only operational, than when the focus is strategic or both. The objectives for adopting ERP also need to be clear (Law & Ngai, 2007). In international contexts, country culture and business regulations also play a role, impacting elements such as information sharing and local implementation strategies. Price, quality, delivery, and flexibility are all competitive goals that have a substantial impact on ERP deployment methods, affecting centralisation, software customisation, information sharing, adaption efforts, and data accessibility. For continued competitiveness, firms must acknowledge the significant role of integrating competitive priorities with structural and infrastructural decisions (Yen & Sheu, 2004).

ERP systems are an important infrastructure choice that has an impact on planning, scheduling, and control systems. However, without strategic planning, firms frequently fail to fully realise the potential benefits of ERP, particularly in terms of competitiveness. To reap the benefits of ERP and establish a competitive advantage, businesses must connect ERP with e-business technology and use their organisational resources. Aligning ERP with e-business technology and developing firm-specific integration capacity are crucial elements in gaining a competitive edge. In this attempt, firm-specific organisational resources play a larger role than IT resources, as integration competency serves as the intermediary for attaining a competitive edge (P. F. Hsu, 2013).

The competitive advantage provided by ERP projects can be significantly increased by investing in training, education, and system integration (Al-Malaise Al-Ghamdi et al., 2013; Ram et al., 2014). Training and education help to gain a competitive edge by enhancing decision-making, supply chain efficiency, innovation, customer service improvements, and profitability. Additionally, for firms to maintain their competitive advantages, system integration is essential for connecting diverse internal systems with the overall ERP that support distinct company processes and competitive strategies (Ram et al., 2014).

Essentially, the pursuit of a sustainable competitive advantage through the adoption of ERP involves the alignment of competitive priorities (Law & Ngai, 2007; Velcu, 2010; Yen & Sheu, 2004), ERP training (Al-Malaise Al-Ghamdi et al., 2013; Ram et al., 2014), system integration (Al-Malaise Al-Ghamdi et al., 2013; Ram et al., 2014), and a focus on organisational resources (P. F. Hsu, 2013). Therefore, the level of top management involvement is very important. A high level of top management involvement means that the ERP adoption a strategic firm-level priority is, providing leadership and resources, and will result in a competitive advantage (Al-Malaise Al-Ghamdi et al., 2013; P.-F. Hsu, 2020).

3.8   ERP architecture

Enterprise Resource Planning (ERP) systems are a significant component of modern business operations. Technology standardisation within these systems is essential in reducing complexity while improving the maintainability, dependability, and security of IT infrastructure (Ross, 2003). This emphasises the importance of a well-defined enterprise IT architecture that not only fits with the firm's strategic objectives but also defines the necessary IT capabilities for their execution. The enterprise IT architecture becomes a cornerstone in creating strategic alignment between IT and broader business objectives by establishing policies and technological choices that govern the development of these capabilities (Ross, 2003). This alignment is more than just a theoretical ideal; it also acts as a channel for maximising the benefits on IT expenditures, promoting a symbiotic relationship between technological projects and strategic outcomes. Finally, efficient enterprise IT architecture implementation not only offers a noticeable payback but also prepares the organisation to achieve a substantial strategic influence in the changing landscape of business operations (Ross, 2003).

ERP project managers and specialists need a solid understanding of ERP architecture regardless of the ERP strategy (standard or customisation). ERP architecture outlines the connections between various complex IT elements, such as hardware, software, data, and organisational elements including organisational structures and business processes (Amini Valashani & Abukari, 2020). There are multiple types of architectures, whereof web-based and cloud-based designs have become common in ERP design frameworks. This shows how far modern ERP systems have come from its simpler on-premises and client-server architectures (Amini Valashani & Abukari, 2020).

It is necessary to build a component-based design for Two-Tier ERP strategies. Both buyers and sellers of solutions can then readily upgrade their software. Components will be updated rather than needing to update the whole ERP system. It also makes the creation and integration of new components or the conversion of a group of components to a new platform simpler. Next to that, a flexible architecture like this makes it easier for business divisions and trading partners to exchange information (Siau, 2004).

3.9 Integration between systems

Integration of ERP systems with existing IT systems and business processes is thought to be essential for reducing complexity while boosting effectiveness, efficiency, and competitiveness (Gagnon, 2023; Velcu, 2010). Performance improves as integration becomes better (P. F. Hsu, 2013). The three main components of ERP module integration are system integration, business process integration, and user integration (Gagnon, 2023; Myers, 2008). System integration includes two components: data integration (common data definitions and consistency) and application integration (real-time communication between modules and information system (IS) applications). All systems must be online at the moment of communication for synchronised integration. It is recommended to employ asynchronous integration because it is challenging to keep all systems synchronised at all times (Alshawi et al., 2004). By integrating and synchronising internal corporate operations and functions, business process integration strives to enhance information flow and visibility across processes. User integration is concerned with how users perceive the interdependence of ERP modules, how they share information, and how they affect other users. In order to accomplish integrated operations within the ERP system, it emphasises collaboration among individuals, workgroups, and business divisions. Thus, user involvement is very important for the success of an ERP project (Al-Malaise Al-Ghamdi et al., 2013; Gagnon, 2023).

Organisational structure and culture are meaningful factors to consider when developing an ERP/IT integration strategy (Al-Malaise Al-Ghamdi et al., 2013; Myers, 2008). A company needs to be open and able to adapt to the change. This is especially the case when ERP systems are combined, for example in the context of Mergers and acquisitions (M&A). The primary trade-offs in M&A ERP integration are the degree of standardisation and independence between two combining systems, as well as the speed of integration (Myers, 2008). Although M&As are outside of this study's scope, in general it could be critical to strike the proper balance between standardisation and independence with ERP systems.

Common techniques for integration include standardising modules for low-value tasks and leveraging Service-Oriented Architecture (SOA) for system communication, which has improved the ERP architecture (Amini Valashani & Abukari, 2020). However, SOA can be costly and inflexible (Myers, 2008). An Enterprise Application Integration (EAI) solution can be used to connect numerous components to obtain flexibility in the architecture. Using EAI technologies with distinct databases creates an infrastructure that makes it simple to add or remove modules and to combine or separate platforms. To integrate different applications running on diverse platforms, adapters were employed to transform the data formats and processes (Alshawi et al., 2004). Other common integration techniques are point to point, client-server and messaging oriented middleware (Prashanth &

Venkataram, 2017). Since the actual integration is outside of this study's scope, this will not be further reviewed.

3.10 Costs

Costs accompanying an ERP project include startup costs, maintenance costs, implementation costs, employee training and consultancy (Elbertsen et al., 2006; Slabbert et al., 2016). When switching ERP systems transitional costs also play a role. Costs play almost always an important role when purchasing new software. However, Elbertsen et al. (2006) found that the startup costs and maintenance costs did not have a significant effect when it came to the choice of implementing an ERP system or an alternative system. This could be explained to the fact that companies considered an ERP system necessary or that the costs for both systems are similar. They also found that cost and speed advantages, same as social pressures from supply chain partners and peers did not play a role in the decision whether to adopt an ERP system.

Looking at costs from the angle of different ERP strategies, the advantages and disadvantages are not always clear. As said in section 3.2, the installation and maintenance costs of a customised ERP system are very high. This might opt companies to go for a Two-Tier strategy, since this could possibly save money by allowing business units to use a less complex and less tailored ERP system. However, a Two-Tier strategy can also be more expensive since it brings more licenses and maintenance. Similarly, the Best-of-breed strategy often leads to high costs, due to the necessity for several licenses and the complexities of integration. Thus, even though costs are important, the costs can differ per business case, which makes it difficult to determine.

3.11 Conclusions and implications for decision support tool

The selection, benefits, and risks of deploying a single ERP system have all been thoroughly explored. There is also a lot of literature on ERP system customisation and the many approaches for assessing when and to what extent customisation is required. Surprisingly, there is no approach to the decision-making process for selecting an ERP strategy, when would a certain ERP strategy be most suitable? There is also little literature about the Two-Tier ERP strategy in general. For example, for change management, costs and competitive advantage research is done for a single ERP but not for a Two-Tier ERP strategy. Furthermore, much of the available literature focuses on organisations who did not have an ERP system before, rather than those that do have an ERP system but find it inadequate.

In Figure 3.5 a summary of all the criteria that were found in the literature review and that are relevant for the decision support tool, is given. The numbers between parentheses are the number of articles that explicitly mention these criteria. Business mergers were proposed as additional criterion for the Two-Tier ERP strategy; however, mergers and acquisitions (M&A) are outside the scope of this study, so they will not be considered in the decision support tool.

Single ERP system	Customisation	Two-Tier ERP strategy	Best-of-breed	ERP Selection
• IT competency (1) • Number, quality and alignment of resources (1)	• Functionality (3) • High-Tech firms (1) • Knowledge (1)	• Adaptability (1) • Capacity of resources (1) • Functionality (2) • Geographic disparaties (1) • Separate business units (2)	• Flexibility (1) • Inter-operability (1) • Size of company (1) • IT expertise (1)	• Business activities (3) • Centralisation (1) • Degree of organisational change (3) • Flexibility (1) • Functionality (1) • Trusted vendor (5)

Figure 3.5: Criteria relevant for the decision support tool based on the literature review

The goal of the literature review was to form requirements for the decision support tool. This does not only include criteria for choosing a strategy, but also other things that are important in the strategy selection process. Change management is one of these topics. From the literature review it became clear that change management is very important, especially the organisation's readiness for change. Before beginning the process, it is also important to secure top management's active participation as not only mentioned for change management but also to receive competitive advantage. Analysing the operational needs, functional requirements, and industry-specific specifications of the firm is also a critical step in this preparatory phase. The alignment of competitive priorities, as outlined in three distinct publications (Law & Ngai, 2007; Velcu, 2010; Yen & Sheu, 2004), emphasises the strategic necessity of integrating ERP activities with overarching corporate objectives. ERP training, system integration, and a focus on organisational resources have all been cited as critical success factors, underscoring the complex nature of ERP deployment. Furthermore, concerns such as IT architectural standardisation, the deep relationship between IT and organisational elements, and the trade-off between uniformity and independence (Myers, 2008) highlight the complexities of ERP adoption decision making. Additionally, system, business process, and user integration are highlighted as critical factors, with a focus on user interaction. The costs of ERP deployment vary depending on the business case, making it difficult to include in a general decision support tool.

To cover the gaps in the literature and to confirm the knowledge gained, the interviews will partially be about the Two-Tier ERP strategy, including its pros, cons, and risks. Questions will also be asked about criteria and constraints when choosing an ERP strategy. Not a lot of criteria were found and the ones that were mentioned are only based on a specific strategy and not overall. The criteria found in the literature will be compared to the interview findings, and a final decision on the criteria for the decision support tool will be made based on all findings. Lastly the interviews will also ask about the different perspectives between business and IT and whether to have a Best-of-breed strategy or customisation of the ERP system. A full list of questions can be found in Appendix 2.

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4 Analysing data part 2: Interview results

In this chapter the results of the interviews will be given. The interview questions are defined based on the literature review. A full list of questions can be found in Appendix 2. As explained in section 2.3, the interviews are analysed with inductive thematic analysis. This way the results are not influenced by the literature and new concepts and ideas can be found. In section 4.1 an overview of the interviewees is given. In section 4.2 the findings will be presented per theme alongside a code tree. Finally, in section 4.3 the main conclusions and implications are given that are important for the requirements of the decision support tool.

4.1 Interview participants

Eventually there were seven interviews held. In Table 4.1 an overview of the participants is given. Every participant is coded, with the P standing for participant, the number for the category of participants (1=ERP partner, 2=ERP vendor, 3=Company with Two-Tier) and the letter for the specific participant. Thus, for example participant P1A and P1B both work at an ERP partner. Three participants work for an ERP partner, which gives them a better perspective on specific ERP implementations and different strategies. Two participants work for an ERP vendor, which gives them a better perspective on ERP systems themselves. The last two participants work for a company that has implemented or want to go to a Two-Tier ERP strategy, which gives them a better understanding of how this strategy works. Most participants have a technical background, which gives them a better understanding of the how a strategy works whereas the other two participants have a sales background, which gives them a better understanding of when companies would choose a strategy. The participants that are part of an ERP partner or vendor, only give advice on ERP implementation and not necessarily decide on the strategy themselves. However, they do have insights on the strategies and have worked with a Multiple-Tier ERP strategy before. They can see how companies decide on a certain strategy. Both participants at a company with a Multiple-Tier ERP strategy have not decided on the used strategy, however they did have knowledge on how their IT landscape came to be. Other limitations could be limited information due to knowledge or sensitivity.

Table 4.1: Overview of interview participants

Participant	Company	Position	Relevancy
P1A	ERP partner	Sales executive	10-12 years of experience with ERP and has done multiple implementations
P1B	ERP partner	Solution architect	20 years of experience with ERP and has done multiple implementations
P1C	ERP partner	Solution architect	15 years of experience with ERP and has done multiple implementations
P2A	ERP vendor	Cloud expert	17 years of experience with ERP and has done multiple implementations
P2B	ERP vendor	Sales & Country manager	20 years of experience with ERP and has done multiple implementations
P3A	Two-Tier	Interim IT manager	Works at a Multi-Tier company, wants to go to a Two-Tier strategy, that has multiple entities in different countries
P3B	Two-Tier	IT/Enterprise architect	Works at a Two-Tier company and has 20 years of experience as an ERP consultant

4.2   Interview results

Following the insightful interviews, a thorough thematic analysis was carried out to extract and organise the rich qualitative data acquired. This thorough examination resulted in the identification of relevant themes and patterns hidden within the interview text. The findings will be presented in a systematic manner, outlining the consequences and insights gained from each separate theme uncovered during the data analysis. The main themes that were discovered were Policy, Business and System. This method guarantees that the results are presented in a clear and ordered manner, allowing for a focused grasp of the specific conclusions related with each theme topic. Not every code is covered under its own theme because some codes are connected to other themes; this is done to avoid repeating information. Certain quotes are mentioned, because they summarise the consesus well or they have an unique view on a topic. An overview of the mentioned quotes is given in Appendix 3.

4.2.1   Policy

The biggest consensus among the participants (P1A; P1B; P1C; P2A; P3A) was that in most circumstances, having an ERP system is required for organisations. Trading companies with small operations could be the exception, but even small-scale manufacturing and finance businesses frequently rely on ERP systems. Next to that, companies often already have an ERP system in place, which makes an implementation of an ERP system for the first time rare (P1B). It is more often that companies switch ERP systems nowadays. This strengthens our decision to only include companies with ERP systems (that do not meet the requirements) in this study.

> *"There is always an ERP system needed. Let alone for the finance functions."* (Participant 1 C)
> *"You always need an ERP system in the centre of your landscape."* (Participant 2 A)

Furthermore, the interviews (P1A; P1B; P2B; P3A) also stated that using a single ERP system provides benefits such as consistent data structures, intercompany analysis, increased business efficiency, and uniform operational processes, ultimately fostering operational excellence. The centralised nature of a single ERP system enhances synergy benefits across multiple corporate operations. A single ERP is more effective in a centralised operational framework because it prevents independent organisations from making autonomous design decisions. Additionally, standardising terminologies becomes critical for enabling extensive intercompany analysis and ensuring uniformity across companies, making a single ERP system the better option. A single ERP system is often more comprehensive and generic, allowing for the uniformity required for expansion and adaptation to changes. When working with the same clientele, having a single ERP system assures uniform data terminology, streamlining operations, and promoting seamless interactions.

> *"I think every organisation that could handle it, should go to one ERP system."* (Participant 1 A)
> *"Benefit of one ERP system is that everyone works in the same way with the same system."*
> (Participant 3 A)
> *"Companies should not have a Two-Tier strategy when there is an integrated process throughout the company. You should be standard and have one ERP system."* (Participant 1 B)

Customisation is often used to bridge the gap between a business process and the system. However, the participants of the interviews all agree against ERP system customisation (P1A; P1B; P1C; P2A; P2B; P3A; P3B). The fundamental reasons primarily revolve around rising prices, increased risks, and complex issues that come after customisation. Customisation tends to increase expenditures and create new hazards, making later upgrades and maintenance operations far more complicated. Furthermore, the knowledge and experience connected with these customisations may fade over time, creating major hurdles for ongoing system management. To prevent the possible risks associated with customisation, the general opinion is to maintain the ERP system's stability and implement changes outside of the core system. Among these concerns is the possibility that customised pieces

will not align or function properly after system updates, creating significant operational challenges and potentially disrupting critical business activities.

"In a modern ERP you don't want to customise anymore." (Participant 1 B)
"Never. I am very much against customisation." (Participant 2 A)
"No, customising is never the way to go." (Participant 3 B)

From the interviews multiple definitions for the Two-Tier ERP strategy were defined. The Two-Tier ERP strategy entails an organisation managing various ERP systems, either across headquarters and various entities or to differentiate key aspects of the business. This could include multiple systems from the same vendor or systems from different vendors. The Two-Tier method arose from the shortcomings of large, complicated ERP systems, a perspective mostly held by Participant 2 B. The decision to implement a Two-Tier ERP strategy is based on whether the firm seeks distinction based on procedures or operational efficiency, which may not fit neatly into a single ERP system (P1A; P1B; P1C; P2B; P3B). However, administering numerous systems increases complexity and requires careful version control across all platforms. A uniform way of working and terminology also becomes more difficult. Nonetheless, choosing a single vendor for various systems provides benefits such as increased control, streamlined integration, licensing benefits, improved management, and a greater opportunity for uniformity throughout the organisation's processes (P2A; P3A; P3B).

"To keep standardisation, you will try to keep every system the same technology, thus the same vendor." (Participant 2 A)
"Finally, there is also another version, you could have multiple ERP systems, but from the same vendor. Then you have the freedom, but it is the same technology and thus easier to control and integrate." (Participant 3 B)

As defined in the literature, best-of-breed aims to accomplish corporate integration and process orientation by integrating standard software modules from diverse suppliers, allowing businesses to take use of the most appropriate software functions. This used to be without an ERP system in place. However, according to the participants, there is always an ERP system in place and best-of-breed means you have smaller standard software modules next to it. There were two major downsides that came up in the interviews; (1) to efficiently handle multiple systems when implementing a best-of-breed strategy, strong program management abilities are required and (2) opting for a best-of-breed strategy may limit or hamper the organisation's growth trajectory (P1B; P1C; P2B).

"Best-of-breed could be very strong, but you need a very strong IT architecture and program management." (Participant 1 B)
"Best-of-breed can limit growth because applications cannot handle it." (Participant 2 B)

A new definition arose from the interview with Participant 2 B, namely a composable ERP system. Composable ERP combines the best-of-breed strategy and typical ERP systems, integrating numerous applications via interconnected processes. This new strategy seeks to streamline operations by linking several apps inside the framework of an ERP system. Composable ERP solutions can considerably simplify procedures for some entities within an organisation.

"Bigger companies have different processes next to the specific ones, more global and corporate processes, such as intercompany processes. This would not be possible in best-of-breed but is in composable ERP." (Participant 2 B)

The selection of an ERP strategy is according to the participants tightly linked to the overall business strategy, considering aspects such as acquisitions, differentiation, and operational requirements (P1A; P1B; P1C; P2A; P2B; P3A; P3B). The decision revolves around the business model, with the question of whether off-the-shelf solutions are sufficient or if tailored processes via specialised apps better meet the organisation's needs. Industries with unique or specialised needs may benefit from dedicated ERP systems that can successfully address their specific demands (P1A; P2A; P2B; P3A; P3B).

"Mostly see Two-Tier with mergers and acquisitions, where they are confronted with different ERP systems." (Participant 1 A)
"Yes, we see often that a Two-Tier situation exists with clients. Especially when companies were merged or acquired." (Participant 1 B)
"The challenge for the organisation is to find the right balance between a generic solution and a commodity one." (Participant 2 A)
"It also depends on where you want to differentiate yourself with. If you want functionalities that go more in depth and a fast pace of change. With bigger systems this is often not the case. They are more generic." (Participant 3 B)

The selection of strategy is also based on the desired amount of synergy within operations; seeking harmonised procedures may lead to a unified system, whilst prioritising flexibility may align with various systems or a composable ERP model that enables simplified processes for certain entities. Maintaining uniformity is critical, stressing the use of same technologies and standardised solutions to reduce customisation while increasing flexibility for future updates and scalability (P1A; P1B; P2B; P3A). Finally, especially according to Participant 1 A, strategy selection requires an analytical approach that considers how to structure operations, intended goals, and potential risks. Furthermore, Participant 2 B pointed out that sentiments or values can affect decisions, as evidenced in examples when businesses desire to keep a Two-Tier structure for nostalgic reasons or a firm stance against change.

"You have to do an analysis, where you see what you want to achieve." (Participant 1 A)
"The restrictions lay in defining the requirements. You have to consider how much you want to standardize and which specific deviations your company has (and wants to keep)." (Participant 3 A)

An ERP deployment is primarily a business-driven initiative that addresses numerous aspects of an organisation's finances, logistics, and sales. Maintaining the business's distinctiveness becomes a top priority in terms of sales. However, the distinction between business and IT perspectives is reflected in their conflicting priorities; whereas business divisions seek solutions adapted to their individual needs, IT departments often prefer standardised systems (P1A; P1C; P2A; P3B). The participants also stated that managing two systems presents substantial issues for IT, yet perspectives on this topic may differ depending on the organisation's goals and projected developments. The integration of business and IT has grown stronger, especially as ERP systems have become more popular. The role of IT in supporting the company's strategy is critical, particularly with the change to software-as-a-service models, which allow IT to provide greater support to business operations, potentially leading to operational excellence and a competitive advantage.

"Business looks at processes and the support of those. They think that their processes are unique and want a solution that fits those needs. While IT just wants a standard solution, …." (Participant 1 C)
"The business wants available, reliable and safe systems that are easy to control and low in costs. It has partly the job to make sure these goals are met." (Participant 3 B)

Other differences that the participants pointed out were that IT prioritises application functionality and coverage, whereas business is more strategic and less concerned with the technical complexities of system operation. However, IT often prefers consolidation into a single system, which simplifies maintenance, knowledge management, and reduces integration complexity in the IT ecosystem. Thus, there is a distinction between the business and IT perspectives; nevertheless, according to Participant 3 A, this is most essential when selecting a system, not the strategy.

"Difference lays mostly in requirements. … But it is mostly important for choosing the ERP system, not really the ERP strategy." (Participant 3 A)

While expenses are an important element in selecting an ERP strategy, they should not be the main factor. The total cost of ownership is important since it includes the costs of maintaining and operating

systems. Although it was already established that customisation should not take place, the costs further underline this because it significantly increases prices in upgrades, as do continuing maintenance costs, creating financial issues within an ERP environment. Managing several ERP systems can dramatically increase expenses, especially for intercompany activities that may require duplicate licensing, making it typically more expensive (P1A; P1B; P1C; P2B; P3A; P3B).

"An ERP system costs a lot of time and effort, thus with two even more. … You have to maintain the systems, but also documents and identity management are double." (Participant 1 B)
"You have to keep the systems running and you also pay for this. Thus, total cost of ownership is also important." (Participant 1 C)

Surprisingly, some participants said that the Two-Tier strategy could also be more financially beneficial. Participant 2 A claims that having numerous systems may cut costs in situations involving acquisitions or divestitures, because only integrations need to be cut/made. Participant 3 B mentioned that opting for a single system frequently results in the engagement of larger vendors, which may incur higher costs than smaller systems. In conclusion, the total cost of ownership depends on the organisation, their strategy, the ERP system and partner itself.

4.2.2 Business

The results of the interviews showed that all of the participants agreed that organisational traits are critical for the choice of ERP strategy. The most significant of these was the organisation's intrinsic complexity, which depends on the variety of entities, processes, legal frameworks, user counts, IT infrastructure, and the requirement for differentiation (P1A; P1B; P1C; P2A; P2B; P3A; P3B). It's important to keep the uniqueness of a company, which is not always possible with big standard systems. Participants stressed that using multiple ERP systems could help run a complicated firm more successfully.

"It starts within the organisation itself. How complex it is." (Participant 3 B)

The size of the business also influences the ERP strategy (P1A; P2B; P1C; P3B). Due to their more controllable scale, smaller businesses typically choose best-of-breed solutions, specialisation, or a single ERP, while a Two-Tier model is thought to be fraught with risks, costs, and obligations. On the other hand, larger businesses with significant income streams deal with complexity that makes switching to a single ERP impractical. They also have more often the resources needed to enlist outside assistance, which is particularly relevant in Two-Tier or Best-of-Breed models. However, size alone might not necessarily be seen as a criterion. As Participant 2 A points out, a certain size and being multinational are not reasons to have a Two-Tier strategy.

"It is about size, geographically with the number of countries but also the number of users."
(Participant 3 B)
"The project of migrating to one ERP system can be so big, that you wouldn't be able to finish it."
(Participant 1 A)

ERP systems, as Participant 1 A mentioned, are very large, as is the project of moving to one. This is why most participants agreed that in general an ERP migration should not be done in a "big bang" but rather in smaller phases. According to Participant 2 B, this is especially because of the amount of organisational change that is or will be happening. Thus, a Two-Tier ERP strategy is often used as a transitional phase. Participant 3 B did point out that, companies often only grow and become more complex. Going back to one ERP would not be reasonable then.

"Nowadays, it's more from ERP to ERP. In that case, you cannot do everything in one big bang."
(Participant 1 B)
"Lasting strategy for multinationals with locations fulfilling different functions (e.g. manufacturing in one location and sales in another)." (Participant 1 C)

Entities contribute greatly to the complexity of ERP strategies by introducing numerous aspects such as distinct functions among business units operating in different industries. Differences in working techniques, terminology, and functions between countries or entities add to the difficulties. Regardless of the number of systems used, the terminology should be the same. Autonomous divisions within an organisation add to the complexity. While using separate systems or a Two-Tier ERP strategy can provide you greater freedom, or even lead to competitive advantage, it may become necessary because of legal constraints or different operational approaches (P1A; P1B; P2A; P2B; P3B). When business units have their own manager, multiple systems may also be preferred to keep some form of autonomy. In this case, composable ERP would be a valid option, according to Participant 2 B, since multiple installations of the system are possible.

> *"Another reason could be if you have two business units that are so different that it couldn't be put into one ERP system. … A reason could also be that business units work so independently, that it doesn't matter for the company if they have the same systems or not."* (Participant 1 A)
> *"It could lead to a competitive advantage, when business units do something completely different."* (Participant 1 B)

However, the diversity of systems may pose threats to operational uniformity, hinder organisational synergy and forms a risk in reporting (P1A; P1B; P2B; 3A). Participants also stated that if there is a single integrated or intercompany process, it should not be implemented in different systems (P1A; P1B; P2B; P3A). Thus, often a single ERP system would be used. Participant 2 B even said that "Reporting, Finance and Logistics shouldn't be in a Two-Tier strategy".

From the interviews it became clear that the presence of a Two-Tier ERP system is frequently the result of mergers and acquisitions, with many organisations eventually transitioning to a single ERP solution (P1A; P1B; P1C; P2A; P2B; P3A; P3B). A compelling argument to keep a Two-Tier ERP strategy would be the pursuit of digital transformation, especially if one sector of the business is far along in its digital journey. You don't want to bring business units back from development. Next to that, continuous restructuring activities, such as divestitures or acquisitions, which require a level of adaptability that the Two-Tier strategy provides, are also reasons to continue to use the Two-Tier structure. Acquisitions could have a quick and relatively cheap onboarding process and divestitures can be cut off easily. This would be more challenging in a single monolithic ERP. Furthermore, in circumstances involving the formation of new business units, businesses may prefer a Two-Tier strategy to keep distinct legal entities while avoiding the legal obligations associated with a consolidated or single ERP system.

> *"So, there are five reference points; acquisitions strategy, divestitures, autonomous divisions and many subsidiaries that you don't want in your headquarters system on principle."* (Participant 2 A)
> *"If there is a lot of change in the surroundings or internally, with for example reorganisations, then you shouldn't put this in one system."* (Participant 3 B)

Additionally, Participant 3 B mentioned that investor involvement often promotes growth and organisational transformation, which makes a Two-Tier system more desirable because of its adaptability, especially when it comes to enabling autonomous expansion into different market niches. Furthermore, the speed at which change, and expansion occur is important to decision-making since large-scale systems' ability to adjust quickly to changes becomes a critical concern.

According to some of the participants, one of the most important departments in the context of ERP strategy selection is the IT department (P1B; P1C; P3A). To ensure effective data management and seamless operations across varied systems, a high level of competence and proficiency in dealing with the complexities of multiple systems is required. As a result, extensive systems knowledge and skills become essential, especially in the context of a Two-Tier ERP strategy and best-of-breed, where the ability to navigate and manage several systems is critical for operational success. Thus, if a company does not have the right IT personnel, it becomes a big risk.

"If the IT knowledge is low, you should have a partner that does everything." (Participant 1 B)
"If there is no or limited internal IT, you should go for a single ERP strategy" (Participant 1 C)

Partnerships with experts are necessary for operating ERP systems, as effective cooperation between partners and internal teams in IT and business operations is critical. This is particularly true in situations when IT expertise is scarce, in that case it would not be wise to have multiple partners since the company is more dependent. The more partners a company has, the more complex it is to manage (P1B; P3B). Effective coordination between partners and systems is essential for coordinating across several tiers, and a clearly defined scope is especially necessary, according to the Participants 1 B and 3 B. The need of precisely defining the scope and drawing limits in order to reduce conflicts and guarantee more seamless operations is highlighted by possible commercial tensions. Moreover, the company bears the majority of the duty when handling various systems, particularly with regard to data management and the landscape. Finally, effective communication channels are essential for a successful implementation, particularly when merging into a single system that necessitates direct or near-by connection.

"As a company you have to handle and coordinate the partners, so as long as the scope is clear it shouldn't be a problem." (Participant 3 B)

Participant 1 C summarised most of the critical organisational traits that were mentioned by all the participants in a good way:

"Size of company, functionality, knowledge and skills, complexity of business processes, complexity in general and internal IT." (Participant 1 C)

4.2.3 System
The flexibility of an ERP system to handle a variety of tasks and offer substantial functionality is often a determining factor when choosing one, as is the feasibility of consolidating under a single ERP. Larger ERPs may handle a wide range of processes and functions, generally becoming more generic as they grow. Participant 1 A also mentioned that functionality is an important aspect not just in process management, but also in technological growth, preventing technological regressions. During upgrades, coordinating features becomes critical to enable smooth transitions. Businesses must consider whether they want to differentiate based on functionality, and if so, they should select a more (industry) specific system. To effectively handle industry-specific requirements, numerous ERPs may be required (P1A; P1C; P2B; P3A; P3B).

"Functionality is a big part in the decision of going for Two-Tier. Another reason could be if you have two business units that are so different that it couldn't be put into one ERP system. But that also depends on the ERP system, because big ERP systems can handle a lot of processes." (Participant 1 A)
"If you want functionalities that go more in depth and a fast pace of change. With bigger systems this is often not the case. They are more generic." (Participant 3 B)

The general consensus among all participants was that the ERP system a critical component of an organisation's design is, providing as the foundation for operational functions and some even said that it contributes to operational excellence.

"In my opinion, it is the central component of an IT landscape. … It doesn't necessarily has to be the most central part, but is an important one." (Participant 1 A)
"Operational excellence of core business processes are achieved with ERP system. Thus, ERP is often put in the middle of the organisation." (Participant 2 B)

Often viewed as a monolithic structure in the technological environment, its position within IT architecture is critical, particularly in handling complexity caused by interfacing across multiple systems. Participant 2 B points out that low-code approaches are widely used to accomplish integrations across several systems, which facilitate communication. However, maintaining

integrations has still substantial risks, particularly during upgrades, demanding stringent testing procedures (P1C; P2A; P2B; P3A). While integration remains the company's duty, many manufacturers provide standard integrations with popular systems, which makes the integration process easier.

"Every integration point is a point of failure." (Participant 2 A)
"With public cloud solutions, you have upgrades every quarter. This means that every quarter you have to test the interfaces." (Participant 2 B)
"Integration is a risk, but it is way better manageable than decades ago." (Participant 3 B)

Despite this, according to Participant 3 B, businesses that use separate systems should manage their data independently, necessitating data transmission between platforms. The decentralised nature of data storage reduces the need for a single system, challenging the concept of centralisation merely for data storage reasons. However, data control remains a challenge due to the variety of systems and databases (P1A; P1C; P2B; P3A).

Managing various systems inside an ERP infrastructure introduces inherent complications and problems for overall system management and control. Different systems lead to greater dependencies, which complicates oversight and coordination (P1B; P1C; P2B; P3A; P3B). When dealing with many systems, the participants also pointed towards user experience and that it becomes an important consideration because variances in workflows and interfaces can possibly impede operational efficiency (P1B; P3A). Ensuring a smooth transition between ERPs is critical to avoiding setbacks, increasing productivity, and preserving employee happiness while reducing resistance to change. Successful ERP adoption necessitates extensive and sophisticated training practices to assure the system's successful utilization and overall success.

"It is also about employees, if the employees have to take steps back as well, it can have huge implications." (Participant 1 A)
"If there are multiple ERP systems, then you need more training, more people and you'll have more dependencies. This is also the case for users, they will have to work and switch between ERP systems." (Participant 3 A)

4.3   Conclusions and implications for decision support tool

A hierarchical code tree was constructed to adequately visualise the detected themes. This code tree serves as a visual representation, displaying the themes extracted from the interview data in a clear and systematic manner, allowing for a more accessible and thorough understanding of the complex insights obtained through thematic analysis. Figure 4.1 depicts the themes and subthemes of the Code tree. In Appendix 4 a full overview of the code tree is given. Each theme has its own colours, namely the theme business has purple/pink, the theme system has orange/yellow and the theme policy has green/turqoise. The lighter colours (pink, yellow and turqoise) indicate a subtheme. An even lighter version of those colours indicate a sub-subtheme. The colours were chosen to make a distinct overview of the themes and carry no further meaning. The size of the circles displaying the themes has no significant meaning other than also indicating the level of the theme. The colour and size in Figure 4.1 carry no meaning about the importance of the (sub)theme.

Figure 4.1: Themes and subthemes as a result of the thematic analysis of the interviews

The findings from the interviews highlight the critical significance of ERP systems in organisational frameworks, serving as a foundation for operations across a wide range of industries. Trading businesses with minor operational activity may be an exception, but they fall outside of this thesis project's scope. The interview findings strongly discourage the incorporation of customisation into ERP systems due to the related higher costs, risks, and complications during upgrades and maintenance, which provide substantial challenges. Which is why this will not be included in the decision support tool. Furthermore, current IT landscapes frequently include best-of-breed systems or smaller applications alongside ERP solutions, making sole best-of-breed considerations irrelevant in the decision support tool. Since this study is about unsatisfactory ERP systems and complete replacement with best-of-breed solutions is not an option (because an ERP is always required), the best-of-breed strategy will not be included in the decision support tool. Furthermore, the interviews showed multiple definitions of the Two-Tier ERP strategy. A Two-Tier ERP strategy entails an organisation that manages multiple ERP systems, either across headquarters and numerous entities or focuses on certain business areas. This method may include many systems from the same or separate vendors, with the goal of differentiating and managing critical business areas. Although usually connected with mergers and acquisitions, this study focuses on companies with a single ERP system, ignoring mergers and acquisitions but including possible future divestitures and independent divisions. Adopting a single technology platform in a Two-Tier strategy improves control, management, uniformity, and integration, pushing for the use of the same technology and thus same vendor whenever possible. Next to that, ERP system migration is often done incrementally rather than in a single large-scale transfer, with the Two-Tier strategy serving as a transitional phase due to the pre-existing ERP systems within businesses. Finally, the introduction of composable ERP systems, which combine best-of-breed features with ERP structures, enables numerous system instalments,

resulting in streamlined operations for individual organisations. These systems, which are often built on a cloud-based framework, provide adaptability and seamless integration of best-in-class apps with other system components. However, as this was only mentioned by one participant, this study will exclude the use of composable ERP systems. In conclusion, the outcomes of the decision support tool will either be switching to a different ERP system with a Two-Tier strategy as transitionary phase or implementing a lasting Two-Tier strategy. The decision support tool will lead to a single vendor strategy whenever possible.

The interviews revealed several criteria that influence the ERP strategy selection process within enterprises, see Table 4.2. These criteria have been mentioned by at least four different participants. Strategic decisions are driven by an organisation's complexity, which includes multiple entities, processes, legal frameworks, user counts, and IT infrastructure, as well as the objective of differentiation. Although legal frameworks and differentiation could also fall under business strategy. Smaller businesses tend to desire specialisation yet choose a single ERP due to associated risks, whereas larger corporations frequently prefer or need a two-tier system. The applicability of numerous systems is dictated by business objectives that include divestitures and operational needs, which are frequently driven by legal constraints and the desired amount of operational centralisation and differentiation. Synergy, whether in uniformity or flexibility, influences the decision between several systems and a more adaptable, modular approach. Additionally, evolution of technology appears as an important aspect in preventing regression in business unit development routes, however since only one participant has mentioned this, it will not count as a criterion in the decision support tool. It is however important to consider, when choosing a new ERP system. Effective data management across several systems requires a high level of competence in dealing with system complexities. As a result, having several partners should not be combined with limited IT skills. Having one system or numerous systems from a single partner would be preferable in that case. Even though only three participants shared this opinion, two of them had 20 years of experience with ERP systems, and the third has worked with numerous systems in his organisation. This, combined with the consensus of more participants that data control is an issue, leads to IT knowledge being considered a criterion for the decision support tool. At last, the importance of system functionality, process efficiency, and technological innovation remains critical. While sentiments or values might impact judgements, they will be excluded from the decision support tool. If a company has set their mind to a certain strategy already, then the decision support tool is useless. Financial factors are essential, but not the key issue, as the total cost of ownership is inextricably linked to an organisation's strategy and the ERP system and partner itself, making it difficult to consider as a separate criterion for ERP strategy selection.

In addition to definitions and criteria, there are several other crucial insights from the interviews. The essence of an ERP project is its business-driven character, in which businesses seek solutions adapted to their individual requirements, whereas IT teams frequently favour standard solutions. IT's critical role in supporting corporate strategy remains important, although businesses are often less concerned with technical details. According to Participant 3 A, the significant distinctions between the IT and business viewpoints are most noticeable when choosing a system, but they aren't always important when choosing a strategy. Other factors for making decisions include business and IT-related elements, making them unnecessary in the decision support tool. However, the interviews did show that it is important that both IT and business employees are included in the decision makers. Furthermore, companies carry ultimate accountability, which is especially evident in collaborations with several partners, necessitating well-defined scopes and efficient coordination methods. While data control, including integration and terminology, is still important, the location of data storage outside of the ERP system, as Participant 3 B mentioned, reduces its significance as a separate criterion. Also, integrations, while risky, are becoming more doable because of low-coding approaches and the availability of standardised integration solutions, like Participant 2 B said. Next to that, data control falls under the IT department, thus if the IT knowledge is low, data control becomes more

difficult. The criterion IT knowledge thereby covers data control inexplicitly. Prioritising user experience during ERP system changes is critical to avoiding setbacks, increasing productivity, maintaining employee satisfaction, and reducing resistance to change, which typically necessitates significant training for success. Finally, strategic ERP system selection needs a complete analytical approach that considers operational structuring, planned objectives, and potential risks. This sentiment is mostly shared by Participant 1 A. However, most criteria (like business strategy and organisation structure) need to be clear and maybe even analysed to know what it entails and where the company stands at.

Table 4.2: Criteria that will be used in the decision support tool, with the number of times mentioned by participants and effects

Criteria	# P	Effect with Single ERP	Effect with Two-Tier
Complexity organisation	7	Intercompany processes	Separation of business units; large companies; legislation
Business strategy	7	Centralisation; single supply chain	Decentralisation; differentiation in system possible; autonomous decision making
Synergy	4	Uniformity	Flexibility; uniformity is a risk
IT knowledge and skills	3	Can be low; consistent data structures	Need to be high; risk in data control
Functionality	5	System is generic	Systems can be specific

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5 Requirements and initial design decision support tool

The implications of the literature review and interviews lead to a set of requirements, defined in section 5.1. The requirements are defined as explained in section 2.1.2, based on the quality and quantity of the sources of both the literature review and the interviews. Requirements are based on at least two literary sources, four interviews or a combination of both. After a requirement is defined, it references to the list of requirements at the end of the section. For example, requirement 1 would be referenced as (req. 1). Based on these requirements, the initial design for the decision support tool is made in section 5.2. Section 5.3 concludes this chapter, with an overview of the main requirements and a short description of the decision support tool.

5.1 Requirements decision support tool

The key objective is to enable the identification and selection of the most suitable ERP strategy (req. 1). This decision support tool seeks to systematically evaluate and weigh many criteria, resulting in a comprehensive assessment of available possibilities. The need for such a tool emerges when a company currently uses a single ERP system that is insufficient to meet its current and anticipated future requirements (req. 3). Using the decision support tool, the company can systematically evaluate different strategies, allowing for a strategic change toward an ERP solution that is more aligned with its operational objectives and aspirations. The decision support tool also increases users' awareness of the several intricate issues associated with ERP strategy selection. Objectives and aspirations change throughout time; hence the tool should be applicable on several occasions (req. 14). Since the scope of this project only includes manufacturing and sales companies, the decision support tool is usable only for manufacturing and sales companies (req. 2). The scope of this project also excludes mergers and acquisitions, hence the decision support tool should as well (req. 5). To be able to employ the decision support tool, the organisation must be open to any strategy (req. 4). If their mind is already made up, the decision support tool is meaningless. Regardless of the recommendations provided by the decision support tool, the corporation will pursue its chosen strategy.

Both the literature review and the interviews reveal a similar pattern emphasising the need of senior management engagement in the successful implementation of an ERP system (Al-Malaise Al-Ghamdi et al., 2013; P.-F. Hsu, 2020). The consensus emphasises the need of having top management actively involved in the decision-making team, who are responsible not only for moving the project forward but also for convincing and gaining support from end users. They also need to know what the business strategy is for the present and the future, thus the Chief Commercial Officer (CCO) could be included. To address gaps between IT and business, decision-making teams should include the IT manager and other business managers, such as supply chain (P1A; P1C; P2A; P3B) (req. 15). Because different roles are important, decision makers should consider their individual functions while making decisions (req. 17). A complete analysis is required, which includes an examination of the firm's business strategy, operational demands, functional requirements, and industry-specific specifications (Haddara, 2014; P1A) (req. 6). This proactive strategy serves as a basis, allowing the decision-making team to properly address the decision support tool's inquiries (req. 20). Since this needs to be done in an earlier stage than the reviewing the criteria, there need to be two phases in the decision support tool (req. 18 & 19). The tool is intended to be used in a focus group with the decision-making team, where there is a consensus on the questions and/or activities (req. 16). The deliberate use of the decision support tool is regarded as critical in directing the team to an informed and strategic decision, offering alignment with the organisation's overall goals and requirements, emphasising the importance of top management engagement.

According to interview findings, the Two-Tier ERP strategy involves firms managing numerous ERP systems, either across headquarters and various entities or focused on specialised business areas. This strategy allows for the deployment of several systems, whether from the same or different suppliers

(req. 9). The interviews emphasised a strong preference for using the same vendor wherever possible, which promotes uniformity in the ERP landscape (req. 10). For this the current vendor needs to be examined, including their systems (req. 7). Notably, the decision support tool purposely excludes customisation based on all participants' advice and Best-of-breed (BoB) considerations in regard of the focus on ERP. Another key takeaway from the interviews is that ERP system migration is frequently done incrementally rather than in one large-scale move. The Two-Tier ERP strategy develops as a transitional phase, which is especially relevant given the prevalence of pre-existing ERP systems within enterprises. As a result, the single ERP strategy may include a transitory Two-Tier ERP phase, which strategically aligns with the progressive nature of ERP system migration and promotes a smooth transition for enterprises. Thus, the possible ERP strategies should include a single ERP strategy (with a transitory Two-Tier ERP phase) and a Two-Tier ERP strategy (req. 8).

A smooth transition would aid in the implementation of organisational transformation. The literature emphasises the need of change readiness, which may be achieved through successful training activities and seamless user integration (Al-Malaise Al-Ghamdi et al., 2013; Gagnon, 2023; Kwahk & Lee, 2008) (req. 11). Literature evaluations highlight the need of preparing and assisting users in embracing technology shifts. Next to that, it is worth noting that the scope does not explicitly address the complex issues of system architecture and integration, which are referenced in literature takeaways but are not the primary focus. However, interview insights underline the need of ensuring that the established system does not regress the organisation technologically (P1B; P3A). This warning note emphasises the importance of striking a balance between user-centric change management efforts and the overall technology implications of the chosen system. It emphasises the importance of addressing not only the immediate user experience, but also the long-term impact on the company's technical trajectory, which is consistent with the broader purpose of advancement and innovation.

When determining the most suitable ERP strategy, it is critical to analyse the elements that will significantly affect the decision-making process. Notably, the criteria mentioned in the literature and gathered from interviews serve as the foundation for evaluating and selecting the most suitable strategy (req. 21). It is explicitly noted that customisation and BoB concerns are purposefully removed from the evaluation. Instead, the emphasis is on the relevant criteria described in the literature for Single ERP, Two-Tier ERP, and Selection of ERP. Taking these criteria will result in a comprehensive yet streamlined evaluation process that closely adheres to the specific requirements and goals outlined in both academic literature and real-world organisational insights. The criteria from Figure 3.5 and Table 4.2 will be evaluated and combined when appropriate.

The establishment of criteria for evaluating ERP strategies necessitates a thorough examination of numerous elements. Functionality is repeatedly highlighted in the selection criteria (Haddara, 2014), Two-Tier ERP strategy (Gill, 2011; Slabbert et al., 2016), and interviews (P1A; P1C; P2B; P3A; P3B), demonstrating its importance as a critical criterion (req. 13c). Business operations (Alaskari et al., 2019; Haddara, 2014; Ziemba & Gago, 2022), which are frequently entangled with functionality, are implicitly included by this criterion, and will not be evaluated independently during the evaluation process. Flexibility, as emphasised in the selection criteria (Yen & Sheu, 2004) and interviews (P1A; P1B; P2B; 3A), is recognised valid, also considering the trade-off between uniformity and independence (Myers, 2008) (req. 13j). This flexibility is consistent with the organisation's goal of achieving synergy. Synergy also includes adaptation (Gill, 2011), which is similar to flexibility. The criterion of a trusted vendor (Alaskari et al., 2019; Al-Malaise Al-Ghamdi et al., 2013; Gessa et al., 2023; Haddara, 2014; Ziemba & Gago, 2022), which is most connected with ERP selection, will also be considered, especially if the current vendor remains a feasible choice (req. 13m & 13l). The importance of resource (Bernroider, 2013; Slabbert et al., 2016) s has been emphasised throughout the review process, with a focus on IT resources throughout interviews (P1B; P1C; P3A). The Single ERP criteria, which include IT expertise (Chopra et al., 2022), emphasises the importance of information technology in the decision-making process. To streamline and unify these associated components, the "IT knowledge and skills" criterion is established, recognising the critical role of information technology

resources and competencies in the successful implementation of the chosen ERP system (req. 13b). The strategic integration of ERP activities with broader company goals is an important aspect, as outlined in three separate publications (Law & Ngai, 2007; Velcu, 2010; Yen & Sheu, 2004) and in all the interviews. This emphasises the need of including the business strategy criterion into the decision support tool. This criterion considers a variety of factors, including ERP alignment with single supply chain strategies (req. 13d), differentiation initiatives (req. 13e), considerations for future divestitures or autonomous divisions (req. 13f), and the dichotomy between centralisation (req. 13i) and local autonomy (req. 13g), which is also discussed in relevant literature. Recognising the interconnected nature of these components, the concept of distinct business units (Gill, 2011; Slabbert et al., 2016) is reconsidered. Initially regarded as a separate criterion, it is now recognised that characteristics of local autonomy, differentiation, and legal considerations for autonomous divisions (req. 13h) are intrinsically integrated into the broader business strategy criterion. This re-evaluation seeks to ensure a more nuanced and complete approach to reviewing ERP strategies in line with business goals. Geographic disparities, which were formerly a part in the Two-Tier ERP criteria (Gill, 2011), are judged less applicable due to their lack of mention in interviews and the use of cloud-based solutions that alleviate these issues. On the other hand, the organisation's complexity is a comprehensive criterion that takes into account a variety of factors such as legal requirements (req. 13h), overall size of the company (req. 13k), and the number of business units (req. 13a) within its structure (mentioned in all interviews and indirect also in the literature). Finally, the degree of organisational change, which was formerly seen to be another criterion (Alaskari et al., 2019; Haddara, 2014; Ziemba & Gago, 2022), is now being reevaluated. The Two-Tier ERP strategy, as a transitional phase, introduces less immediate change, and the implementation of a long-term Two-Tier ERP strategy further reduces the overall impact. Furthermore, the criterion is presented primarily as a rationale in the selection criteria from the literature, with little focus in interviews. Thus, six topics (Functionality, IT knowledge and skills, business strategy, complexity organisation, synergy, and trusted vendor) which cover 13 criteria were identified (req. 12, 13 & 22), indicating that the condition for entering the second diamond phase has been met, and the design of the decision support tool can start.

In conclusion, the following requirements are defined for the decision support tool. The requirements are defined in such a way that they are achievable, verifiable, unambiguous, complete, and consistent. The criteria mentioned in requirement 13 are ordered by importance, meaning rate of influence for the strategy selection. Whenever sources explicitly mentioned the requirements, references are given. If no reference is mentioned, this means that the researcher set the requirements or that the researcher got the requirements implicitly from the literature or the interviews.

Goal

1. The goal of the decision support tool is to identify the most suitable ERP strategy.

Constraints

2. The decision support tool is usable for manufacturing and sales companies.
3. The decision support tool is usable for companies that have a single ERP system that does not meet all their current and future needs.
4. The users must be receptive to any strategy.
5. The decision support tool should not take into account mergers & acquisitions.

Functional requirements

6. The decision support tool should include analysing the firm's business strategy, operational demands, functional requirements, and industry-specific specifications. (Haddara, 2014; P1A)
7. The decision support tool should include analysing the current vendor and its ERP systems.

8. Possible ERP strategies should include a single ERP strategy (with a transitory Two-Tier phase) and a Two-Tier ERP strategy. The Two-Tier ERP strategy is defined as managing various ERP systems, either spanning headquarters and multiple companies, or focusing on specific business areas.
9. The Two-Tier strategy can involve multiple systems from the same or other vendors.
10. The decision support tool should priorities the usage of same vendor technology whenever possible.
11. The decision support tool should include change readiness, which can be accomplished through successful training activities and seamless user integration. (Al-Malaise Al-Ghamdi et al., 2013; Gagnon, 2023; Kwahk & Lee, 2008)
12. The decision support tool should include the topics Functionality, IT knowledge and skills, business strategy, complexity organisation, synergy, and trusted vendor.
13. The decision support tool should include the criteria:
    a. Number of business units
    b. Availability of IT knowledge and skills (Bernroider, 2013; Chopra et al., 2022; Slabbert et al., 2016; P1B; P1C; P3A)
    c. Functionality of current ERP system (Gill, 2011; Haddara, 2014; Slabbert et al., 2016; P1A; P1C; P2B; P3A; P3B)
    d. Presence of single supply chain
    e. Desire for differentiation
    f. Likeliness of future divestitures or autonomous divisions
    g. Importance of local autonomy
    h. Presence of legal reasons for separation
    i. Importance of centralisation of operational framework
    j. Importance of IT Flexibility (Gill, 2011; Myers, 2008; Yen & Sheu, 2004; P1A; P1B; P2B; 3A)
    k. Ability to handle one ERP system (Size of company)
    l. Possibility of different ERP system from current vendor
    m. Trusted current vendor (Alaskari et al., 2019; Al-Malaise Al-Ghamdi et al., 2013; Gessa et al., 2023; Haddara, 2014; Ziemba & Gago, 2022)

Non-functional (Performance) requirements

14. The decision support tool should be useable multiple times.
15. The users of the decision support tool are the decision makers in the ERP project and should include at least the chief commercial officer (CCO) and top managers (c-level) from the departments IT and Supply Chain. (Al-Malaise Al-Ghamdi et al., 2013; P.-F. Hsu, 2020; P1A; P1C; P2A; P3B)
16. The decision support tool will be utilised as a group decision.
17. The users should use the perspective of their respective jobs.
18. The decision support tool should be used in two phases, with the first phase being done in a research project and the second phase being done in one session.
19. Analysing the firm's business strategy, operational demands, ERP requirements, and industry-specific specifications, should be done in the first phase. All other functional requirements should be included in the second phase.
20. Analysing the firm's business strategy, operational demands, ERP requirements, and industry-specific specifications should deliver information that is needed for the other functional requirements.
21. The criteria should lead to an ERP strategy.
22. The topics should be covered by the criteria.

5.2 Initial design decision support tool

In section 5.2.1 the chosen decision support tool structure is discussed and in section 5.2.2 the design of the decision support tool is explained. The design is explained with the help of pictures of the tool and the requirements that were set in section 5.1.

5.2.1 Decision support tool structure

The initial design of the decision support tool was based on predetermined requirements (see section 5.1), which guided the instrument's structure and functionality. As mentioned in section 2.4.2, three possible design structures were considered; a decision tree, a flowchart, and a multi-criteria decision analysis. Since the criteria could be arranged hierarchical and sequential the decision support tool started out as a decision tree with only the criteria. The tool then expanded as additional requirements (activities) were added, resulting in a more dynamic and comprehensive flow chart. The decision-making criteria were presented as questions, each of which was intended to have a significant impact on the selection of an ERP strategy. In addition to these criteria, further requirements were defined as different processes within the tool. The decision to omit multi-criteria decision analysis was influenced by the criteria's hierarchical and sequential structure and the presence of a well-defined strategy preference per criteria. The criteria were grouped in a clear hierarchy (as showed in the order of requirement 13) based on importance for the selection process, ensuring a streamlined approach for quick decision making. This framework allowed for a step-by-step decision-making process that was consistent with each criterion's prioritised importance level. Furthermore, the availability of a separate strategy preference enabled a more straightforward decision-making process, eliminating the need for substantial quantitative analysis that is inherent in multi-criteria decision analyses. On top of that, a decision tree is easier to use and takes less time than a multi-criteria decision analyses. The clarity of the hierarchy, as well as the clear strategy preference, influenced the decision to take a more direct and concentrated approach to finding the most suitable ERP strategy.

5.2.2 Decision support tool design

The decision support tool is designed based on the requirements and the structure mentioned in section 5.2.1. The tool is designed in a way that it is clear, visually, and verbally, understandable, not too crowded, and not too big. Basic figures from a flowchart are used, including round nodes for beginning and ending points, square nodes for actions and functions, and diamond-shaped nodes for critical decision points or questions. Thus, the action functional requirements 6, 7, 8, 9 and 11 are given square nodes and the other functional requirements are given diamond-shaped nodes. A legend is added to explain the shapes. To indicate that there are different phases in the tool, round nodes are used, and the requirements are placed in the correct phase. The colours of the decision support tool have no meaning, other than to make the decision support tool clear and look attractive.

To explain the decision support tool and add the non-functional (performance) requirements, an introductory text is written. In Appendix 5 the introductory text of the decision support tool is given. The tool's opening text is an in-depth guide that explains its purpose and functionality. It simply defines the broad aim of the tool, agreeing with requirement 1, while describing the limits imposed by requirements 2, 3, 4, and 5. This clarification provides clarity on the tool's intended purpose and restrictions. Furthermore, the text discusses the intended users (req. 15), and explains the recommended approaches for using the tool, satisfying requirements 14, 16, 17, and 18. In this way, the non-functional criteria are easily integrated into the introductory text, offering a comprehensive overview of the decision support tool's aims, restrictions, user base, and operational recommendations. It also explains that the tool's inventor cannot be held responsible for the consequences of the chosen strategy.

Figure 5.1 shows the decision support tool. Since it is too big to be readable in one figure, it is highlighted in multiple parts. The parts (Figure 5.2 until Figure 5.6) correspond with the representation in Figure 5.1, and show where in the decision support tool it takes place.
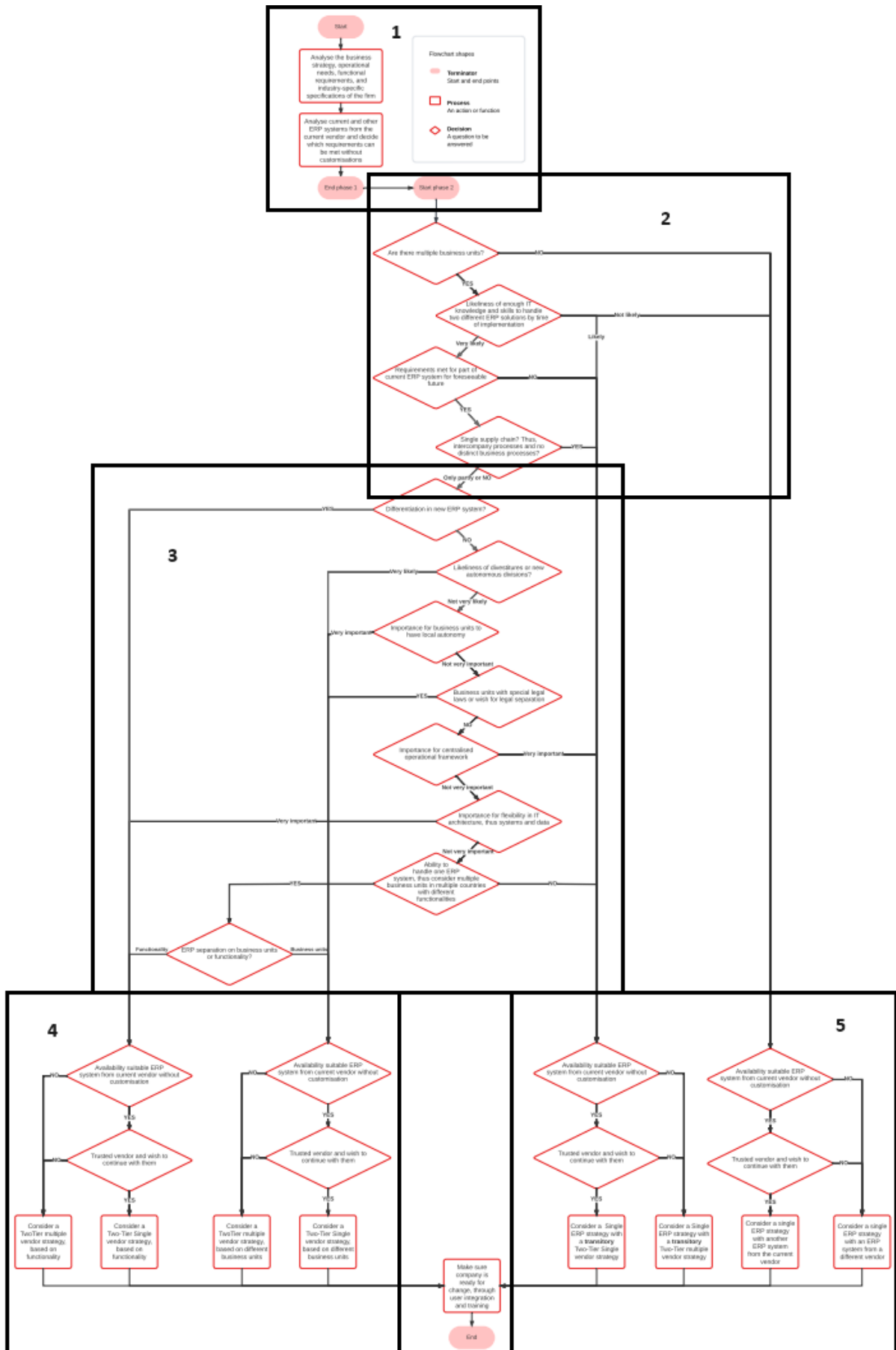
Figure 5.1: Overview of decision support tool with selected zoomed in parts

The first phase of the decision support tool is a thorough investigation of the business strategy, ERP requirements and the current vendor, to be able to answer the questions in phase 2 (req. 6 and 7). Figure 5.2 shows phase 1 of the support tool and shows which requirements are covered by this part.
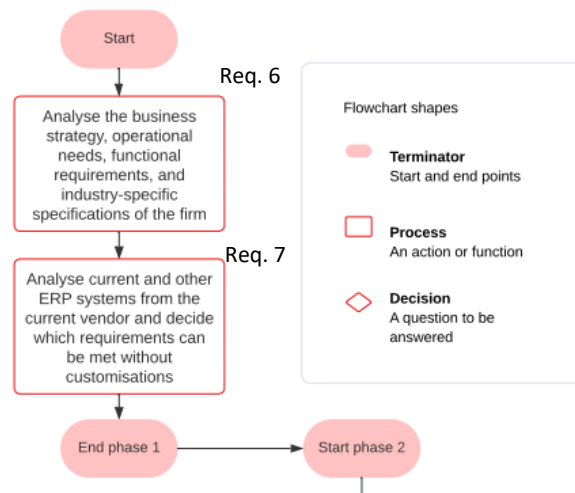

Figure 5.2: Part 1 of decision support tool

Figure 5.3 until Figure 5.6 show phase 2 of the decision support tool. Again, the corresponding requirements are shown. Phase 2 begins with the important assessment of the number of business units (req. 13a). This critical factor defines the viability of a Single ERP strategy, which transitions to a Transitory ERP or Two-Tier method as the number of business units grows. The emphasis then changes to the relevance of IT knowledge and skills (req. 13b), recognising the critical role of a skilled workforce in successfully implementing a Two-Tier ERP strategy. In this case, the functionality criteria are centred on the demands of the existing ERP system (req. 13c). It can result in a long-lasting Two-Tier ERP strategy if it is still appropriate for some areas of the business; otherwise, only a single ERP with a transitional phase would be appropriate. As the review develops, the tool goes into specific scenarios, such as choosing for a single ERP with a transitory phase based on a single supply chain (req. 13d) or going with a Two-Tier ERP strategy for differentiation (req. 13e). Considerations for divestitures (req. 13f), autonomous divisions (req. 13f), local autonomy (req. 13g), and legal separation (req. 13h) help to shape the decision-making process. The hierarchy then discusses the value of a centralised operational structure (req. 13i) and the importance of IT flexibility (req. 13j). Toward the end, the tool asks queries about the company's size and complexity (req. 13k), which leads to critical vendor-related inquiries. These final questions determine if the ERP solution should be obtained from the same reliable vendor or if a different solution is more appropriate (req. 9, 10, 13l & 13m). Finally, the decision support tool recommends the most suitable ERP strategy (req. 8), emphasising the need of user integration and training to ensure the organisation's readiness for change (req. 11). All functional requirements have been included, as requirement 12 is met by requirement 13 (req. 22).

The criteria incorporated in the decision support tool serve as deciding factors, directing the selection toward a given ERP strategy based on the responses supplied to the associated questions (req. 21). This structured approach is consistent with the segmentation of the decision support tool into discrete phases, which not only improves clarity but also satisfies the specified requirement 19. The research step is methodically carried out before dealing with the criteria-specific queries. This process guarantees that requirement 20, which requires the completion of research before answering criteria-related questions, is effectively accomplished. As a result, the non-functional requirements are an integral component of the tool's design since the methodical flow through research and criteria responses promotes logical and intuitive decision-making.
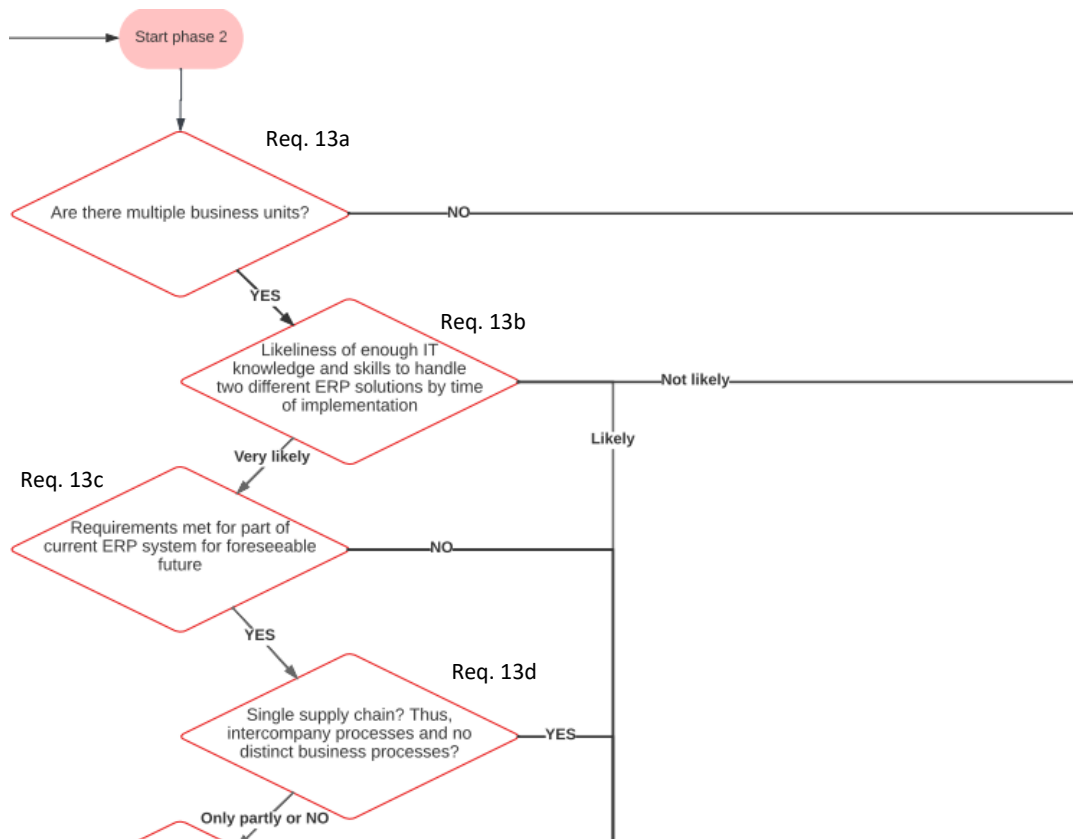
Figure 5.3: Part 2 of decision support tool
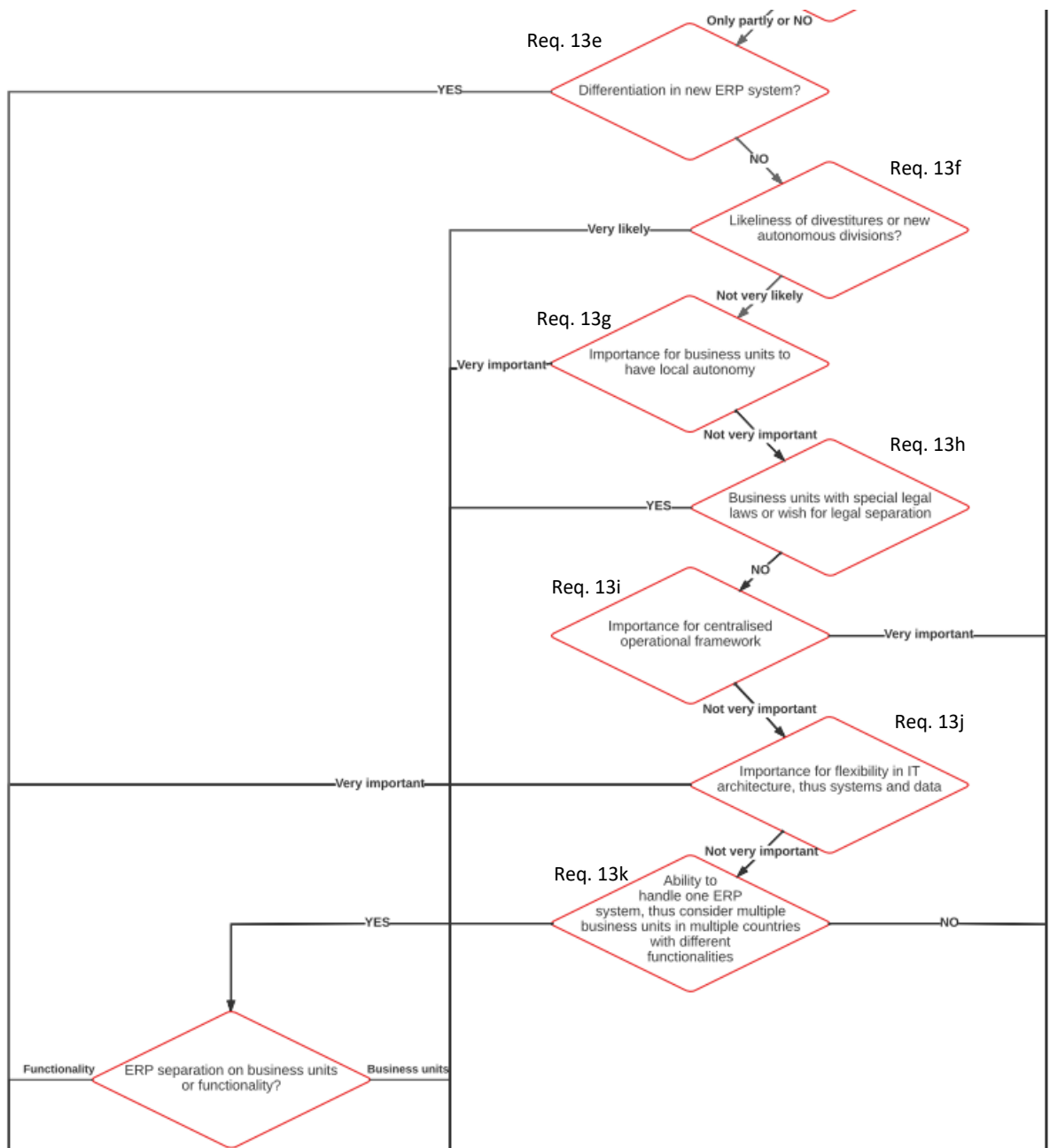
Figure 5.4: Part 3 of decision support tool
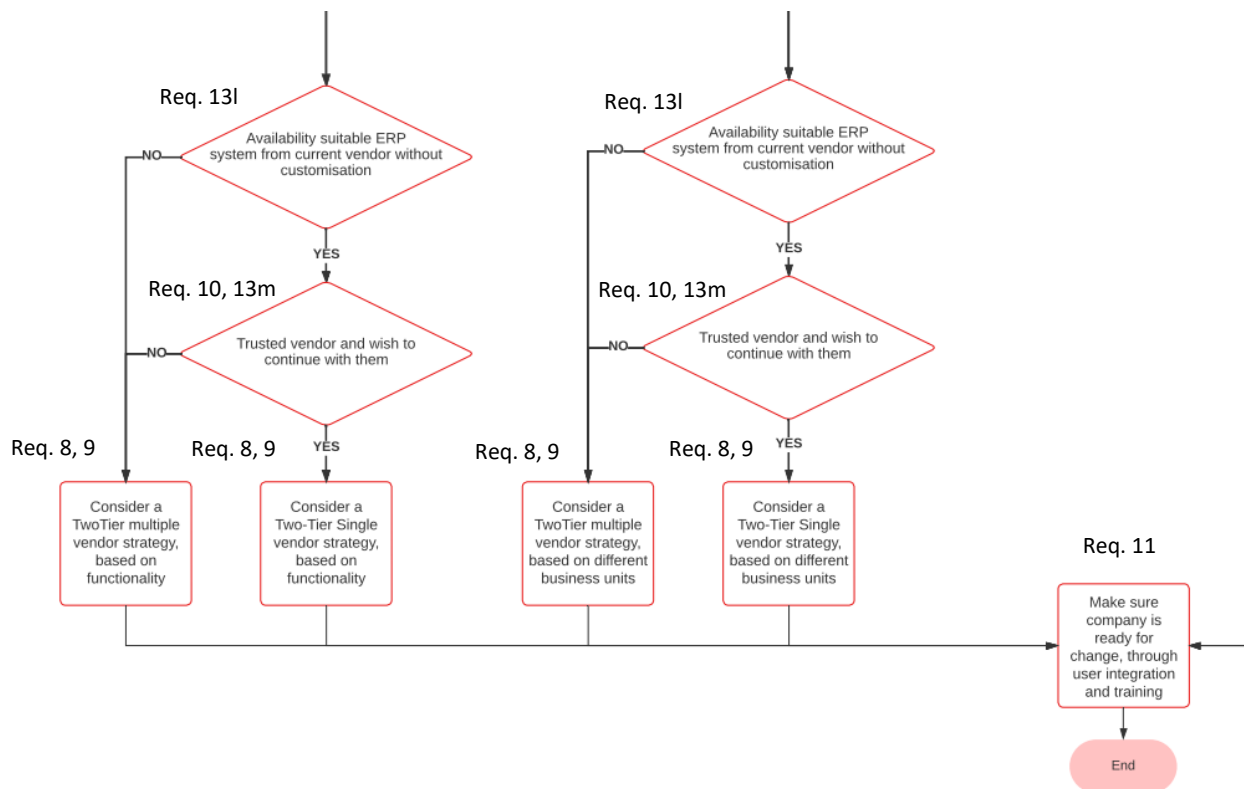
Figure 5.5: Part 4 of decision support tool
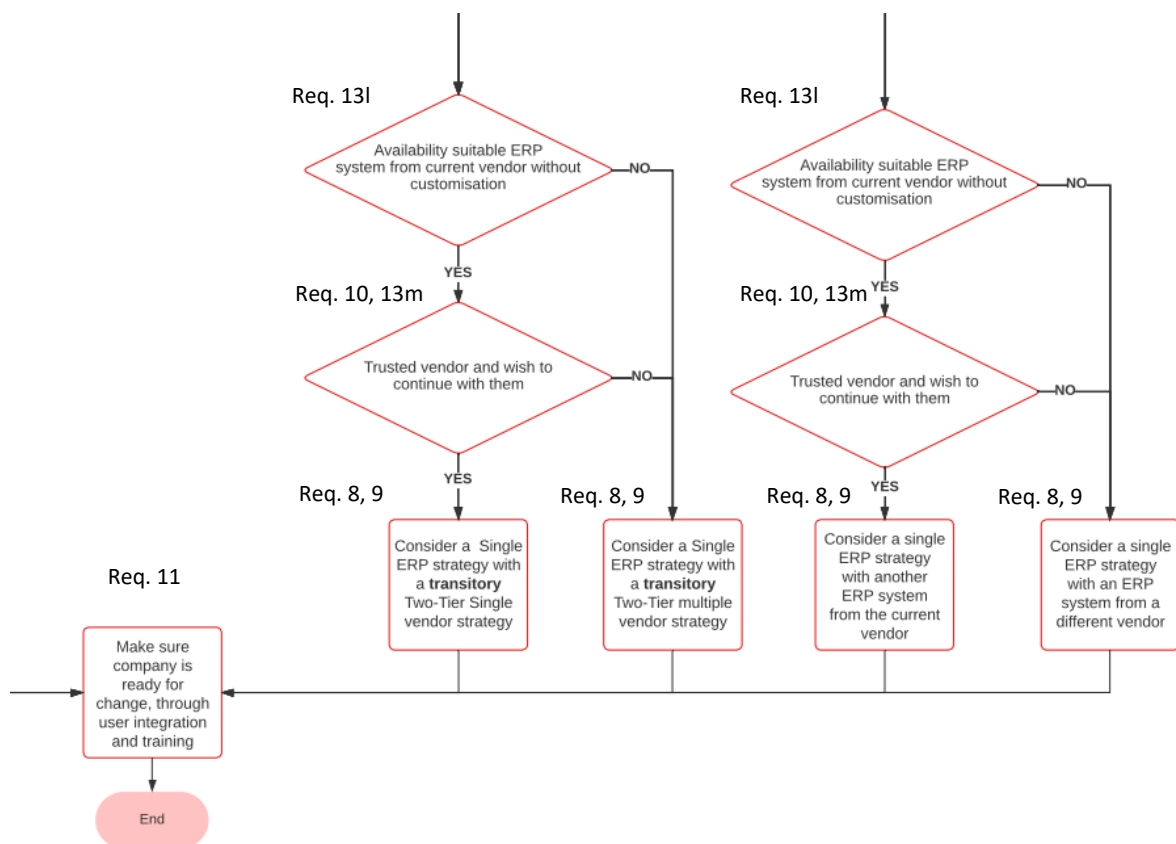
Figure 5.6: Part 5 of decision support tool

5.3   Conclusion

In conclusion, the development of the decision support tool for determining the most suitable ERP strategy is driven by a thorough understanding of the requirements, constraints, and functional requirements stated in this chapter. A structured framework has been developed to successfully guide the decision-making process following a thorough assessment of the literature and interviews. The decision support tool is intended to simplify a step-by-step process, starting with an examination of the company's business strategy, operational demands, and current vendor analysis before going into specific criteria assessment in phase two. The tool ensures a thorough review process by following a set of functional requirements, which include considering alternative ERP strategies such as Single ERP (with a transitory Two-Tier phase) and Two-Tier ERP. The decision support tool's criteria, which include functionality, IT expertise and abilities, business strategy alignment, organisational complexity, vendor trust, and IT flexibility, are critical considerations in driving the selection process. These factors are methodically analysed, resulting in educated recommendations customised to the organisation's specific needs and goals. Top managers should use the decision support tool to make group decisions. The decision support tool has a flowchart structure since the requirements are hierarchical and sequential, and there are both criteria and activities.

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6 Case study Quooker

In this chapter, a case study is presented in which the decision support tool is revised and reviewed. Section 6.1 provides an overview of the case study. Section 6.2 reviews additional information obtained through requests for information (RFI), requests for partnership (RFP), and investigations conducted by Quooker with other parties. Section 6.3 addresses any potential adjustments to the decision support tool, and this version is assessed in a focus group, the findings of which are explored in 6.4.

6.1 Overview of case study Quooker

Founded in 1987, Quooker is a pioneering company that revolutionised the kitchen industry by introducing the world's first boiling water tap. With a resolute commitment to providing boiling water solutions for as many kitchens as possible worldwide, Quooker has become a global leader in this niche. The company's dedication to continuous improvement and technical innovation has resulted in a remarkable success. Currently, Quooker is doing very well in the Netherlands and is growing rapidly worldwide. Quooker's influence extends across several continents, with a network of established branches in key countries such as Belgium, Germany, Hong Kong, the Netherlands, Ireland, Italy, Austria, Spain, Portugal, the United Kingdom, the United Arab Emirates, and Switzerland. The company's headquarters are situated in Ridderkerk (NL), where a dedicated team of more than 550 professionals continuously work on technical ideas, innovative designs, and excellent services. Quooker is more than just a manufacturing company; it is also a dynamic sales organisation. The factory in Ridderkerk handles the complete R&D, production, and assembly of Quooker's diverse product range. In contrast, the various foreign branches operate as autonomous sales and service entities in their respective countries, where a transformation to HQ service is made across the countries for Supply Chain, Business Intelligence & Information Management, Information Technology, and Logistics.

Quooker's vision for the future is marked by ambition. The company aims to achieve a 100% increase in revenue over every three years. Each year, Quooker plans to enter new markets, expanding its global reach and market presence. As Quooker strives to make the boiling water tap an indispensable part of every kitchen worldwide, it recognises the importance of growth. To facilitate this growth, Quooker is dedicated to establishing a future-proof organisation that can continually fulfil customer expectations. Key to this approach is the development of a future-proof application landscape, including an ERP system that can seamlessly support the company's anticipated growth.

Due to these various operational difficulties and goals, Quooker stands out as an intriguing and relevant case study for evaluating the decision support tool created in this thesis project. Notably, Quooker has adopted a best-of-breed strategy with its IT landscape, hoping to take advantage of specialist solutions. The company's present on-premise ERP system adds another level of complication to its already complex technological environment. Quooker found in 2023 that their current ERP system does not suffice to facilitate future and growth needs for their manufacturing entity. Their current ERP system lacks functionality in certain areas such as intercompany accounting, revision management and traceability. However, the system does give a good functional fit for the country entities and users are satisfied with the solution. Therefore, Quooker is looking for another ERP system, to purposefully implement a (transitory) Two-Tier strategy, where the sales entities will continue to use the current ERP system and the manufacturing entity will use a new ERP system. They will however keep certain best-of-breed applications, as the functionality and user experience of these systems are high. They are also confident that an overall ERP system will not support the specific functional demands, that these applications do cover.

During this study Quooker went through the Request for Information (RFI), Request for Partnership (RFP) and Request for Quotation (RFQ) phase. Quooker's complexities and current position makes for

a good fit for assessing the decision support tool created in this study. This is because Quooker's situation closely resembles the challenges faced by businesses choosing an ERP strategy.

At Quooker, the plan is to develop and evaluate the decision support tool in a practical, industry-specific setting by performing a critical case study. This empirical study enables us to investigate the subtleties of ERP strategy selection, adapt our methodology to real-world settings, and provide significant insights and advice for enterprises facing comparable issues in their ERP strategy decisions.

6.2 Analysing data part 3: Additional information

In 6.2.1 the RFI's and RFPs are reviewed. In 6.2.2 the investigations are summarised and in 6.2.3 the main implications for the decision support tool are given.

6.2.1 Received information from potential partners

Quooker diligently sought ideas and recommendations from numerous ERP vendors and partners on their selected business approach. All vendors and partners are kept anonymous due to privacy concerns, except for Scheer (an SAP implementation partner), who gave additional information through their website. The RFI was filled out by seven vendors, and two of those firms submitted the RFP themselves. Two other vendors let two implementation partners fill out the RFP. Thus, in total there was information gathered from seven vendors and four partners. Notably, a consensus formed among these stakeholders in favour of implementing a single ERP strategy. The rationale for this common recommendation stems from the numerous benefits it provides, in addition to its marketing value. First and foremost, a single ERP system enables the full use of efficiency benefits and features, resulting in a streamlined and coherent approach to operations (Scheer, 2023; V1; V2; P1, P2). Furthermore, using a single ERP solution greatly minimises administrative efforts, promotes a consistent method of working, and gives users a unified and smooth experience (V1, V3, P1, P3). This strategy reduces the difficulties associated with many integrations by reducing duplicate processes and functions (V1, V3, V4, P3). Implementing a unified ERP strategy is expected to improve order management procedures, consolidate administration, and automate support for intercompany transactions (V2, V6, P2, P3). The main goal is to streamline intercompany operations, resulting in a completely integrated supply chain that improves collaboration, transparency, and efficiency (Scheer, 2023; P2). Furthermore, Vendor 6 expressed that their ERP improves management insights across several sites and companies, supports full product traceability, accommodates circular product flows, and better aligns with service operations, which would best be used in a single ERP strategy. Finally, using a single ERP system should provide Quooker with a definite and dependable source of truth, paving the way for a more efficient and productive worldwide corporate operation (V3, V4, P2).

Notably, the current ERP system is regarded inadequately scalable to support Quooker's ambitious expansion objectives according to V5. However, most of the vendors and partners agreed that Quooker should not go to a single ERP at once (V1, V5, V6, P1, P2, P3, P4). They should go with a transitory Two-Tier ERP strategy, where temporary interfaces are made with the current ERP system. Several reasons were given for this transitional Two-Tier ERP strategy. An important reason of this strategy is to manage the project's workload in a practical and achievable manner for the persons involved (V3, V5, P1). By breaking down the implementation into different phases, the project's complexity is decreased, resulting in a more focused and manageable burden (V5). Furthermore, implementing a two-tier ERP design helps to keep the project's early phase on track. This staged implementation ensures that each stage is thoroughly planned and implemented, increasing the overall efficiency of the change (V5). It also allows the project team to have a tight focus on each phase, boosting the likelihood of success (V5). The concept of a Minimum Viable Product (MVP) adds to this strategy by allowing for the prioritising of critical features and functionalities in the early stages (P1, P3, P4). MVP is the concept of going live with the fewest number of features possible while still adding value. Finally, the two-tier strategy reduces the impact of change on the organisation, allowing the staff to gradually adapt to the developing ERP landscape (V3, V5, P1). Overall, the transitional Two-

Tier ERP strategy is a deliberate and strategic decision aimed at improving project manageability, lead time, success rates, and lessening the impact of change on the business.

Scheer (2023) provides some more major benefits for the Two-Tier ERP strategy. The flexibility it offers enables the easy introduction of new business processes, ensuring adaptation to changing needs. The strategy's adaptability allows for faster onboarding of innovations, increasing responsiveness to market changes. Autonomy is a significant advantage, allowing individual units to start changes at their leisure. Compliance is also addressed, with the system accepting local legal requirements and providing independent legal structures, which are critical for different activities. In divestiture scenarios, the strategy ensures a smooth transfer while retaining operational integrity across organizations. They also claimed that standard integrations exist for the ERP system S/4Hana and other SAP on-premise ERP systems, and intercompany processes are still possible. If this were true for other vendors, it would be a compelling argument in favour of a single vendor strategy. However, only Scheer mentioned this.

The information on ERP implementation costs is clearly inconsistent in the literature and interviews. Notably, this also applies to ERP vendors and partners. Vendor 3 claims that it enables enterprises to achieve economies of scale, resulting in lower application license and maintenance costs. However, it is understood that the initial implementation costs for a single ERP may be higher (V3). As a result, the (transitory) two-tier ERP system is positioned to keep expenses under control during the initial phase of adoption (V5). Scheer (2023) believes that the total cost of ownership can be reduced, particularly for S/4Hana and other SAP on-premise ERP systems.

6.2.2   ERP research within Quooker

Quooker conducted two separate research projects with external consulting firms to acquire thorough insights into their strategic business operations. The first study, done in September 2022, was to analyse the futureproofing of their application strategy. This project intended to anticipate and connect its technical roadmap with future breakthroughs and requirements. In March 2023, Quooker teamed with another firm to investigate the feasibility of their current ERP system and potential next steps. This study aimed to critically examine the current ERP system's performance, finding areas for improvement or the need for a strategy shift. These two research projects demonstrate Quooker's commitment to staying ahead of the competition by proactively developing and changing its technical infrastructure for long-term success.

During the initial assessment at Quooker, four distinct solutions were identified to handle the application landscape. These techniques included alternatives for maintaining the current landscape (A), improving the existing system (B), implementing a new ERP system (either with a new version of the current ERP (C1) or a different one (C2)), preserving best-of-breed applications, or maybe introducing a new ERP and phasing out existing solutions (D). To evaluate and inform decision-making, these solutions were rigorously scored on two critical dimensions: value and cost. The assessment took into account business and IT risks, the solution's future-proofing, and the related costs, which included budget implications, time restrictions, user effect, and the possibility of disruption to everyday operations. Following an investigation, strategies A and B scored poor on value and cost, while strategy C1, C2, and D scored well on both. Conclusions were that the hazards and future proof solution pose a risk to operational activities, which will only increase. This indicates that scenarios A and B are no longer applicable, and the ERP system must be re-implemented. With Quooker as a product-driven, growing, and inventive organisation, time, energy, and budget must be optimally allocated. When the additional investment in complexity, size, and influence for the implementation does not provide much extra, it is not wanted. The complexity, size, and impact of strategy D are greater than those of strategies C1 and C2, due to the additional replacements and renewals. This will not directly result in a more future proof solution; hence strategy D is not appropriate. Additional research needed to be conducted to determine whether scenario C1 or C2 is preferable. For this, the current ERP system had to be examined and compared to other alternatives.

Quooker embarked on a second research phase to properly analyse the feasibility of their current ERP system and investigate viable alternatives. To conduct this assessment, they extended partnership requests to implementation partners of their existing ERP system, including their current partner. Two partners rejected to bid after careful and thorough research, citing worries about meeting all required features. The last ERP partner, with whom Quooker already works, acknowledged existing flaws but believed they could be fixed through customisation or standard solutions. This led to the awareness that if the current ERP system had to be maintained, joint efforts and partnership enhancements were required from both ends. The following research phase considered four potential strategies: re-implementation of the current ERP system with enhanced functionalities and integrations (1), adoption of a Two-Tier ERP strategy focusing solely on changing the manufacturing entity's ERP system (2), implementation of a new ERP system for both manufacturing and sales entities (3), or an application landscape without an ERP system (4). These strategic options were thoroughly explored to find the best way forward for Quooker's evolving company needs. Following a thorough review of the research findings, it was determined that the current ERP system serving as Quooker's backbone is not future-proof. As a result, strategy 1, which involved reimplementing the current ERP, was ruled out. Strategy 4, which explored an application landscape without ERP, was judged difficult, particularly for the IT department, and was discouraged by consultants. Given that the current ERP is still suitable for sales entities, the recommended course of action is strategy 2, which involves implementing a Two-Tier ERP strategy in which only the manufacturing entity's ERP is altered. This technique provides a defined scope, reduces the impact on business compared to a full migration, and is judged more manageable for Quooker's IT capabilities. While strategy 3, which involves a new ERP for both manufacturing and sales entities, is not ruled out, a phased migration approach would be studied, with a focus on sales entity functions. The selection of the strategy was influenced by a number of criteria, including the expected impact, costs, timeline, project scope, functional alignment, IT considerations, ongoing side projects, and the necessity for centralisation in the setting of decentralised inventory management. Overall, the selected strategy is consistent with Quooker's strategic aims while accounting for the practicalities and challenges of the shift.

6.2.3 Implications for decision support tool

Quooker has sought input from several ERP vendors and implementation partners to create their business plan, with Scheer providing further information via their website. Stakeholders agreed that a unified ERP strategy would be more efficient and provide more cohesive operations. However, the current ERP system's inability for Quooker's future needs prompted the development of a transitional two-tier ERP strategy. This technique, which is endorsed by numerous vendors and partners, is regarded as a viable method for managing project effort, simplification, and ensuring a successful phased implementation. This supports the interview findings and potential outcomes for the decision support tool in section 5.2. Scheer makes a solid case for the Two-Tier strategy's advantages in flexibility, autonomy, and compliance, which also confirms the requirements 13e, 13g, and 13h from section 5.1. Again, variations were found in information about ERP implementation costs, with different viewpoints on economies of scale and total cost of ownership. This corroborates the decision not to include costs in this decision support tool.

Quooker conducted two detailed research studies with external consulting firms to acquire insight into their strategic business processes. The initial study found four options for managing the application landscape, which were assessed based on their value and cost (in terms of cost, time and impact). The conclusion was that the ERP system needs to be re-implemented. The following research phase explored four methods, eventually preferring a Two-Tier ERP solution due to its specified scope, lower impact on business, and higher manageability. Quooker's decision-making variables included impact, costs, timeline, scope, functional alignment, and ongoing initiatives. Except for costs, these factors are applied in the decision support tool in accordance with requirements 13a, 13c, 13i (see section 5.1). The impact, timeline, and ongoing projects are not specifically stated, however having a transitory or long-term Two-Tier strategy compensates for this. Exploring the concept of having a

trustworthy vendor, the assessment of the current ERP system goes beyond its feasibility and future improvements. It also dives into the existing relationship dynamics, examining whether the current vendor is reliable and if any improvements or efforts are needed to continue a beneficial collaboration for future undertakings. This provides additional support for requirements 13l and 13m (section 5.1).

6.3   Second iteration decision support tool

So far, the information acquired in the case study has been consistent with the decision support tool's existing design. No new ideas or data have emerged that require changes to the tool's structure. As a result, the focus group will evaluate the decision support tool of section 5.2.

6.4   Evaluation decision support tool results

To evaluate the decision support tool, a focus group was used. The focus group session was done effectively using the predetermined methodology in section 2.5. The focus group was brought together in a meeting of one hour. During the meeting, the decision support tool (see Figure 5.1) was introduced to the participants, with a thorough walkthrough of phase 2 of the decision support tool. This includes the part where the criteria are being evaluated and the most suitable ERP strategy will be advised. Since they already conducted their own research, phase 1 was not included in the focus group meeting. With every component the participants were asked if they thought the component was clear and useful. At the end they were asked what they thought of the tool in general, the structure, usefulness and if they thought something was missing. The introductory text was not finished at this point, thus was not included in the focus group. The setting was conducive to open conversations, which allowed for the collection of useful input, opinions, and critiques from a variety of perspectives. There were six overall participants all from different departments and thus different perspectives. Five of them are Quooker employees and one works as an external ERP consultant. They all have great knowledge about Quooker, and some have seen one or two other ERP implementations. They actively examined the tool's usability, comprehensiveness, and relevance to real-world scenarios, with a special emphasis on its effectiveness in tackling the complexities and challenges of ERP strategy choices. Furthermore, the focus group gave an insightful analysis of how well the tool corresponds with the stakeholders' specific objectives, concerns, and goals, resulting in a comprehensive assessment of its practical usefulness within the organisational environment.

The overall feedback of the focus group that examined the decision support tool was overall positive. Participants regarded the tool to be straightforward, clearly constructed, and simple to use. They did recommend adjusting the form of the tool from a flowchart to a PowerPoint, where it switched between the questions. This way the next steps are not revealed, it is easier to use with buttons and can include necessary additional information. The tool was generally regarded as effective in its intended purpose, giving a methodical approach to selecting ERP strategies. The participants acknowledged the tool's value in guiding decision-making processes. Furthermore, explicit remarks were made about specific criteria within the instrument, implying that special attention was devoted to parts that connected with the participants.

The focus group provided useful information, including suggestions for additional clarity and improvement of the decision support tool. Participants accepted the purposeful omission of customisation and best-of-breed criteria but suggested a more specific definition for "best-of-breed" due to its broad application. The grasp of IT department criteria was positive, with a special mention for the consideration of workforce numbers throughout implementation. This is because IT does not currently need to have the necessary knowledge and abilities, but they may still acquire them before choosing and implementing an ERP system. The participants mentioned that placing more attention on this factor earlier in their ERP decision process would have been useful for them. Feedback also underlined the need for clearer definitions of terminology like "autonomous," "flexibility," and "differentiation," as these can be ambiguous. Furthermore, concerns about the company's size and

complexity provoked inquiries about the "too big" threshold and how specific issues, such as those involving various business divisions and the supply chain, differ. These statements highlight the significance of fine-tuning specific components of the decision support tool to provide a more precise and user-friendly review process. In the introductory text an overview of definitions is given, to explain their context and meaning.

The focus group also suggested improving key criteria in the decision support tool. Specifically, it was suggested to broaden the criterion for a single supply chain. The idea involves expanding it to include not only a single supply chain, but one characterised by solely serial business operations, with no parallel or distinct processes. Another significant point raised was the review of legislative criteria. Some participants questioned its necessity, arguing that legal compliance could still be done within the same system, especially with the introduction of cloud alternatives. They emphasised the ability of cloud systems to support several administrations within the same system, each theoretically independent and capable of being turned off without legal implications. This viewpoint stressed that, in the case of cloud solutions, the legal ramifications may not demand separate systems for compliance, particularly given the worldwide reach of cloud platforms, which may cover and adhere to the laws of various countries inside a unified framework.

Not only were there useful comments on the decision support tool, but there were also insightful recommendations for further research. Recognising the subjective character of certain choices and the potential for subsequent arguments, participants suggested including objective options instead of using "Very likely", "Very important", etc. However, to accomplish this, statistical research on the criteria is required. It was noted that such an undertaking is beyond the scope of the current study, but it will be suggested for further research. Furthermore, it was suggested that considering a known business model, with possible investors or sellouts, influences the chosen ERP strategy. The measurable value created by ERP systems and their dependencies would need to be explored, which was regarded outside the scope of the current investigation. It will be highlighted as a promising avenue for future research. The third idea to be implemented was to provide an overview of the obstacles and benefits associated with various ERP strategies, contributing to a more comprehensive grasp of the decision-making environment. This idea will be implemented.

6.5   Conclusion

Finally, the Quooker case study provides useful insights into the intricacies and problems associated with selecting an ERP strategy. Quooker was founded in 1987 and has grown to become a global leader in the kitchen sector due to its pioneering attitude and commitment to innovation. The company's ambitious strategy for the future, which includes rapid expansion and revenue growth, demands a strategic approach to its IT landscape, notably its ERP system. Quooker discovered the need for a transitional Two-Tier ERP strategy after conducting extensive study and consulting with ERP vendors and implementation partners. This strategy, supported by numerous stakeholders, provides a practical answer for managing project effort, decreasing complexity, and ensuring a successful phased deployment. Quooker's decision-making process included a detailed analysis and evaluation of numerous strategic possibilities, considering elements including impact, costs, timeframe, and functional alignment. Finally, selecting a Two-Tier ERP strategy for the manufacturing organisation coincides with Quooker's strategic goals while considering practical factors and challenges. The information gathered from the case study simply confirmed the requirements stated for the decision support tool, hence a subsequent iteration of the decision support tool was unnecessary. A focus group was used to evaluate the decision support tool, specifically phase 2 of the tool. The feedback from the focus group emphasised the tool's effectiveness in directing decision-making processes while also proposing opportunities for improvement, such as clarifying terminology and refining essential criteria. With this feedback the final design of the decision support tool is developed.

7 Final design decision support tool

In this chapter the final version of the decision support tool is developed. In section 7.1 the feedback of the evaluation by a focus group is incorporated in the decision support tool and in section 7.2 a PowerPoint version of the tool is shown.

7.1 Revision based on evaluation results

In response to the evaluation results, done by a focus group, a revised version of the introduction text has been created, which now includes a definition of autonomy and single supply chain and a more extensive definition of flexibility, as shown in Appendix 6. The definition of differentiation had already been provided. To improve clarity, extra notes have been added to explain the benefits and risks of the selected ERP strategy. An intriguing disagreement was found between interview and focus group findings, regarding legal considerations as a motivator for a Two-Tier ERP strategy. Although the focus group discounted legal considerations, the interviews revealed differently. Given the differing maturity levels of these two sources, the decision was made to keep the criterion, recognising the need for future study to firmly determine its importance in influencing ERP strategy decisions. The decision support tool is depicted in Figure 7.1, with Figure 7.2 and Figure 7.3 the parts of the tool that were changed. Because the case study merely supported the defined requirements and more clarity was given to the decision support tool, the decision support tool is generic and not particular to Quooker.
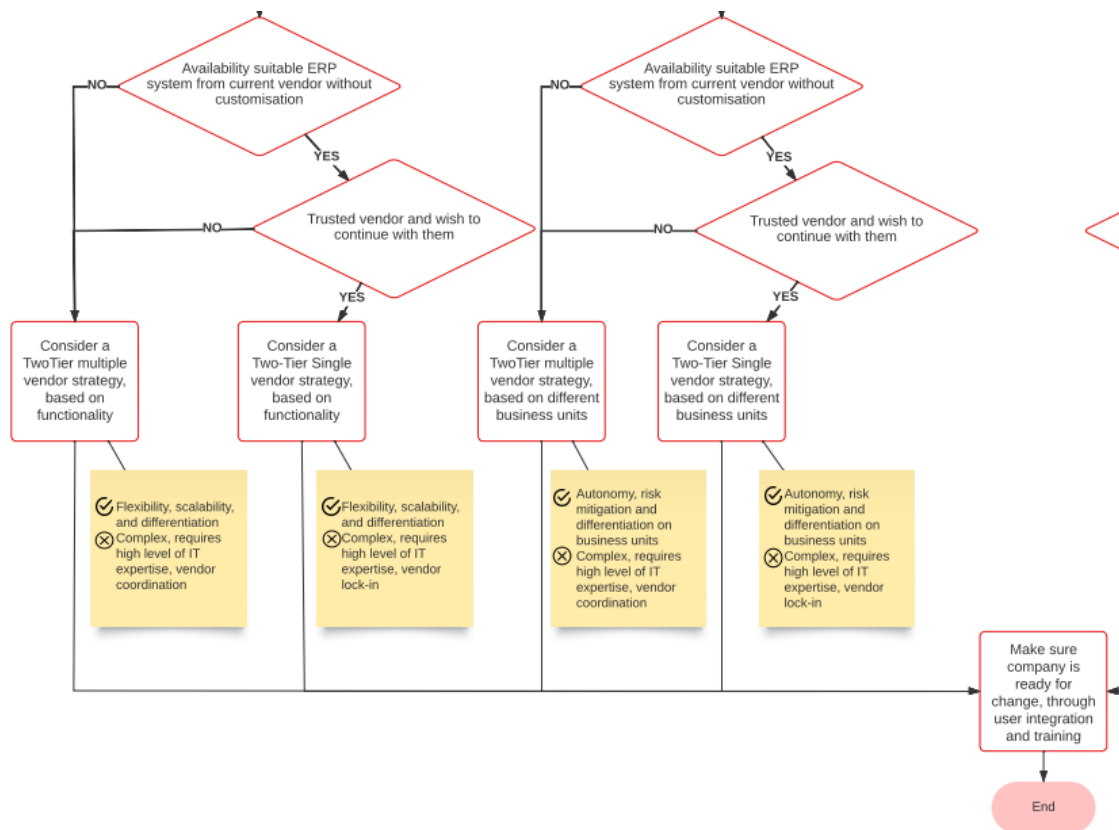
Figure 7.1: Overview of final version decision support tool in flowchart form

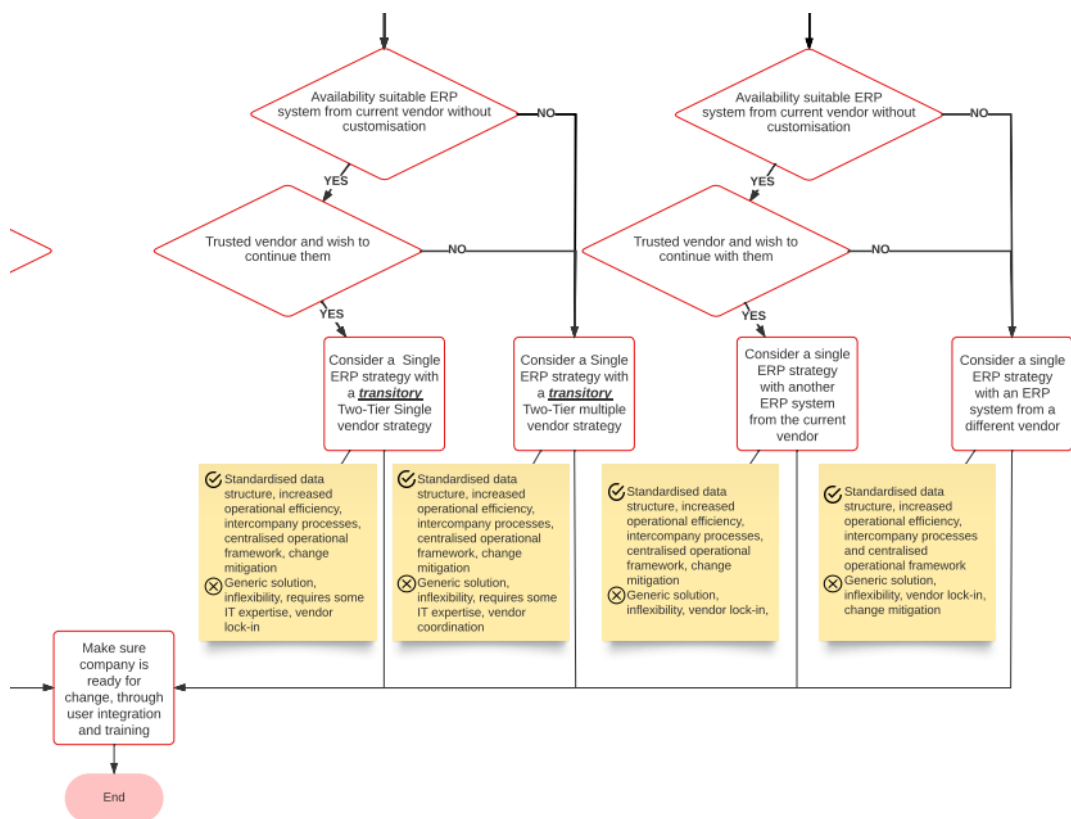*Figure 7.2: Part 1 of changes in decision support tool*

Figure 7.3: Part 2 of changes in decision support tool

7.2   PowerPoint version

Next to a revision of the decision support tool in the form of a flowchart (see Figure 7.1), the decision support tool was also made in PowerPoint. Converting the decision support tool to PowerPoint format has numerous substantial benefits. First, it improves accessibility and usability by providing information in a familiar and easy-to-navigate style. PowerPoint slides are easily comprehended by users of all technical skill levels, allowing for smooth interaction with the application. Second, the visual structure of PowerPoint allows for the incorporation of supplementary information (such as definitions from the introduction text in Appendix 6) to improve clarity and understanding. Furthermore, the PowerPoint version supports interactive usage, allowing users to simply click on their preferred answer or option, and the presentation will instantly transition to the related slide or section of the tool. This streamlined navigation improves the user experience by lowering the time and effort required to find important information and make informed decisions. Overall, the PowerPoint format of the decision support tool is very dynamic, with a semi-automated functionality and improves accessibility, clarity, and interaction, making it a useful tool for assisting decision-making processes. A few slides of the PowerPoint version are depicted in Figure 7.4 until Figure 7.8, to give a general idea of how this version looks and works. The full decision support tool can be found in Appendix 7. Since the answers to the questions are linked to another specific slide, the criteria "possibility of different ERP system from current vendor" and "trusted vendor" both have four slides, since these create four different paths and possible solutions. This results in a PowerPoint of 30 slides (excluding a front page).

Phase 1

- Analyse the business strategy, operational needs, functional requirements, and industry-specific specifications of the firm
- Analyse current and other ERP systems from the current vendor and decide which requirements can be met without customisations

Go to Phase 2

Figure 7.4: Part 1 of decision support tool PowerPoint version

Number of business units

When there are multiple business units, it's often better to not go from one ERP to another ERP in one big bang

Does the company have multiple business units?

No

Yes
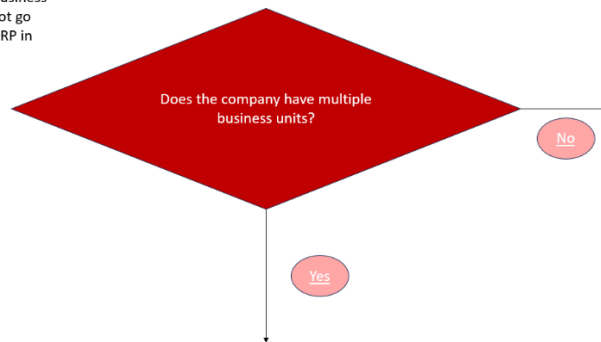
Figure 7.5: Part 2 of decision support tool PowerPoint version

IT expertise

With multiple ERP systems a lot of IT knowledge and skills is necessary. IT expertise could still be brought on board before time of implementing, thus keep this in mind

How likely is it that your IT team has enough knowledge and skills to handle two different ERP solutions by time of implementation?

Not likely

Likely

Very likely
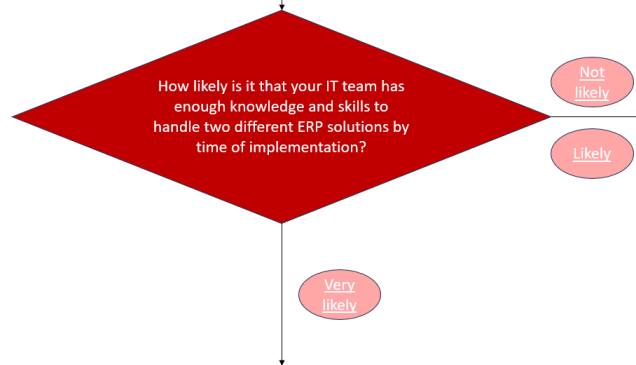
Figure 7.6: Part 3 of decision support tool PowerPoint version

ERP strategy

Go for a single ERP strategy with an ERP system from a different vendor

✓ Standardised data structure, increased operational efficiency, intercompany processes and centralised operational framework

✗ Generic solution, inflexibility, vendor lock-in, change mitigation

Next

Figure 7.7: Part 22 of decision support tool PowerPoint version

Change management

- Make sure the company is ready for change, through user integration and training

End

Figure 7.8: Part 30 of decision support tool PowerPoint version

7.3   Conclusion

The decision support tool is not unique to Quooker; rather, it is generic, as the case study only provided additional clarity to the requirements that were already established. The decision support tool and its related materials have been improved in response to the evaluation of the focus group. The introductory text is expanded on important phrases including autonomy, single supply chain, and flexibility, with the goal of improving user clarity and understanding. Furthermore, additional notes have been added to the tool to provide a fuller explanation of the benefits and dangers connected with the chosen ERP system. Furthermore, to make the tool more dynamic and improve accessibility and usability, the decision support tool has been translated to a PowerPoint format. This adaption has various benefits, including increased navigation, visual clarity, and interactive engagement, resulting in more efficient and informed decision-making processes.

8 Discussion

This chapter concludes the thesis, with a discussion of the main results in section 8.1. This section will discuss the results of the project activities of this thesis, based on the double diamond methodology. Section 8.2 discusses the theoretical and practical implications that the results bring.

8.1 Discussion of main results

This section first discusses the methods that were used, including the double diamond methodology, literature review, interviews, and a case study with a focus group for evaluation (8.1.1). Then the results of the project activities are discussed, with the first four activities that were done with literature review and interviews in section 8.1.2 and the last two project activities in section 8.1.3.

8.1.1 Discussion of methods & process

The double diamond technique was utilised to carry out all project activities. The first diamond involved data collection and analysis, which was the focus of the first four project activities. The first diamond also served as the foundation for *designing and developing a decision support tool to guide the process towards finding a suitable ERP strategy for companies.* This was the main project goal of this thesis. Requirements and the preliminary decision support tool design were the first deliverable. The second diamond was a Quooker case study used to assess and modify the decision support tool. Finalising the decision support tool's design was the last deliverable. Working with the double diamond methodology gave this study the opportunity to have an iterative process, which is very important in a design study. The iterative process also gave the opportunity to not only make the decision support tool theoretically based, but also practical and it gave the opportunity to evaluate and further develop the tool.

For the first diamond and thus the first four project activities, literature and interviews were used as research methods. Since only four articles were found on the Two-Tier ERP strategy and no articles about ERP strategy specifically, most of the results are based on articles that focus on a single ERP system or on the interviews. The fact that there was little literature about Two-Tier ERP strategy or deciding between ERP strategies, strengthens the complexity of this thesis project. In the end seven interviews were done, and data saturation was attained because the latest interviews did not provide significantly new information. Due to time constraints and restricted contacts, only two organisations using a Two-Tier ERP strategy, while four ERP partners/vendors were questioned. However, one of the participants that was working at a company with a Two-Tier ERP strategy, was also an ERP consultant with a lot of experience in different companies. This, combined with the data saturation and evaluation that was done in the case study (which included a focus group with another ERP consultant), make the results a good foundation for the decision support tool and further research. Even though some of the participants were approached through Quooker, the interviews were held generic, and they were told that their responses should not be influenced by Quooker's situation. To this purpose, the interview results were generic; nonetheless, there may have been some bias in the results due to the interviewees' continued association with Quooker or similar companies.

Inductive coding is applied to the interview data, where based on the interview transcripts codes were created, then they were linked to form categories, which are combined into themes. The pre-existing results from the literature review are then combined with the themes that emerged from the inductive coding procedure. This strategy guarantees compatibility with existing theoretical frameworks found in the literature while facilitating the investigation of unique insights from the interview data. Combining the data from these two sources allows for a more thorough analysis that considers the depth of the empirical findings as well as the knowledge gained from the body of previous research. The literature also reveals that only a few criteria were discovered because there was limited knowledge regarding ERP strategy selection. For this reason, open coding of the interviews was crucial to gaining new insights.

With the case study at Quooker, the decision support tool was evaluated. Additional information from ERP vendors and implementation partners was provided to see if there were any new insights. Two of the participants that were interviewed, were also involved in supplying the additional information of their company, however there were seven other vendors and two other partners that provided information. From these vendors and partners some were bigger companies than others, thus there is variation in the origin of the information. There was also variation in the focus group, including multiple perspectives from Quooker as well as an ERP consultant. These perspectives give extra strength to the results gained in this thesis.

Overall, the thesis project progressed smoothly, with no noteworthy delays or issues in data collection and analysis. While navigating a large depth of literature presented some challenges due to the number of publications, only a few were directly relevant to the study. However, the participation and willingness of respondents considerably aided data gathering, resulting in minimal delays in the study's timeframe. Lastly, the case study at Quooker went smoothly, allowing for the gathering and sharing of relevant information, which improved the foundation of the decision support tool.

8.1.2 Discussion of results literature and interviews

In the context of Enterprise Resource Planning (ERP) strategies, *a thorough assessment of various ERP strategies demands a detailed exploration of both their inherent benefits and related risks*. The orchestration of ERP strategies is critical for organisations, emphasising the importance of having a thorough awareness of various strategies to make educated decisions. As a result, the initial project task was to gain a thorough understanding of the various ERP strategies, including both their inherent benefits and risks associated with them. Keeping the scope of the study and the following results in mind, the decision support tool only considers a single ERP strategy (with a transitory Two-Tier ERP strategy) and a Two-Tier ERP strategy as possible options.

- **Single ERP Strategy**
    - o **Definition:** A strategy in which an organisation uses a single, integrated ERP system to manage all or parts of its business operations and functions. When using the ERP system for parts of the business operations, other (smaller) applications are used to cover the rest of the functions.
    - o **Advantages:** Implementing a single ERP system promises a standardised data structure, increased operational efficiency, intercompany processes, and a centralised operational framework.
    - o **Drawbacks:** Cautionary notes speak against the generic solution, its inflexibility, vendor lock-in and change mitigation.
- **Customisation**
    - o **Definition:** A single ERP system strategy, where customisations are made to the system to overcome functionality gaps.
    - o **Advantages:** Customisation can offer higher user quality and better functional compatibility.
    - o **Drawbacks:** The risks are difficulties during system upgrades, maintenance complexities, increased costs, and disruptions in vital company operations. The literature gave mixed opinions and all the interviewees advised against it.
- **Two-Tier ERP Strategy**
    - o **Definition:** A strategy in which an organisation uses various ERP systems, typically at different levels or business units, to serve distinct demands or functions. Thus, different business units can use (nearly) all functions of different ERP systems, or one business unit can use modules from a different ERP system that are relevant, while the other business units use a different ERP system. Both ERP systems can be from the same or different vendors. The Two-Tier strategy can also be used as an interim solution before moving to a Single ERP strategy.

- o **Advantages:** Implementing a Two-Tier ERP strategy provides differentiation based on functionality and/or business units, flexibility, agility, local autonomy, scalability, and risk mitigation.
    - o **Drawbacks:** It increases complexity, requiring a high level of IT expertise and skills. Depending on a single vendor or multiple, it can create vendor lock-in or vendor coordination.
- **Best-of-breed**
    - o **Definition:** Selecting and deploying the most superior or specialised solutions for specific business operations, regardless of whether they come from the same vendor. The goal is to improve performance and capacities in each area by utilising high-performing, specific solutions.
    - o **Advantages:** Taking the Best-of-breed strategy ensures flexibility, tailored functionality, quality assurance, and a lower risk of vendor reliance.
    - o **Drawbacks:** There are often many vendors in place and juggling various vendors and organising the extensive integration process poses a maze of problems. Furthermore, a Best-of-breed strategy without an ERP is uncommon according to the interviews, and transitioning from an ERP system to a Best-of-breed approach is rarely feasible. Hence, the exclusion in the decision support tool.
- **Composable ERP System**
    - o **Definition:** ERP system that combines the Best-of-breed strategy and a typical ERP system, integrating numerous applications via interconnected processes on one platform.
    - o **Advantages:** It aims to streamline operations by connecting various apps within the ERP framework and can simplify processes for subsidiaries.
    - o **Drawbacks:** The composable ERP system was only mentioned by one person and was not explored in this study because of its novelty and lack of understanding, especially given its restriction during the study period.

The second part of the project included a significant task*: identifying essential criteria and restrictions that would have a substantial impact on the selection of the most suitable ERP strategy*. The criteria were carefully developed based on a synthesis of common literature on ERP strategies and insights gained through interviews. However, because the researcher created the codes and code tree, the insights gathered from interviews may be influenced by research bias. A well-rounded set of criteria was developed by integrating the underlying ideas articulated in existing literature with actual experience gathered through interviews. This method guaranteed that the criteria represented not only established academic perspectives, but also practical considerations and real-world insights from industry experts. Several relevant topics surfaced during this endeavour, including functionality, IT expertise and skills, business strategy, organisational complexity, synergy, and vendor credibility. Following these investigations, a thorough set of criteria emerged to guide the strategy selection process. These criteria are:

- Number of business units
- Availability of IT knowledge and skills
- Functionality of current ERP system
- Presence of single supply chain
- Desire for differentiation
- Likeliness of future divestitures or autonomous divisions
- Importance of local autonomy
- Presence of legal reasons for separation
- Importance of centralisation of operational framework
- Importance of IT Flexibility
- Ability to handle one ERP system (Size of company)

- Possibility of different ERP system from current vendor
- Trusted current vendor

The careful definition of these criteria provided the groundwork for a framework of strategic decision-making, which enabled a prudent and customised approach in the later stages of the ERP deployment. The requirements for IT expertise and skills, as well as the number of business units, can be considered as both criteria and possible constraints in the selection process. These factors are critical in deciding whether a single ERP strategy is needed or if there is room to explore other strategies. The amount of IT knowledge inside the company, as well as the number of business units, have a direct impact on the need to implement a single ERP system or the potential of considering other strategies to satisfy unique organisational demands. Other constraints were determined based on the scope of the study. The decision support tool implicitly incorporates IT resources and impact by considering elements such as IT competence, organisational size, and transitional ERP phases. This broader perspective aims to reflect the varied character of expenses beyond their financial implications, recognising the diverse and interdependent aspects that contribute to the entire investment in ERP implementation. Some criteria can be a bit more complex, like differentiation, size of the organisation and flexibility. These criteria are not straightforward and might create more discussion while using the decision support tool. This is why having diverse perspectives within the user group is both important.

Having multiple perspectives reinforces the value of project activity three, *exposing the differences between business and IT perspectives*. As it was completed throughout project activities one and two, it was also based on interviews and literature. Businesses prioritise customised solutions that emphasise operational excellence, consistency, and efficiency. IT, on the other hand, values uniformity for ease of maintenance and reduced integration complexity. Business decisions consider strategic goals, acquisitions, and operational requirements, with an emphasis on analytics. IT prioritises internal competencies and in-depth system expertise, notably in Two-Tier ERP and Best-of-breed strategies. While business considers variables such as complexity and competitiveness, IT focuses on system architecture and integration. Because of their fundamental contrasts, effective collaboration between IT and business is critical. To resolve these discrepancies, it is critical to incorporate criteria from both sides. This integration considers elements such as IT competence, business processes, and goals to achieve a complete approach. Furthermore, decision support tools should be used by staff from both the IT and business sectors to provide a diverse range of opinions. In essence, successful ERP adoption and integration need harmonious collaboration, with business decisions guided by strategic goals and IT in charge of handling the technical components of the process. This joint effort ensures a comprehensive approach, matching the system with both organisational goals and technological constraints.

The fourth project activity focused on *understanding change management, system integration, and the pursuit of competitive advantage in the context of various ERP strategies*. Change management is a critical tool for effectively navigating ERP initiatives, serving not only to overcome resistance but also to motivate and include employees in the transformative process. This proactive approach ensures a more seamless transition in business operations, improving organisational readiness, acceptance, and overall project success. It also explains why a transitional Two-Tier ERP strategy is included. The Two-Tier strategy can both have a smaller and larger change impact on the business and its users than a single ERP migration. It can have a smaller impact on the business because not all units would have to change their system. However, some might need to work with two systems, which is more complex. The impact would depend on the type of Two-Tier ERP strategy, thus based on functionality or business units, on the vendor, thus a single or multiple, and on the organisation of the business itself. However, overall could the Two-Tier ERP strategy be considered as less of a change impact than a complete single ERP migration. Hence the incorporation of a transitory Two-Tier ERP strategy. The growing landscape of low-coding techniques and standardised integration solutions is reshaping views of integration risks; therefore, it was not further considered in this study. However, integration between IT systems and business processes is regarded as crucial for reducing complexity and

enhancing efficiency. Organisations are encouraged to approach ERP adoption decisions holistically, acknowledging the dynamic interaction of technological, organisational, and user-oriented aspects that contribute to effective ERP implementation and integration. Furthermore, the pursuit of a competitive advantage with ERP is inextricably linked to the chosen strategy. Different strategies, such as single ERP or Two-Tier ERP, have varying effects on the alignment of competing priorities. At last, change management and competitive advantage are essential concerns that are incorporated into the decision support tool so that competitive priorities are analysed, and ERP user engagement and training is recommended.

8.1.3   Discussion of decision support tool

The fifth project activity was, to design and develop a decision support tool that will serve as a guiding framework for the process of determining the most suitable ERP strategy, and the last project activity was the evaluation of the decision support tool that will serve as a guiding framework for the process of determining the most suitable ERP strategy. First a set of requirements were defined based on the first four project activities (the first diamond). There is researcher bias since the criteria were combined and defined by the researcher. However, the requirements are based on literature and interviews, with at least two literary sources and/or four interviews. Making the requirements well substantiated. The bias has been minimised by supporting the requirements by literature and interviews, however it could not have been avoided completely, given that this thesis project is a design study. The requirements are generic and not Quooker specific, so that the decision support tool could be used by multiple companies. The decision support tool meets every requirement.

This tool, which was first designed as a decision tree, evolved into a dynamic flow chart that included additional criteria and procedures. The criteria were prioritised and organised in a hierarchical structure of questions, making the decision-making process more efficient. In addition to the criteria, the decision support tool was based on various functional and non-functional (performance) requirements derived from the study's scope and outcomes. The deliberate absence of multi-criteria decision analysis stemmed from the hierarchical character of the criteria and their well-defined strategy preferences. The accompanying introductory paragraph supplied critical information about the tool's purpose, limits, target user base, and operating advice. The introductory text also provided that all requirements of the decision support tool were fully met. The tool's design was iterative, not only for the information it contains, but also for its form, colours, and size. Initially, more and darker colours were employed, but using white shapes with coloured lines makes the decision support tool more clear, readable and calm. The decision support tool given in this thesis is a valuable resource for firms looking to navigate the complexity of ERP strategy selection. By highlighting key factors to examine and structuring them as actionable questions, the tool allows decision makers to approach the process with clarity and purpose. Its value stems from its ability to simplify what would otherwise be a difficult endeavour by providing a systematic framework that leads decision makers through each stage of the ERP strategy selection process. Overall, the tool provides a streamlined guide that enables organisations to make informed decisions that are consistent with their organisation's goals and demands.

The additional information found at the case study of Quooker, mostly confirmed the requirements that were already established. However, the two major factors that played a role in choosing the Two-Tier ERP strategy for Quooker, were the total cost of ownership and change impact. These two factors were not explicitly considered in this thesis project. The total cost of ownership was found to be dependent on the ERP system and vendor itself, which is out of the scope of this thesis project. There were also inconsistencies with the findings on costs, making it difficult to incorporate without further research. Change impact was included implicitly, by including the transitory Two-Tier ERP strategy and the criteria ability to handle one ERP system (size company). For this thesis project these decisions were just, however including these factors explicitly, could change the decision support tool. It is important to stress that, while the decision support tool is based on theoretical and empirical data, its vulnerability to research bias remains a concern. Furthermore, the decision support tool was

evaluated by a focus group for usability and real-world applicability. The focus group tested if this was the case and did not particularly look at if it would not work. One example did arise for when the tool would not work, which is when the business strategy is to sell the company. If selling the company is the business strategy, then more factors could be in place to select an ERP strategy. The value of the company should be maximised; therefore, two ERP systems might not be worth the effort. However, since this is not further explored, no comments can be made about this. Besides that, the focus group deemed the tool to be intuitive, well-constructed, and easy to use. However, based on advice from the focus group a PowerPoint format for the decision support tool was made, making it more user-friendly than the current flowchart. The shift to PowerPoint allows users to navigate fluidly because the next stages are not shown prematurely, avoiding the temptation to take alternative paths due to unfamiliarity with other possibilities. Next to that, the focus group evaluated the tool on usefulness and practicability, but this does not mean that the tool is validated. Validation would require a lot of tests, repetitions and seeing the results of using the tool. Which is also why the researcher and inventor of the tool cannot be held responsible for any results that are brought on by using the decision support tool. If using the decision support tool as is, companies are taken a risk and bear the responsibility themselves.

8.2 Theoretical contributions and practical implications

Theoretical (8.2.1) and practical implications (8.2.2) are presented in this section. By conducting this dual investigation, knowledge on ERP techniques is added in academia and practical advice to help enterprises make these crucial choices is offered.

8.2.1 Theoretical contributions

The theoretical implications of this thesis are varied adding new insights to the existing body of knowledge in ERP strategy selection. The combination of literature and interviews generates theoretical concerns that can inform future study and academic discourse. Here are some significant theoretical contributions:

Clarifications of the Two-Tier ERP strategy: This thesis helps to improve comprehension of the Two-Tier ERP strategy. Even though the Two-Tier ERP strategy was already defined by Gill (2011) and Slabbert et al. (2016), this thesis provides a clearer definition of the different types of Two-Tier strategy. This study also discovered that the Two-Tier ERP technique can be used as a transitional phase while establishing a single new ERP system. This nuanced perspective contributes to the theoretical landscape by highlighting differences in how organisations interpret and apply this strategy.

ERP strategy selection complexity: The study highlights how challenging it is to select an ERP strategy. Until currently, no other literature has been dedicated to ERP strategy selection. Articles were written about ERP system selection or one of the ERP strategies, but not on how to pick between them. This study demonstrates that various factors influence the decision, and that multiple project activities must be completed before an ERP strategy can be chosen. It also demonstrates the need for many perspectives to make decisions about the elements, making the process more complex.

Criteria and constraints identification: The study employs literature and interviews to identify and emphasise numerous significant characteristics that influence ERP strategy selection. Most of the criteria had already been mentioned in at least one publication, but the interviews clarified or expanded on them. This was notably true for the criteria "company goals" (Law & Ngai, 2007; Velcu, 2010; Yang, 2016; Yen & Sheu, 2004). The literature did not go into detail on what these goals would be and how they might influence ERP strategy selection. However, this study divided company goals or business strategies into other sub-criteria, including single supply chain, differentiation, prospective divestitures or autonomous divisions, central operational framework, and local autonomy. The literature also did not mention organisational complexity, such as the size of the organisation and

number of business units, explicitly. These factors help to build a theoretical framework for analysing ERP strategies.

Role of IT and business alignment: The study underlines the significance of harmonising IT and business views in ERP strategy decisions. The theoretical implication is to recognise the different perspectives of IT teams and business stakeholders. This observation motivates future research into theoretical frameworks that account for the alignment problems and teamwork required during ERP strategy selection.

Finally, this thesis adds theoretical depth to our understanding of ERP strategy selection by illuminating the complexities, differences, and implicit connections that arise during the decision-making process. The identified theoretical implications pave the way for future research projects aimed at improving existing theoretical frameworks and addressing emergent difficulties in the dynamic landscape of ERP strategy selection.

8.2.2   Practical implications

The practical implications of this thesis provide actionable insights for companies involved in ERP strategy selection. Here are the main practical implications:

Streamlined Decision-Making Process: The decision support tool takes an organised and hierarchical approach to ERP strategy selection. This tool can help organisations streamline their decision-making processes by ensuring that critical criteria are carefully examined and prioritised. This increases decision-making efficiency and minimises the likelihood of missing important factors.

Consideration of organisational complexity: Practitioners must recognise the impact of organisational complexity on ERP strategy decisions. According to the study, laws and regulations, differentiating aims, and IT infrastructure all have a major impact on ERP strategy choices. Organisations should do a thorough assessment of their internal challenges to align ERP strategies with their specific requirements.

ERP strategy selection complexity: This study demonstrates the complexities of selecting an ERP method. The tool assists decision makers in critically evaluating certain factors and asking the appropriate questions. Its value stems from its ability to simplify what would otherwise be a difficult endeavour by providing a systematic framework that leads decision makers through each stage of the ERP strategy selection process.

Strategic alignment of IT and business teams: The practical significance of harmonising IT and business views during ERP strategy selection is highlighted. Organisations are encouraged to establish collaboration between IT and business teams to ensure that strategic decisions are consistent with both technological capabilities and overarching business goals.

User experience and change management focus: Prioritising user experience and conducting successful change management during ERP system updates emphasises the practical necessity of addressing human and organisational aspects. To ensure that ERP implementations go smoothly, organisations should allocate resources for user training, anticipate resistance to change, and apply change management tactics.

Consideration of data management competence: The inclusion of data management competence as a criterion implies that firms should engage in improving their ability to handle data. This includes ensuring that IT staff have the requisite capabilities to negotiate the complexities of various databases and information exchange, regardless of ERP strategy.

Limitation of customisation: The practical implication of opposing excessive customisation in ERP systems is that businesses should strike a balance between adapting the system to their needs and

avoiding complications during upgrades and maintenance. Organisations should avoid customisation and instead select an alternative system or strategy.

Awareness of technology evolution: Organisations should be aware of technical changes and their implications for ERP strategy choices. While not expressly included in this decision support tool, the interviews show the necessity of evaluating the evolution of technology, especially when picking a new ERP system.

Finally, the practical implications of this thesis provide organisations with concrete advise as they navigate the intricacies of ERP strategy alternatives. Decision-makers can use these insights to make well-informed decisions that are relevant to their organisation's context, hence increasing the effectiveness and success of ERP strategies.

9 Conclusions and recommendations

This chapter concludes the thesis in section 9.1 and highlights the thesis project limitations with recommendations for further research in section 9.2.

9.1 Main conclusion

This thesis project delves into the difficulties of ERP strategy selection, with an emphasis on the Two-Tier strategy in the context of a single ERP system that does not match (future) demand scenarios. Using the double diamond methodology, including a thorough review of literature, interviews with industry experts, and a case study at Quooker provided important insights into the factors impacting ERP strategy decisions and a decision support tool. The construction of a decision support tool provided a systematic method that considered several factors drawn from literature and interviews. The tool's design, which was an iterative process and based on requirements driven from theoretical and empirical research, provided a systematic framework for decision making. The decision support tool created for this thesis project provides various advantages for firms navigating the difficulties of ERP strategy selection. By arranging criteria in a hierarchical framework and organising them as actionable questions, the tool makes decision-making more efficient and effective. Its methodical structure enables decision-makers to approach the selection process with clarity and purpose, resulting in informed selections that are consistent with company goals and demands. Furthermore, the tool's adaptability allows it to be used by many firms, increasing its value as a guiding resource in the ERP strategy selection process. However, despite these advantages, there are some drawbacks and issues to be aware of. Conflicts such as the lack of financial factors and a constrained scope are potential limitations in the tool's application and comprehensiveness. Furthermore, while the focus group rated the tool as straightforward and user-friendly, its usability and real-world applicability have yet to be validated through rigorous testing and repetition. As a result, businesses adopting the technology should be aware of the inherent risks and responsibilities that come with its deployment, because the outcomes are ultimately determined by their own decisions and actions. Moving forward, firms can use this tool as a valuable resource in their ERP strategy selection process, emphasising the significance of careful thinking and rigorous study to ensure effective outcomes. Overall, this thesis advances the field of technology management by providing a practical answer to a challenging problem and laying the groundwork for future research and refinement in ERP strategy decision making.

This thesis is in line with the Management of Technology curriculum's emphasis on scientific rigor in tackling technology issues and corporate views by creating a decision support tool based on both theoretical and empirical data. By examining ERP strategy selection, a crucial component at the intersection of corporate strategy and technology, this thesis adds to the technological background. It shows understanding of technology as a business resource, by developing a tool that helps businesses with the ERP strategy selection. Using focus groups, interviews, and literature review, the study applies scientific methodologies to investigate the intricate issue of ERP strategy selection in businesses.

9.2 Thesis project limitations and recommendations

While this thesis seeks to provide useful insights into ERP strategy selection, several limits must be noted. First, the project environment is predominantly focused on manufacturing and sales organisations, which may limit the generalisability of findings to other industries. Next to that, seven interviews were done, and data saturation was attained because the latest interviews did not provide significantly new information. However, due to time constraints and restricted contacts, only two organisations using a Two-Tier ERP strategy, while four ERP partners/vendors were questioned, thus potentially skewing the results. More interviews with companies who have implemented a Two-Tier

ERP strategy might be beneficial to the study's comprehensiveness. Furthermore, this study focuses on the Two-Tier ERP strategy, as it was limited to organisations that use a single ERP system. Mergers and acquisitions (M&A) were purposely excluded from the scope, as it would include more than one or two ERP systems. It also affects the problem, because in this thesis, the problem was that the current ERP system no longer met (future) requirements, whereas M&A's result in several ERP systems that may all be sufficient. With M&A, the issue is deciding which systems to keep. However, in M&A situations, the Two-Tier ERP strategy is highly common and thus worth investigating. The composable ERP system arose as a strategy during interviews, however it was not thoroughly investigated in this study. This strategy, which falls somewhere between ERP and Best-of-breed, is regarded as a viable solution to capability shortages and integration issues and deserves additional examination. While the study did not go into detail about Best-of-breed, there is still need for more research into ERP domains in addition to Best-of-breed options.

Several other aspects were not included in this study and deserve further investigation. For starters, financial expenses, like total cost of ownership, were not included, due to inconsistent information and reliance complexities. More research is needed to determine how the organisation's strategy, ERP system, partners, and possibly other factors influence these costs, as well as whether they can be incorporated into the decision support tool, given that costs are an important component in most projects. The study did widen the scope of costs, acknowledging their expression in terms of time, impact, and resources. Because expenses are also dependent on the vendor and the ERP system itself, the decision support tool may need to be expanded to include the selection of both the ERP strategy and the ERP system. The selection of an ERP system was left unaddressed, assuming that a perfect ERP system could be found when deciding on just one. To improve comprehensiveness, the decision support tool might be integrated into the process of selecting ERP systems. Furthermore, selling the company as a business model was discussed during the focus group, leading to the necessity to investigate its implications for ERP strategy and the value that a specific ERP system or strategy provides to a corporation. Finally, all criteria in the study are being evaluated subjectively. While the focus of this study was on establishing criteria, a follow-up study, as indicated in the focus group, should seek to objectively establish the criteria through statistical research. Another possibility is to use multi-criteria decision analysis to identify the importance of each criterion. Because of the hierarchical and sequential structure of the criterion, multi-criteria decision analysis was not used as a design for the decision support tool in this study. However, while this hierarchical and sequential structure is clear, it may also be due to researcher bias. An intriguing study could be to see what companies think of the criteria and how essential they are to them, and whether this affects the decision support tool.

Finally, the decision support tool was not validated due to limitations in time and resources. To verify the tool's reliability and validity, significant model testing would be required, spanning several iterations. However, implementing such a comprehensive testing project would be a time-consuming activity that would last several years because it requires a thorough analysis to determine whether the chosen ERP strategy is effectively implemented and successful in practice. To completely evaluate the decision support tool, another case study that evaluates the whole tool is required. In this thesis project, only the second phase of the decision support tool is evaluated, since Quooker already had done the first phase, and this phase takes time. However, the second phase of the decision support tool was evaluated by a focus group to ensure practical utility and develop face validity. Face validity or receiving acceptance from non-researchers on the study's validity (Lucko & Rojas, 2010), was tried to gain by conducting interviews with domain experts and subject matter experts before, during, and after the research. The focus group, which consisted of potential users who evaluated the tool, also contributed to face validity. Another form of verifying the tool, besides validating is falsification. Popper developed the falsification theory, which states that a theory should be tested using falsifiable hypotheses. When a theory passes falsifying tests frequently, it is considered good. The tool could potentially be falsified by testing it in scenarios when it may not work. Take the situation where a

business objective is to sell the firm in a few years and employing two ERP systems diminishes the company's value. The hypothesis would be that when the business objective is to sell the company, the tool would not recommend a Two-Tier ERP strategy. When the tool does recommend a Two-Tier ERP strategy, this hypothesis is proven to be false. When trying to falsify the decision support tool, the current scope of the tool should be taken into account.

In conclusion, while this thesis gives useful insights into ERP strategy selection, its exclusive focus on certain industries and small sample size may limit generalisability. The absence of mergers and acquisitions overlooks common situations that require additional investigation. Furthermore, the introduction of the composable ERP system as a viable option, as well as the necessity for further investigation into financial costs, identify potential areas for future research. Despite these limitations, the decision support tool provides a methodical foundation for companies, however it requires additional validation and refining to improve efficacy.

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Appendix 1   Informed consent form

Informed consent interview: A guide to ERP strategy selection

You are being invited to participate in a research study titled *A guide to ERP strategy selection*. This study is being done by Nikki Seepers from the TU Delft and Quooker as part of a Master Thesis project.

The purpose of this research study is to define a decision support tool to guide the process of ERP strategy selection, including criteria for choosing between a single ERP, Two-Tier ERP and best-of-breed and will take you a maximum of 60 minutes to complete. The data will be used for Master Thesis publication, educational and practical intentions. I will be asking you to answer questions about your own experience and expertise with ERP strategies, namely the Two-Tier ERP strategy.

As with any online activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimise any risks by keeping the data in Quooker and the TUD. If you agree, the audio will be recorded and a transcript will be made and shared with you, whereafter the audio recording will be deleted. You will be welcome to express any concern regarding the transcript content. Your name and company name will be anonymised in the Thesis. The thesis will be made publicly available at the end of the study (+/- end of February 2024).

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. Should you have any questions regarding the management of your personal data, feel free to contact me (corresponding researcher).

Contact details:
Corresponding researcher:
Nikki Seepers

Responsible researcher:
Ir. M.W. (Marcel) Ludema

_____

Signature
_____   _____   _____
Name of participant   Signature   Date

Appendix 2   Interview questions

Questions to vendors:

1. What do you know about a Two-Tier ERP strategy?
    a. Have you ever worked with a Two-Tier ERP strategy?
    b. How many years of experience do you have with ERP systems?
    c. If and then in what ways did your relationship with the client changed in any way after being part of a Two-Tier strategy?
    d. In case of the Two-Tier strategy, do clients already have an ERP in place?
    e. Did you ever advise companies to have a Two-Tier strategy? Can you give an example?
2. What do you think are the pros and cons of a Two-Tier ERP strategy?
    a. How do you think a Two-Tier ERP strategy can bring a company competitive advantage?
3. How do you think the Two-Tier strategy influences the risk profile? In what way?
4. Why do you think companies choose or not choose a Two-Tier ERP strategy?
    a. Do you think a Two-Tier strategy is a lasting strategy or is it more often used as a temporary strategy?
    b. What kind of companies do you know that should not choose a Two-Tier ERP strategy? What characteristics do these companies have?
    c. (If costs not mentioned, what influence do costs have on the decision?)
5. In general, what do you think are the constraints for choosing a strategy, such as single ERP, Two-Tier or Best-of-breed? When would a strategy be unqualified?
6. In general, what do you think are criteria for choosing a certain strategy, such as single ERP, Two-Tier or Best-of-breed?
    a. Which criteria do you think are more important than others? And why?
7. There are multiple perspectives to look from, when choosing a strategy. What do you think is the difference between an IT perspective and a business perspective when choosing an ERP strategy?
8. Do you think companies with an ERP system that does not meet their requirements or future needs would go to a best-of-breed landscape without an ERP system?
    a. Do you think it would be better to (heavily) customize the current ERP system?
    b. How do you think an ERP system fits within an IT landscape?

Questions to companies:

1. What do you know about a Two-Tier ERP strategy?
    a. Does your company have a Two-Tier ERP strategy?
    b. Did you already have an ERP in place before that?
    c. Did your relationship with the partners change after having an ERP strategy? For example, did one start to act different with another ERP partner in place.
    d. Did vendors advise you to have a Two-Tier strategy?
2. What do you think are the pros and cons of a Two-Tier ERP strategy for your company?
    a. Do you think the Two-Tier ERP strategy brought your company a competitive advantage? If so, how?
3. What do you think are or were the risks of a Two-Tier ERP strategy for your company?
4. How did you come to choose your ERP strategy?
    a. Were there any organisational features that helped influence your choice? For example multiple entities..
    b. Did you have any reasons for not adopting a Two-Tier ERP strategy?
    c. Is the choice for a Two-Tier ERP strategy a temporary one, or do you think it will last?

       d. (If costs not mentioned, what influence did costs have on the decision?)
5. In general, what do you think are the constraints for choosing a strategy, such as single ERP, Two-Tier or Best-of-breed? When would a strategy be unqualified?
6. In general, what do you think are key criteria for choosing a certain strategy, such as single ERP, Two-Tier or Best-of-breed?
       a. Which ones do you think are more important than others?
7. There are multiple perspectives to look from, when choosing a strategy. What do you think is the difference between an IT perspective and a business perspective when choosing an ERP strategy?
8. Do you think companies with an ERP system that does not meet their requirements or future needs would go to a best-of-breed landscape without an ERP system?
       a. Do you think it would be better to (heavily) customize the current ERP system?
       b. How do you think an ERP system fits within an IT landscape?

Appendix 3 Interview quotes

Table A. 1: Quotes from interviews

Interview	Quote
Participant 1 A	*"I think every organisation that could handle it, should go to one ERP system."*
	"Mostly see Two-Tier with mergers and acquisitions, where they are confronted with different ERP systems."
	"You have to do an analysis, where you see what you want to achieve."
	"The project of migrating to one ERP system can be so big, that you wouldn't be able to finish it."
	"Another reason could be if you have two business units that are so different that it couldn't be put into one ERP system. … A reason could also be that business units work so independently, that it doesn't matter for the company if they have the same systems or not."
	"Functionality is a big part in the decision of going for Two-Tier. Another reason could be if you have two business units that are so different that it couldn't be put into one ERP system. But that also depends on the ERP system, because big ERP systems can handle a lot of processes."
	"In my opinion, it is the central component of an IT landscape. … It doesn't necessarily has to be the most central part, but is an important one."
	"It is also about employees, if the employees have to take steps back as well, it can have huge implications."
Participant 1 B	*"Companies should not have a Two-Tier strategy when there is an integrated process throughout the company. You should be standard and have one ERP system."*
	"In a modern ERP you don't want to customise anymore."
	"Best-of-breed could be very strong, but you need a very strong IT architecture and program management."
	"Yes, we see often that a Two-Tier situation exists with clients. Especially when companies were merged or acquired."
	"An ERP system costs a lot of time and effort, thus with two even more. … You have to maintain the systems, but also documents and identity management are double."
	"Nowadays, it's more from ERP to ERP. In that case, you cannot do everything in one big bang."
	"It could lead to a competitive advantage, when business units do something completely different."
	"If the IT knowledge is low, you should have a partner that does everything."
Participant 1 C	*"There is always an ERP system needed. Let alone for the finance functions."*

	"Business looks at processes and the support of those. They think that their processes are unique and want a solution that fits those needs. While IT just wants a standard solution, …."
	"You have to keep the systems running and you also pay for this. Thus, total cost of ownership is also important."
	"Lasting strategy for multinationals with locations fulfilling different functions (e.g. manufacturing in one location and sales in another)."
	"If there is no or limited internal IT, you should go for a single ERP strategy"
	"Size of company, functionality, knowledge and skills, complexity of business processes, complexity in general and internal IT."
Participant 2 A	*"You always need an ERP system in the centre of your landscape."*
	"Never. I am very much against customisation."
	"To keep standardisation, you will try to keep every system the same technology, thus the same vendor."
	"The challenge for the organisation is to find the right balance between a generic solution and a commodity one."
	"So, there are five reference points; acquisitions strategy, divestitures, autonomous divisions and many subsidiaries that you don't want in your headquarters system on principle."
	"Every integration point is a point of failure."
Participant 2 B	*"Best-of-breed can limit growth because applications cannot handle it."*
	"Bigger companies have different processes next to the specific ones, more global and corporate processes, such as intercompany processes. This would not be possible in best-of-breed but is in composable ERP."
	"Operational excellence of core business processes are achieved with ERP system. Thus ERP is often put in the middle of the organisation."
	"With public cloud solutions, you have upgrades every quarter. This means that every quarter you have to test the interfaces."
Participant 3 A	*"Benefit of one ERP system is that everyone works in the same way with the same system.*"
	"The restrictions lay in defining the requirements. You have to consider how much you want to standardize and which specific deviations your company has (and wants to keep)."
	"Difference lays mostly in requirements. … But it is mostly important for choosing the ERP system, not really the ERP strategy."

	"If there are multiple ERP systems, then you need more training, more people and you'll have more dependencies. This is also the case for users, they will have to work and switch between ERP systems."
Participant 3 B	*"No, customising is never the way to go."*
	"Finally, there is also another version, you could have multiple ERP systems, but from the same vendor. Then you have the freedom, but it is the same technology and thus easier to control and integrate."
	"It also depends on where you want to differentiate yourself with. If you want functionalities that go more in depth and a fast pace of change. With bigger systems this is often not the case. They are more generic."
	"The business wants available, reliable and safe systems that are easy to control and low in costs. It has partly the job to make sure these goals are met."
	"Take into account costs. Depends on the organisation of the systems how much this is. Maybe you need more people to handle one big system instead of smaller systems. … The costs depend on the complexity of the technology."
	"It starts within the organisation itself. How complex it is."
	"It is about size, geographically with the number of countries but also the number of users."
	"If there is a lot of change in the surroundings or internally, with for example reorganisations, then you shouldn't put this in one system."
	"As a company you have to handle and coordinate the partners, so as long as the scope is clear it shouldn't be a problem."
	"If you want functionalities that go more in depth and a fast pace of change. With bigger systems this is often not the case. They are more generic."
	"Integration is a risk, but it is way better manageable than decades ago."

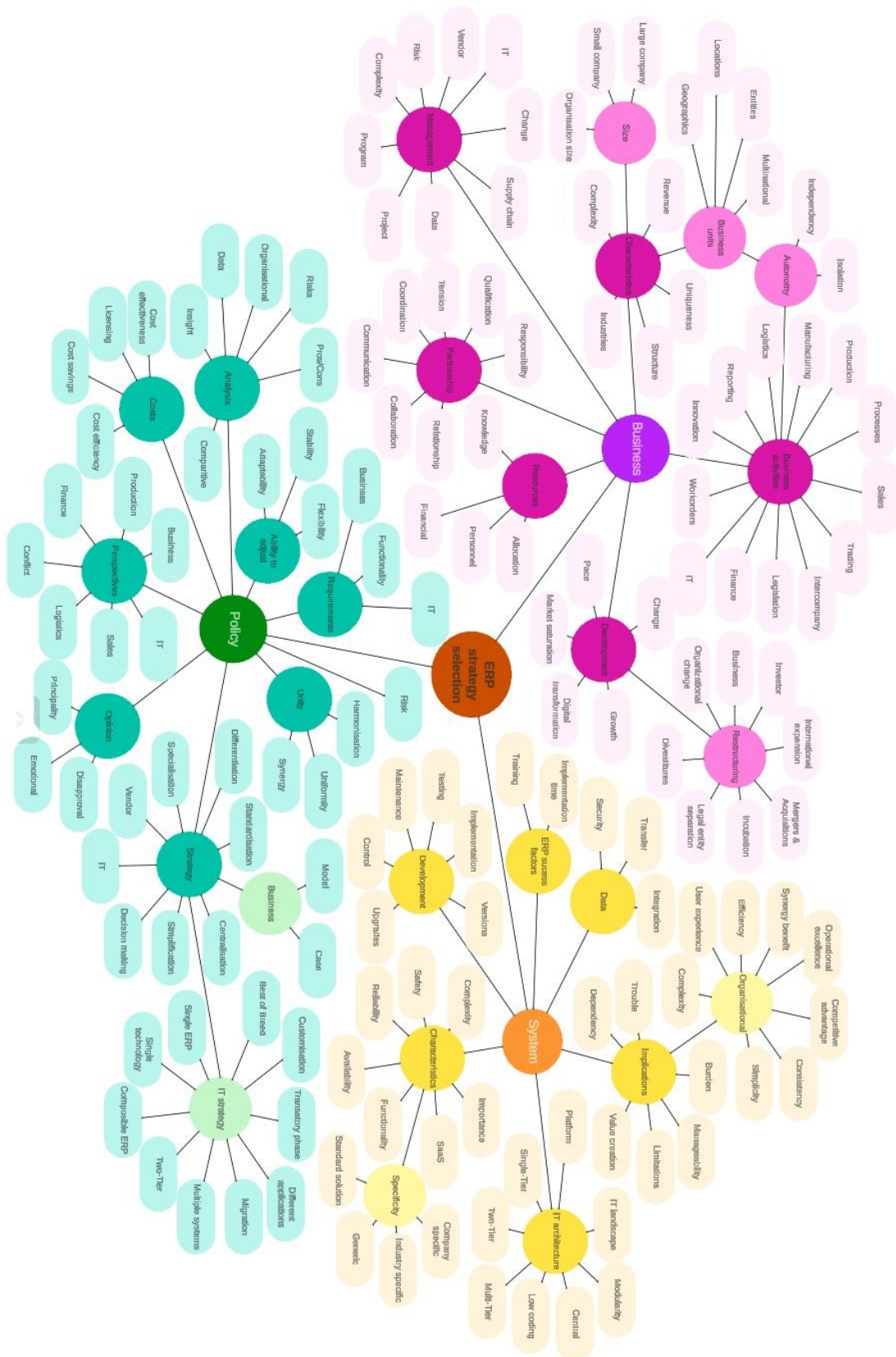# Appendix 4   Code tree

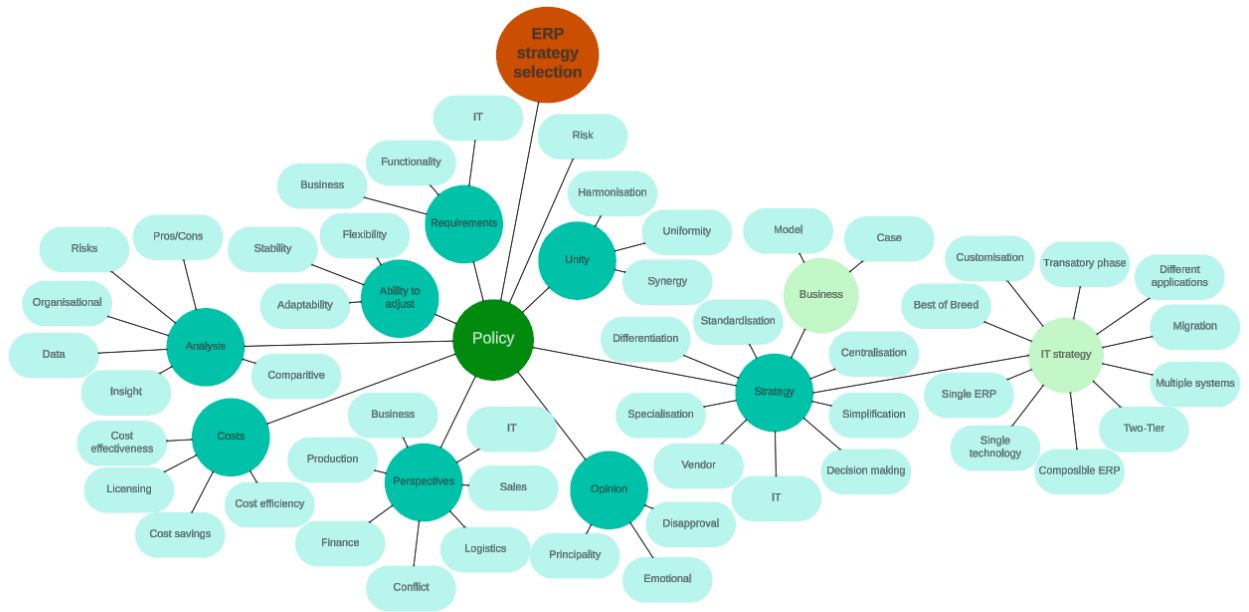*Figure A. 1: Code tree as a result of thematic analysis of interviews*

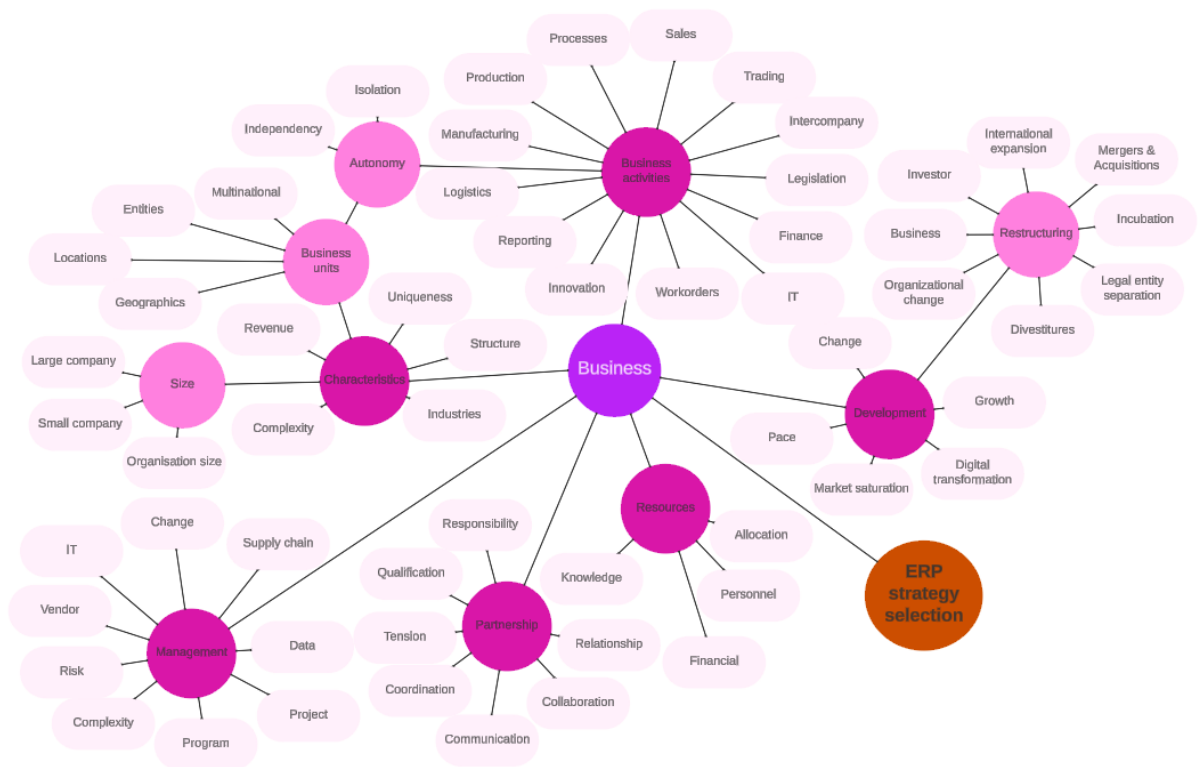*Figure A. 2: Code tree more specific of the theme Policy*

Figure A. 3: Code tree more specific of the theme Business

Figure A. 4: Code tree more specific of the theme System

Appendix 5   Introduction decision support tool

Welcome to the ERP selection strategy decision support tool, a comprehensive and user-friendly resource designed to help firms navigate the challenging process of determining the most suitable Enterprise Resource Planning (ERP) strategy. The major purpose of this tool is to enable informed decision-making by assisting in the selection of the most suitable ERP strategy adapted to your organisation's specific needs and goals. To ensure proper use, it is critical to understand the limits that shape this tool. The decision support tool is specifically designed for manufacturing and sales enterprises who are dealing with the challenges of a single ERP system that does not meet their present and future needs. It is critical, however, that potential users approach the tool with an open mind, willing to try novel strategies. The success of the decision support tool is dependent on the user's willingness to evaluate other ERP strategies. Importantly, the approach is meant to remove merger and acquisition factors, resulting in a focused and relevant assessment for businesses dealing solely with the shortcomings of a single ERP system. The tool's inventor cannot be held responsible for the consequences of the chosen strategy. It is still the company's responsibility to have a successful ERP project.

The decision support tool is intended to be a reusable asset, supporting several rounds of evaluation and strategic decision-making in the context of ERP initiatives. The users should be key decision-makers in ERP projects, including the Chief Commercial Officer (CCO) and top-level managers from the IT and Supply Chain departments. The decision support tool is designed for group decision-making sessions and emphasises the importance of diverse perspectives from various functional areas. Users are urged to use their professional insights while embracing the viewpoints inherent in their individual positions. The decision support tool is divided into two distinct phases, which follow an organised method. The initial phase entails extensive study, which lays the groundwork for informed decision-making. The following phase consolidates the decision-making process into a single session, boosting efficiency and cohesion in selecting an ERP strategy.

Employees with some experience of ERP systems should utilise the decision support tool; nonetheless, to ensure clarity, below are some definitions and clarifications that are specified for this case:

ERP (Enterprise Resource Planning): An integrated software solution that helps an organisation manage its numerous business operations and services, such as finance, human resources, supply chain, and manufacturing.

Single ERP Strategy: An approach in which an organisation uses a single, integrated ERP system to manage all its business operations and functions.

Two-tier ERP strategy: A strategy in which an organisation uses various ERP systems, typically at different levels or business units, to serve distinct demands or functions.

Two-Tier Single Vendor strategy: A Two-Tier strategy where both ERP systems are different, but from the same vendor.

Two-Tier Multiple Vendor strategy: A Two-Tier strategy where both ERP systems are different and from different vendors.

Transitory Phase: A phase during ERP strategy implementation in which a Two-Tier method is used as an interim solution before moving to a Single ERP strategy.

Group Decision-Making: The collaborative approach of involving numerous stakeholders, including top-level management and department heads, in the process of developing an ERP strategy.

Intercompany processes: The many transactions and activities that occur between different entities or subsidiaries of the same corporate group or parent company. It is ideal to have a single ERP system when intercompany processes are in place, eliminating the requirement for integrations.

Differentiation: The process of separating a company's products or services from those of its competitors to make them more appealing to the target market. A more specialised system is frequently favoured when functional differentiation exists.

Divestiture: A company's strategic choice to sell, spin off, or otherwise dispose of a portion of its business or assets. This action entails the separation and sale of a subsidiary, business unit, division, or a portion of the company's assets to third parties. It is preferable to have a separate system for divestment, requiring the termination of just integrations.

Centralised operational framework: A business model or organisational structure in which important decision-making authority, control, and coordination of operations are concentrated at one single location inside the organisation. In this architecture, operational processes, policies, and strategic directives are developed and implemented by a central headquarters or management team, which has great influence over multiple functional units or divisions. This makes a single ERP system more suitable.

Flexibility: The ability to adapt and respond to changing requirements, situations, or demands without needing large changes or interruptions to the existing infrastructure. There is greater flexibility when numerous systems are in place.

Appendix 6   Final introduction decision support tool

Welcome to the ERP selection strategy decision support tool, a comprehensive and user-friendly resource designed to help firms navigate the challenging process of determining the most suitable Enterprise Resource Planning (ERP) strategy. The major purpose of this tool is to enable informed decision-making by assisting in the selection of the most suitable ERP strategy adapted to your organisation's specific needs and goals. To ensure proper use, it is critical to understand the limits that shape this tool. The decision support tool is specifically designed for manufacturing and sales enterprises who are dealing with the challenges of a single ERP system that does not meet their present and future needs. It is critical, however, that potential users approach the tool with an open mind, willing to try novel strategies. The success of the decision support tool is dependent on the user's willingness to evaluate other ERP strategies. Importantly, the approach is meant to remove merger and acquisition factors, resulting in a focused and relevant assessment for businesses dealing solely with the shortcomings of a single ERP system. The tool's inventor cannot be held responsible for the consequences of the chosen strategy. It is still the company's responsibility to have a successful ERP project.

The decision support tool is intended to be a reusable asset, supporting several rounds of evaluation and strategic decision-making in the context of ERP initiatives. The users should be key decision-makers in ERP projects, including the Chief Commercial Officer (CCO) and top-level managers from the IT and Supply Chain departments. The decision support tool is designed for group decision-making sessions and emphasises the importance of diverse perspectives from various functional areas. Users are urged to use their professional insights while embracing the viewpoints inherent in their individual positions. The decision support tool is divided into two distinct phases, which follow an organised method. The initial phase entails extensive study, which lays the groundwork for informed decision-making. The following phase consolidates the decision-making process into a single session, boosting efficiency and cohesion in selecting an ERP strategy.

Employees with some experience of ERP systems should utilise the decision support tool; nonetheless, to ensure clarity, below are some definitions and clarifications that are specified for this case:

ERP (Enterprise Resource Planning): An integrated software solution that helps an organisation manage its numerous business operations and services, such as finance, human resources, supply chain, and manufacturing.

Single ERP Strategy: An approach in which an organisation uses a single, integrated ERP system to manage all its business operations and functions.

Two-tier ERP strategy: A strategy in which an organisation uses various ERP systems, typically at different levels or business units, to serve distinct demands or functions.

Two-Tier Single Vendor strategy: A Two-Tier strategy where both ERP systems are different, but from the same vendor.

Two-Tier Multiple Vendor strategy: A Two-Tier strategy where both ERP systems are different and from different vendors.

Transitory Phase: A phase during ERP strategy implementation in which a Two-Tier method is used as an interim solution before moving to a Single ERP strategy.

Group Decision-Making: The collaborative approach of involving numerous stakeholders, including top-level management and department heads, in the process of developing an ERP strategy.

Single Supply Chain: Business model in which a company's business units share the same supply chain. This means that there are no distinct business processes, only serial related processes. It is ideal to have a single ERP system when intercompany processes are in place, eliminating the requirement for integrations.

Intercompany processes: The many transactions and activities that occur between different business units or subsidiaries of the same corporate group or parent company. It is ideal to have a single ERP system when intercompany processes are in place, eliminating the requirement for integrations.

Differentiation: The process of separating a company's products or services from those of its competitors to make them more appealing to the target market. A more specialised system is frequently favoured when functional differentiation exists.

Divestiture: A company's strategic choice to sell, spin off, or otherwise dispose of a portion of its business or assets. This action entails the separation and sale of a subsidiary, business unit, division, or a portion of the company's assets to third parties. It is preferable to have a separate system for divestment, requiring the termination of just integrations.

Autonomous: Independence and a high level of decision-making authority, controlling operations, resources, and strategic direction with little interference from central leadership. This includes, but is not limited to, choosing one's own IT systems.

Centralised operational framework: A business model or organisational structure in which important decision-making authority, control, and coordination of operations are concentrated at one single location inside the organisation. In this architecture, operational processes, policies, and strategic directives are developed and implemented by a central headquarters or management team, which has great influence over multiple functional units or divisions. This makes a single ERP system more suitable.

Flexibility: The ability of an IT infrastructure to adapt, scale, and respond to changing needs and conditions. It refers to the architecture's ability to be quickly adjusted or reconfigured to fit changing business requirements, technical improvements, or external variables without significantly disrupting its operations or performance. There is greater flexibility when numerous systems are in place.

Appendix 7   Decision support tool: PowerPoint version

Phase 1

- Analyse the business strategy, operational needs, functional requirements, and industry-specific specifications of the firm
- Analyse current and other ERP systems from the current vendor and decide which requirements can be met without customisations

Go to Phase 2

Figure A. 5: Part 1 of decision support tool PowerPoint version

Number of business units

When there are multiple business units, it's often better to not go from one ERP to another ERP in one big bang

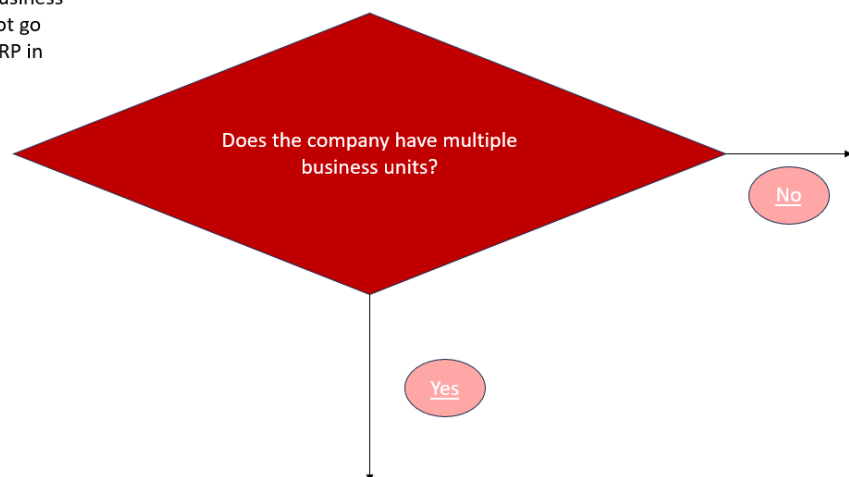Does the company have multiple business units?

No

Yes

Figure A. 6: Part 2 of decision support tool PowerPoint version

IT expertise

With multiple ERP
systems a lot of IT
knowledge and skills is
necessary. IT expertise
could still be brought on
board before time of
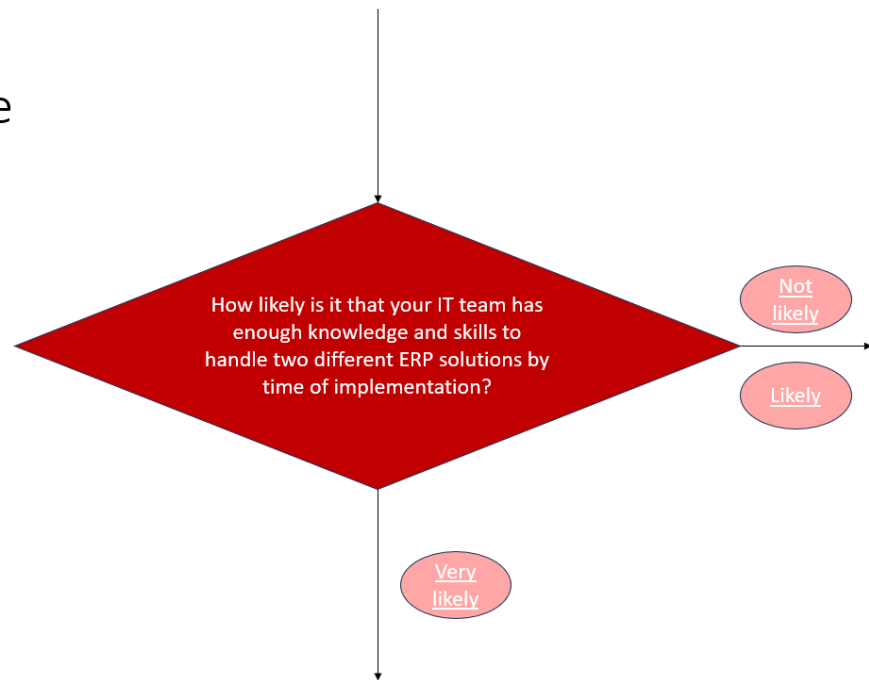implementing, thus keep
this in mind

How likely is it that your IT team has
enough knowledge and skills to
handle two different ERP solutions by
time of implementation?

Not
likely

Likely

Very
likely

Figure A. 7: Part 3 of decision support tool PowerPoint version

Functionality

When the current ERP system is still
viable for some parts of the
business, it is possible to keep the
current system

Is part of the current ERP system for
some parts of the business still
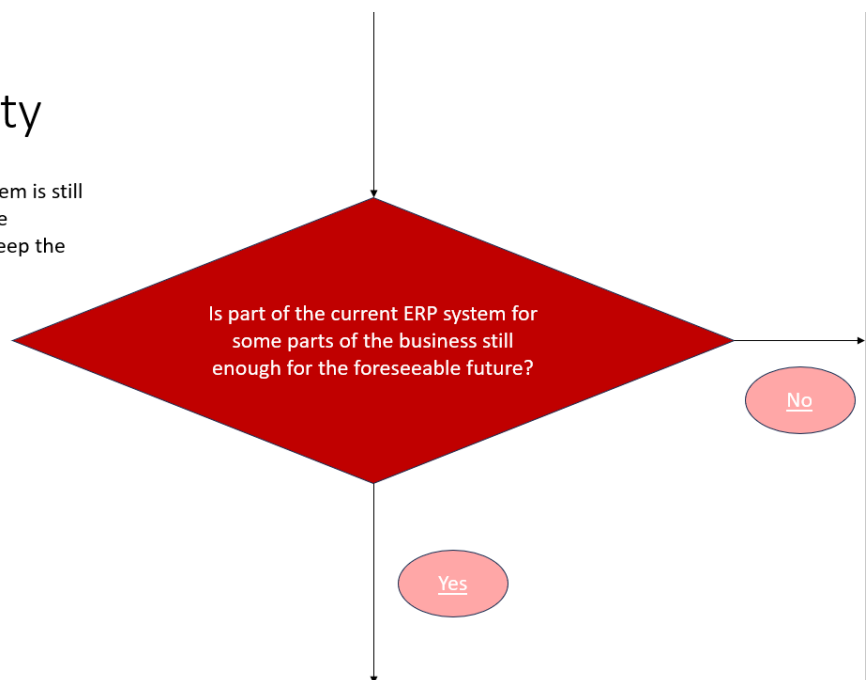enough for the foreseeable future?

No

Yes

Figure A. 8: Part 4 of decision support tool PowerPoint version

Single supply chain

Single supply chain: Business model in which a company's business units share the same supply chain. This means that there are no distinct business processes, only serial related processes.

Intercompany processes: The many transactions and activities that occur between different business units or subsidiaries of the same corporate group or parent company.
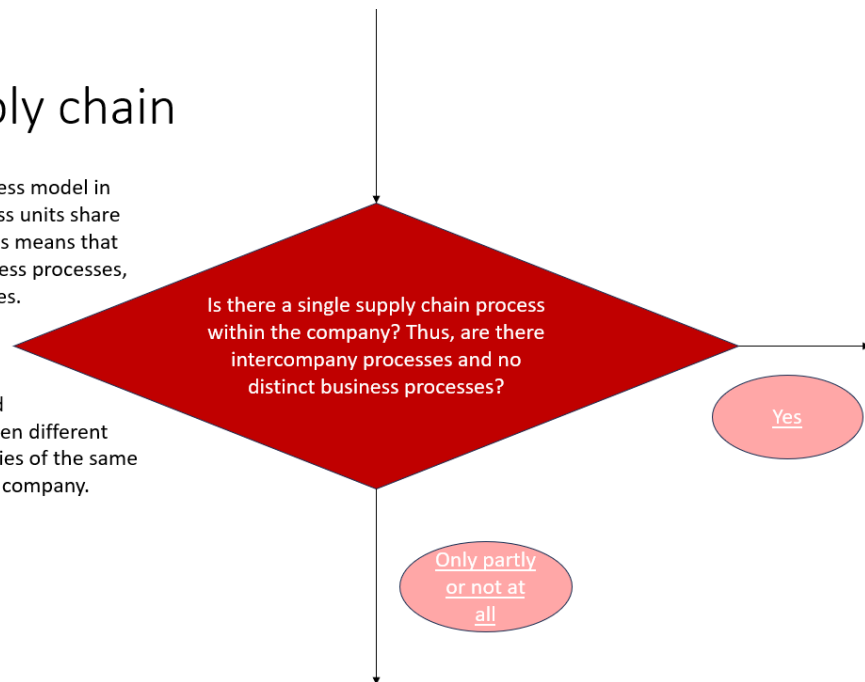
Is there a single supply chain process within the company? Thus, are there intercompany processes and no distinct business processes?

Yes

Only partly or not at all

Figure A. 9: Part 5 of decision support tool PowerPoint version

Differentiation

Differentiation is the process of separating a company's products or services from those of its competitors to make them more appealing to the target market.
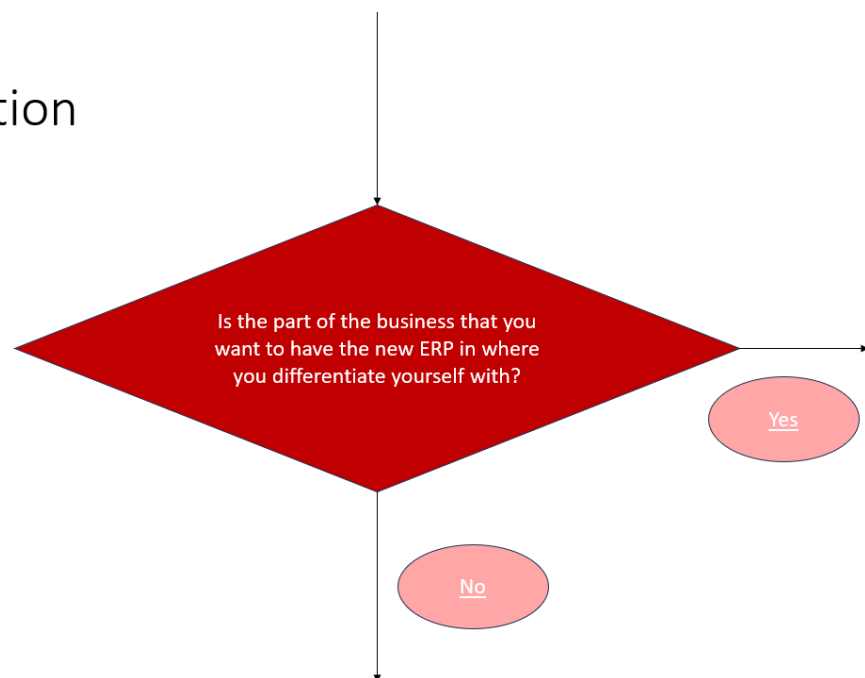A more specialised system is frequently favoured when functional differentiation exists.

Is the part of the business that you want to have the new ERP in where you differentiate yourself with?

Yes

No

Figure A. 10: Part 6 of decision support tool PowerPoint version

Divestitures & autonomous divisions

Divestiture: A company's strategic choice to sell, spin off, or otherwise dispose of a portion of its business or assets. This action entails the separation and sale of a subsidiary, business unit, division, or a portion of the company's assets to third parties. It is preferable to have a separate system for divestment, requiring the termination of just integrations.

Autonomous: Independence and a high level of decision-making authority, controlling operations, resources, and strategic direction with little interference from central leadership. This includes, but is not limited to, choosing one's own IT systems.
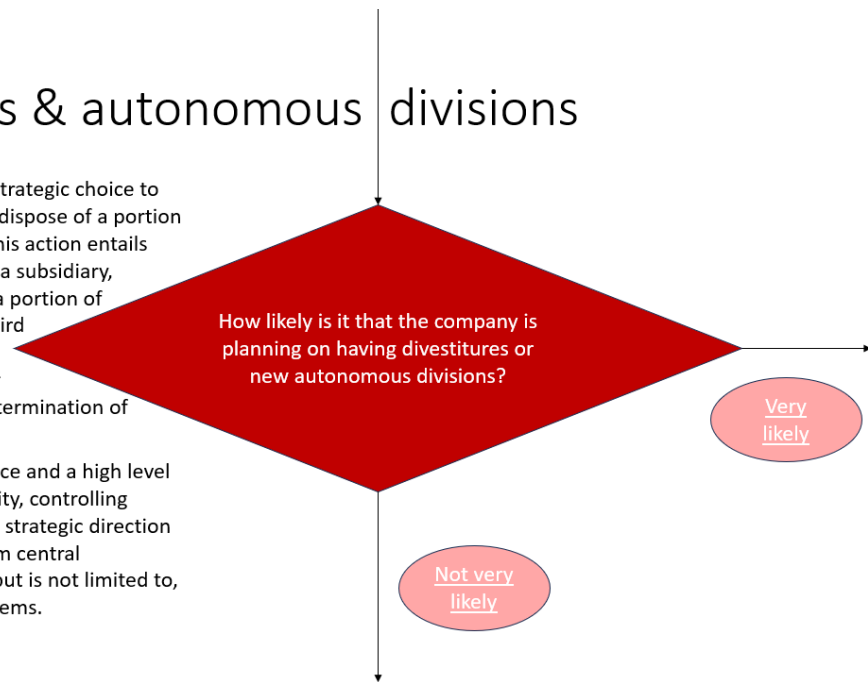
How likely is it that the company is planning on having divestitures or new autonomous divisions?

Very likely

Not very likely

Figure A. 11: Part 7 of decision support tool PowerPoint version

Local autonomy

Autonomy entails independence and a high level of decision-making authority, controlling operations, resources, and strategic direction with little interference from central leadership. This includes, but is not limited to, choosing one's own IT systems.
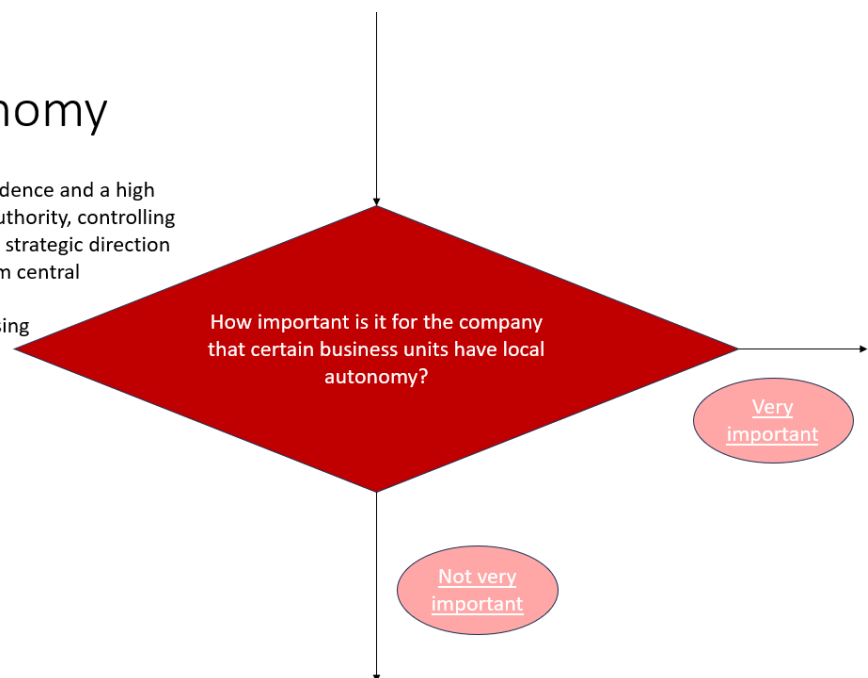
How important is it for the company that certain business units have local autonomy?

Very important

Not very important

Figure A. 12: Part 8 of decision support tool PowerPoint version

Legislation

Legal reasons for separation could be keeping the liability separate, easier shutting down entities and laws that only allow to have systems and data in certain countries.
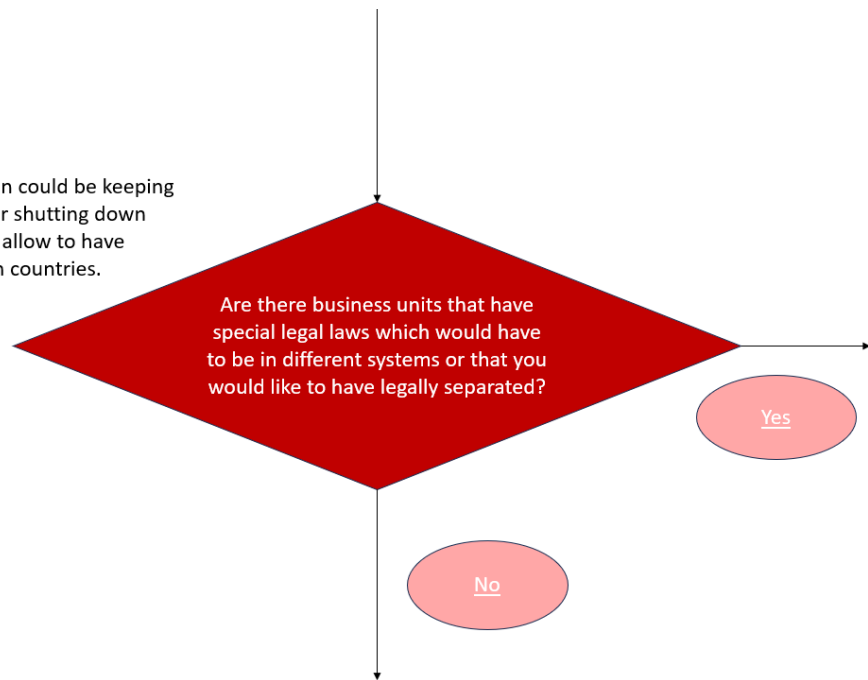
Are there business units that have special legal laws which would have to be in different systems or that you would like to have legally separated?

Yes

No

Figure A. 13: Part 9 of decision support tool PowerPoint version

Centralisation

Centralisation is a business model or organisational structure in which important decision-making authority, control, and coordination of operations are concentrated at one single location inside the organisation.

In this architecture, operational processes, policies, and strategic directives are developed and implemented by central headquarters or a management team, which has great influence over multiple functional units or divisions.
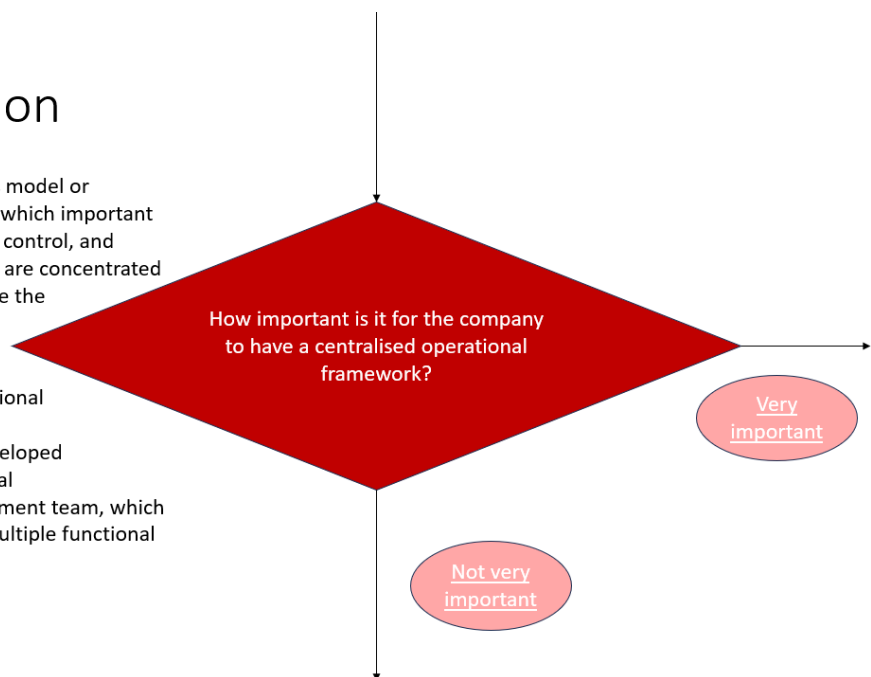
How important is it for the company to have a centralised operational framework?

Very important

Not very important

Figure A. 14: Part 10 of decision support tool PowerPoint version

Flexibility

Flexibility is the ability of an IT infrastructure to adapt, scale, and respond to changing needs and conditions. It refers to the architecture's ability to be quickly adjusted or reconfigured to fit changing business requirements, technical improvements, or external variables without significantly disrupting its operations or performance.
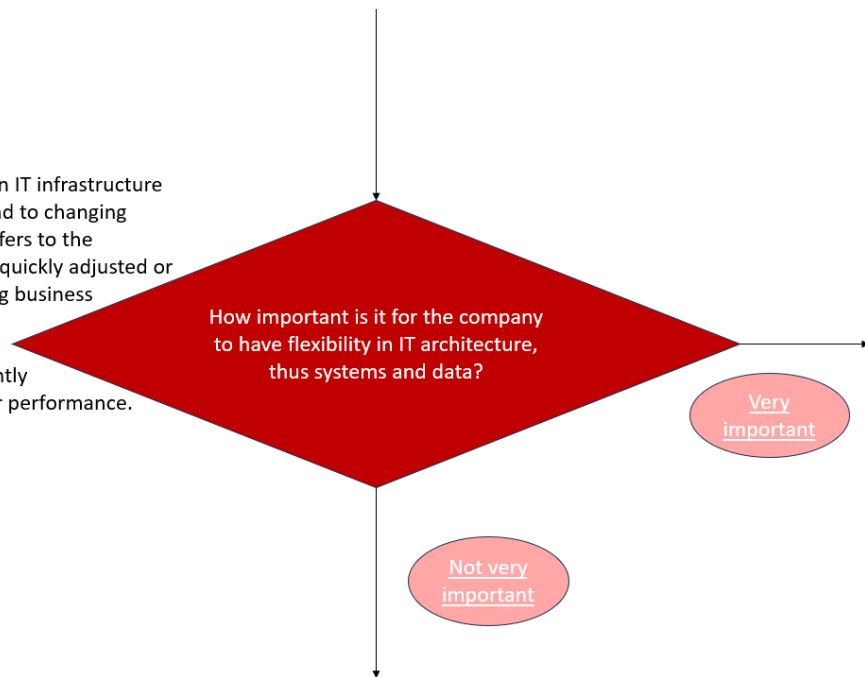
How important is it for the company to have flexibility in IT architecture, thus systems and data?

Very important

Not very important

Figure A. 15: Part 11 of decision support tool PowerPoint version

Size of the company

When a company is too big, it is often not feasible to have one ERP system. The implementation will almost always fail.

Would the company be able to handle one ERP system, or is it too big with multiple business units in multiple countries with different functionalities?
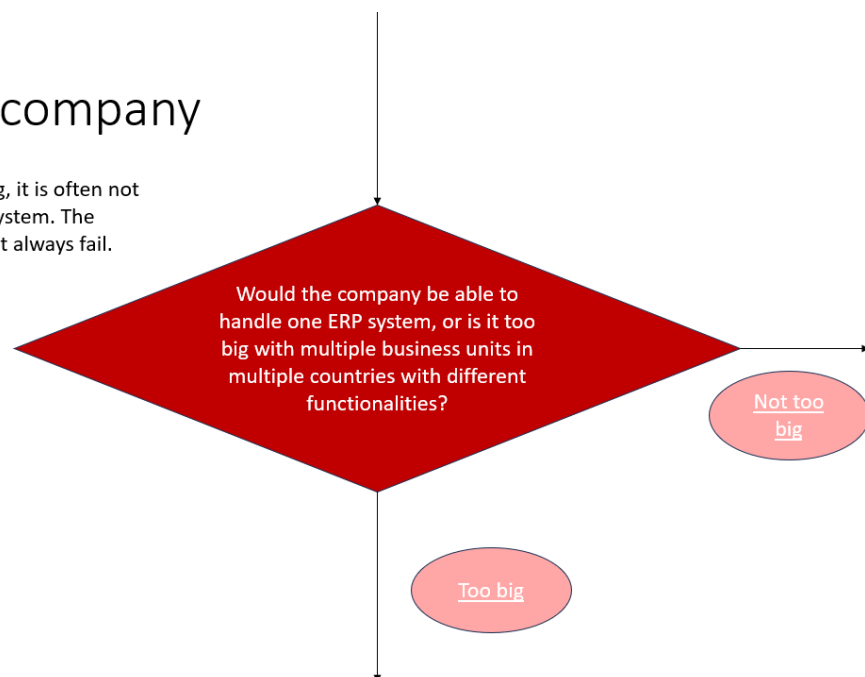
Not too big

Too big

Figure A. 16: Part 12 of decision support tool PowerPoint version

Functionality vs business units

The migration of a single ERP system might not be feasible, thus a Two-Tier approach would be better.

Would the company want to separate their ERP systems on business units or functionality?

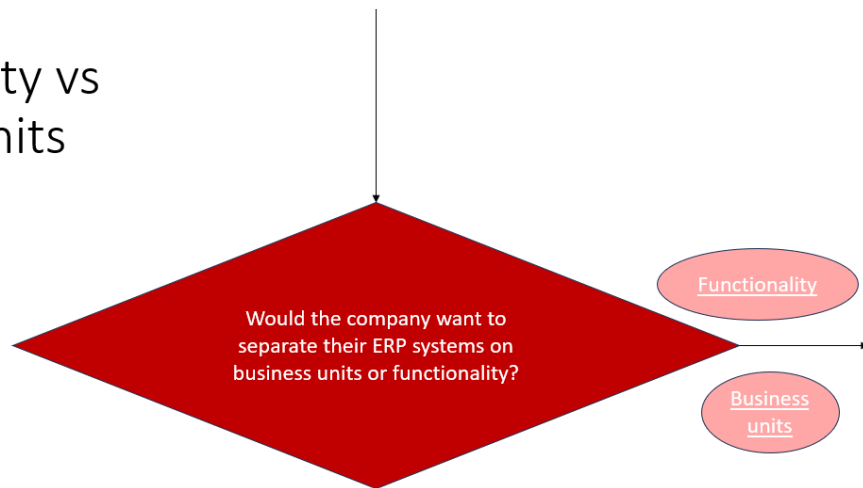Functionality

Business units

Figure A. 17: Part 13 of decision support tool PowerPoint version

ERP system

In terms of change management and IT, it is best to stay with the same technology and vendor whenever possible

Does your current vendor have an ERP system that does cover the requirements without customisation?
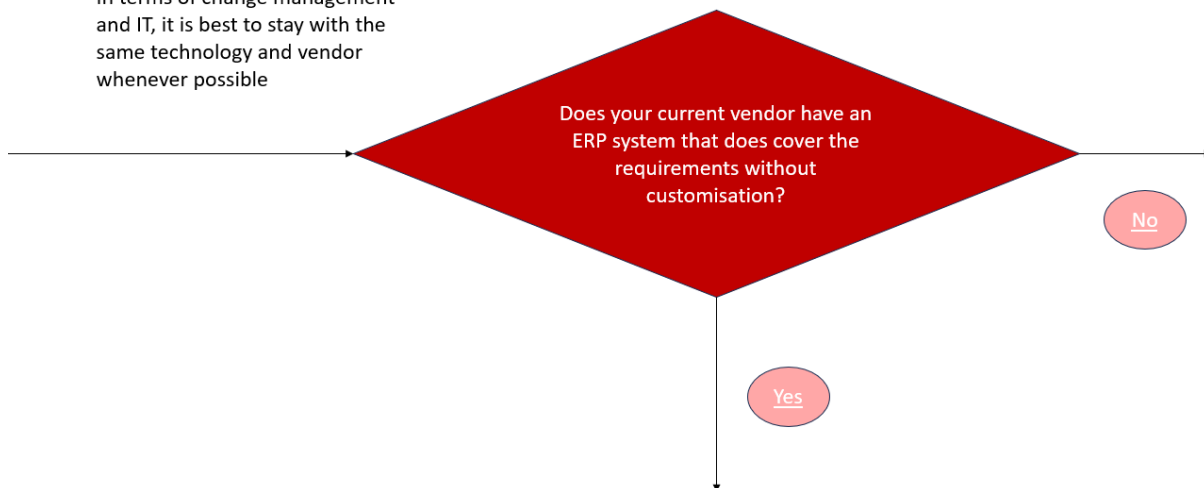
No

Yes

Figure A. 18: Parts 14, 15, 16 and 17 of decision support tool PowerPoint version

Trusted vendor

Implementing an ERP system is a complicated and large project, thus a trusted vendor is important.
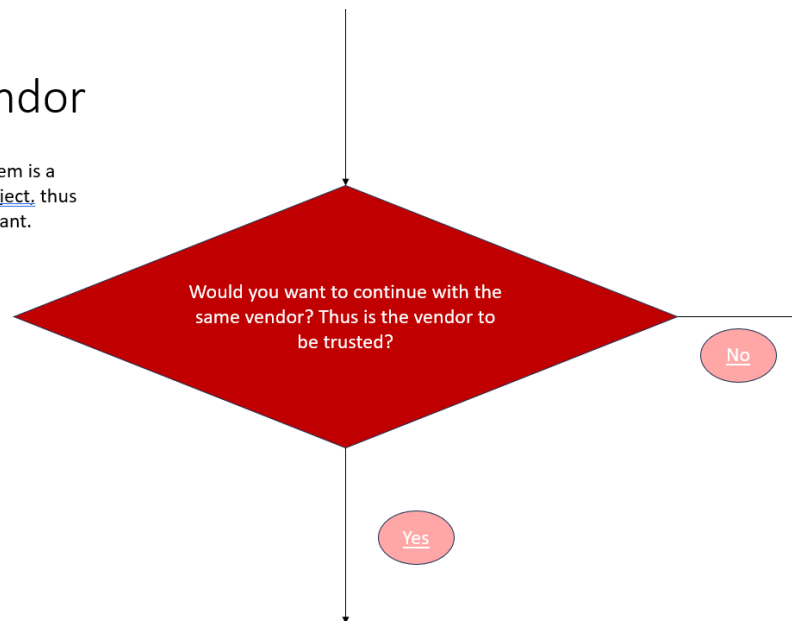
Would you want to continue with the same vendor? Thus is the vendor to be trusted?

No

Yes

Figure A. 19: Part 18, 19, 20 and 21 of decision support tool PowerPoint version

ERP strategy

Go for a single ERP strategy with an ERP system from a different vendor

- ✔ Standardised data structure, increased operational efficiency, intercompany processes and centralised operational framework
- ✖ Generic solution, inflexibility, vendor lock-in, change mitigation

Next

Figure A. 20: Part 22 of decision support tool PowerPoint version

ERP strategy

Go for a single ERP strategy with another ERP system from the current vendor

- ✔ Standardised data structure, increased operational efficiency, intercompany processes and centralised operational framework, change mitigation
- ✖ Generic solution, inflexibility, vendor lock-in

Next

Figure A. 21: Part 23 of decision support tool PowerPoint version

ERP strategy

Go for a single ERP strategy with a <u>transitory</u> Two-Tier multiple vendor strategy

- ✅ <u>Standardised</u> data structure, increased operational efficiency, intercompany processes, <u>centralised</u> operational framework, change mitigation
- ❌ Generic solution, inflexibility, requires some IT expertise, vendor coordination

Next

Figure A. 22: Part 24 of decision support tool PowerPoint version

ERP strategy

Go for a single ERP strategy with a <u>transitory</u> Two-Tier single vendor strategy

- ✅ <u>Standardised</u> data structure, increased operational efficiency, intercompany processes, <u>centralised</u> operational framework, change mitigation
- ❌ Generic solution, inflexibility, requires some IT expertise, vendor lock-in

Next

Figure A. 23: Part 25 of decision support tool PowerPoint version

ERP strategy

Go for a Two-Tier single vendor ERP strategy based on different business units

- ✅ Autonomy, risk mitigation and differentiation on business units

- ❌ Complex, requires high level of IT expertise, vendor lock-in

Next

Figure A. 24: Part 26 of decision support tool PowerPoint version

ERP strategy

Go for a Two-Tier multiple vendor ERP strategy based on different business units

✔ Autonomy, risk mitigation and differentiation on business units

✖ Complex, requires high level of IT expertise, vendor coordination

Next

Figure A. 25: Part 27 of decision support tool PowerPoint version

ERP strategy

Go for a Two-Tier single vendor ERP strategy based on different functionality

✔ Flexibility, scalability, and differentiation

✖ Complex, requires high level of IT expertise, vendor lock-in

Next

Figure A. 26: Part 28 of decision support tool PowerPoint version

ERP strategy

Go for a Two-Tier multiple vendor ERP strategy based on different functionality

✔ Flexibility, scalability, and differentiation

✖ Complex, requires high level of IT expertise, vendor coordination

Next

Figure A. 27: Part 29 of decision support tool PowerPoint version

Change management

- Make sure the company is ready for change, through user integration and training

End

Figure A. 28: Part 30 of decision support tool PowerPoint version