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ERP MIGRATIONS – CHOOSING A SUITABLE MIGRATION APPROACH

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Yritysten digitalisaation myötä toiminnanohjausjärjestelmien vaatimukset ovat muuttuneet ja tarve muun muassa paremmalle käytettävyydelle, pilvipohjaisuudelle ja tekoälylle on kasvamassa. SAP:in uusin toiminnanohjausjärjestelmä SAP S/4HANA on luotu vastaamaan näihin vaatimuksiin ja monet yritykset ovatkin siirtymässä käyttämään sitä vanhan ERP-järjestelmänsä sijaan. Migraatio vanhasta yritysjärjestelmästä uuteen on kuitenkin aina suuri ja hankala prosessi, joka vaatii yritykseltä tarkkaa suunnittelua. Tämän tutkimuksen tavoitteena on tunnistaa keinoja, joilla yritykset voivat valita juuri oikean migraatiotavan uuteen ERP-järjestelmään, käyttäen SAP S/4HANA -järjestelmää tutkimustapauksena. Tutkimuksessa käsitellään siirtymistä vanhasta järjestelmäarkkitehtuurista uuteen, eri migraatiomenetelmiä ja niiden eroja sekä kustomoinnin mahdollistamista uuteen järjestelmään siirtyessä. Systemaattisen kirjallisuuskatsauksen avulla tunnistetaan käytetyimpiä migraatiomenetelmiä sekä niiden valintaa ohjaavia tekijöitä. Laadullisessa tutkimuksessa käydään läpi konsulttiyrityksen näkemyksiä migraation onnistumisesta sekä migraatiomenetelmien eroista.

Asiasanat: ERP, migraatio, SAP S/4HANA, yritysjärjestelmä

ABSTRACT

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As companies face digitalization, the requirements for ERP systems change. There is an increasing need for better usability, cloud-based services, and artificial intelligence among other things. The newest ERP suite of SAP, SAP S/4HANA, is created to fulfill these new requirements and many companies are shifting into it from their old systems. However, the migration from legacy enterprise system to a new one is always a major and difficult process that requires a lot of careful planning from the company. The goal of this research is to recognize ways to choose just the right migration method to a new ERP system for the company, using SAP S/4HANA as a study case. The research covers the migration from old system architecture to the new one, different migration approaches, and the enabling of customization when transforming to the new system. With a systematic literature review, the most used migration approaches and factors guiding the choosing of one are recognized. In a qualitative study, the views of a consultant company are discovered on the successfulness of a migration and on different migration approaches.

Keywords: ERP, migration, SAP S/4HANA, enterprise system

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1 INTRODUCTION

Enterprise resource planning (ERP) is a part of enterprise systems (ES) alongside other systems such as customer relationship management, and supply chain management. ERP is considered to be the most important class in enterprise system software. Organizations use ERP systems to share enterprise-wide data and practices, automate and integrate their business processes, and access all the information real-time. The benefits of ERP appear mostly as operational improvements by enhanced decision-making, and support for strategic goals. (Shanks, Seddon & Willcocks, 2003.)

SAP S/4HANA is SAP's newest business suite that is optimized for their in-memory database SAP HANA. It offers companies an ERP system for the era of digital transformation with solutions for intelligent decision making, process automation, and much more. (Saueressig et al., 2021.) The transition to SAP S/4HANA is becoming an inevitable change to many companies, since SAP has announced that it will stop providing mainstream maintenance for its core applications of SAP ERP 6.0 by the end of 2027 (Schmidthals, 2022). Now companies are faced with big changes regarding the transition, and it is crucial for them to optimize the migration from their old ERP system to the new one. ERP migration is found to be one of the top challenges with ERP as it is an intense and complex process (Mahmood, Khan & Bokhari, 2020).

There are three migration approaches from legacy ERP system to SAP S/4HANA that are widely used. The first migration approach is the new implementation, also called as Greenfield. With this approach, organization implements a whole new standardized ERP system with SAP's best practices and a clean core. With this approach, it does not matter if the organization has previously had an SAP or non-SAP ERP system, since the SAP S/4HANA is implemented as a whole new system. With the new system, organizations can adopt business processes based on SAP's best practices. (SAP SE, 2021.)

The second migration approach is the system conversion, also called as Brownfield. It is a complete technical in-place conversion of company's previous SAP ERP system to SAP S/4HANA. It means, that a company can bring their

existing business processes and data to the new platform and adopt SAP's new innovations at their own speed. With Brownfield, companies can start the migration rapidly by reusing their existing capacities. (SAP SE, 2021.)

The third and last migration approach is the selective data transition, which combines these two previous approaches, Greenfield and Brownfield. With selective data transition, companies can cover the migration of relevant business data from their previous SAP ERP system to SAP S/4HANA. They can retain some historical data and combine it with redesigned business processes. (SAP SE, 2021.) SNP has recently trademarked their selective data transition solution as Bluefield (SNP SE, 2019).

The goal of this research is to collect information from the various migration approaches, define common characteristics, and enhance understanding of the challenging process of system migration. The findings could help consultant and customer companies to plan their migration process better to avoid failures and customer unsatisfaction. The research questions guiding this study are:

- How should companies choose a suitable migration approach to their new ERP system?
    - How the different migration approaches affect companies financially and operatively?
    - What options are there to customize the new system while maintaining its standard functionalities?

The research was carried out in two phases. Firstly, a systematic literature review was conducted based on Templier and Paré's (2015) framework for literature reviews. Literature was searched of ERP migration approaches and factors guiding the selection of the migration approach. 233 articles were selected for further analysis and 32 of those were selected as applicable for the study. From these articles, the relevant information was gathered for further analysis.

In the second phase, a qualitative case study was conducted. Qualitative case study is qualitative research, where focus is on one or more cases in a certain environment. Case study includes an in-depth analysis of the cases, people, and organization. (Baskarada, 2014.) The data was collected primarily from interviews that were carried out as semi-structured. The interviewees were from a large Finnish consulting company operating mainly in Nordic countries. The company's SAP department plans and executes SAP migrations to client organizations and has a strong competence in SAP S/4HANA migrations for various clients.

The paper is divided into six chapters from which the first one is introduction. Chapter two defines enterprise resource planning on a general level and introduces SAP S/4HANA. Chapter two contains the systematic literature review and its findings. In the end of the chapter, the findings from literature review are applied to SAP S/4HANA migration cases. Chapter four introduces the research methods for the qualitative case study and chapter five presents the

findings. In chapter six, reflection and analysis is conducted based on the findings, and research limitations are discussed. Findings from the literature review are compared with findings from the qualitative case study for further analysis. Chapter seven is a conclusion chapter, where main findings are reviewed and further research topics are suggested.

2 ENTERPRISE RESOURCE PLANNING

Enterprise resource planning (ERP) is a collection of software systems used to manage enterprise's various business processes, such as accounting, production, and purchasing. These processes are done in an integrated way, as ERP software records transactions in a common database that the whole company uses on their information systems. (Monk & Wagner, 2006.) This chapter will introduce enterprise resource planning over time, its key concepts, and importance to business.

2.1 Enterprise systems and evolution of enterprise resource planning

To understand enterprise resource planning, it is beneficial to introduce enterprise systems (ES) first. According to Davenport (1998), enterprise systems were created in order to manage large quantities of data within a company, and keep the data collected in a single database to avoid information fragmentation. The data to ES comes from various applications that support the company's business activities, such as sales and accounting. When new data is put in the ES database, all the related data is updated accordingly, and it can be used in the business applications. ES is therefore a highly useful system, but it is more than merely a business tool used by the company. It is a defining part of an organization and its strategy that determines the way a company does business. (Davenport, 1998.)

Shanks, Seddon, and Willcocks (2003) define enterprise systems as "– – large-scale organizational systems, built around packaged enterprise system software". They describe enterprise system software (ESS) in three parts, which can be summarized as 1) packaged application software modules for data integration in real time, 2) providing deep knowledge of company's business practices, and 3) containing tables and parameters that company needs to customize and bring into use in their business, integrating it to their other information systems. Companies purchase ESS from vendors such as SAP, Oracle, and Siebel to save costs on developing custom software. (Shanks et al., 2003.)

The introduction of ES brings us to the concept of enterprise resource planning (ERP). ERP is a part of ESS, alongside other ESS classes such as customer relationship management, supply chain management, and product lifecycle management. Out of all ESS classes, ERP is considered to be the most important one (Shanks, Seddon & Willcocks, 2003). Møller (2005) defines ERP as:

> – – a standardized software package designed to integrate the internal value chain of an enterprise. An ERP system is based on an integrated database and consists of several modules aimed at specific business functions.

To simplify, ERP is used to manage business processes with data.

ERP began its journey in the 1950s when computers started to become more common in business, and the first applications were used to automate bookkeeping, invoicing, and other manual tasks (Møller, 2005). At that time, large manufacturing companies were using Material Requirement Planning (MRP) to keep track of all their material. MRP was designed only for manufacturer use, but ERP's aim was to integrate all the functional areas of a business. Even though ERP has been around for over 50 years, companies started heavily implementing ERP only in the 1990s, due to the fear of new millennium and Y2K software problems. (Nah, 2002.)

The Y2K problem, as Monk and Wagner (2006) call it, rose in 1990's when programmers realized that their programs used only two digits to indicate a year, such as 12/10/85. This was done to save storage space, as it was much more limited those days compared to the present. In order to still identify the year after moving to 2000s, all of the programs in a software had to be modified, or even replaced by new ones. This shift caused many ERP software vendors to offer new and updated systems that could tackle the Y2K problem, but also offer improved ways for companies to manage their business processes. The leader of ERP software vendors at the time was SAP, that in its new ERP software offered many business advantages, such as real-time data that was distributed to all business units. SAP's biggest competitors were PeopleSoft and Oracle, which provided similar functionalities, but not as a wide variety or high quality as SAP. PeopleSoft had its strengths in human resources, while Oracle focused on improving their relational database. (Monk & Wagner, 2006.) Later Oracle took over PeopleSoft, and it is still a part of their offering.

2.1.1 ERP II

When ERP technology started to develop and reach more business areas, a concept of ERP II was introduced, first by GartnerGroup. The main difference in ERP II from its predecessor is that it is using components to integrate business functions (Møller, 2005; Nah, 2002). Møller (2005) discusses that the reasons behind moving to ERP II in the beginning of 2000s were an e-business challenge with traditional ERP, and a growing need for application integration. Companies wanted to transfer themselves from vertically integrated organizations to agile and core-competency-based organizations, that optimize their supply-chain and

value network (Bond et al., 2000). ERP II can be defined by six elements that describe its technology, application, and business strategy. They are considered as the points that differentiate ERP II from traditional ERP (Møller, 2005). The elements are:

1. the role of ERP II,
2. its business domain,
3. the functions addressed within that domain,
4. the kinds of processes required by those functions,
5. the system architectures that can support those processes, and
6. the way in which data is handled within those architectures (Bond et al., 2000, Møller, 2005).

The changes between ERP and ERP II based on these six elements are further illustrated in Figure 1.

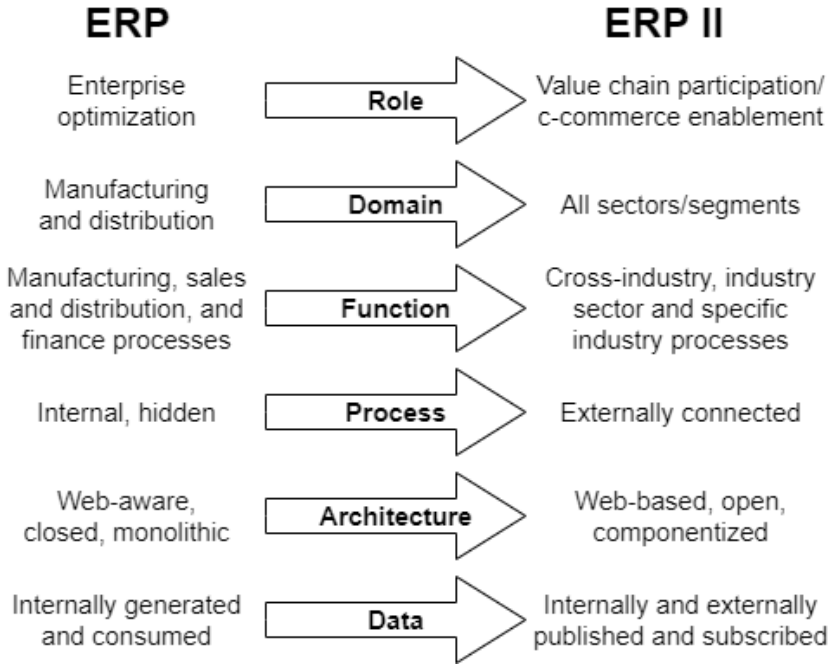

FIGURE 1: ERP II Definition Framework (in accordance with Bond et al., 2000)

To summarize the definition framework, ERP II incorporates e-business and collaboration in the supply chain and is componentized. Examples of components include application frameworks, databases, and decision support systems. Business intelligence (BI) is an example of an analytical DSS tool that is now integrated into the core of standard databases. Internet standards like XML have also been adopted into the infrastructure of ERP systems. The ERP industry gradually incorporated this new philosophy into legacy ERP systems, and all major vendors adopted the ERP II concept. The evolution was driven by emerging business requirements and new information technology. (Møller, 2005.)

2.1.2 The importance of ERP

Shang and Seddon (2000) study the benefits of ERP systems and collect the benefits found from the literature together. They categorize the discovered benefits into five dimensions:

1. operational benefits,
2. managerial benefits,
3. strategic benefits,
4. IT infrastructure benefits, and
5. organizational benefits.

The operational benefits of ERP systems come from automating and streamlining processes and transactions for improved business benefits. The streamlining can lead to minimizing costs and improving productivity, quality, and customer service. The managerial benefits of ERP systems are related to the centralized database and data analysis capabilities. These informational benefits help companies in achieving better resource management, improved decision making and planning, and performance improvement. (Shang & Seddon, 2000.)

The strategic benefits of ERP systems can be observed by achieving competitive differentiation. ERP can be used in customizing products or services for individual users at a lower cost and supporting a tight link with customers and all related business parties. ERP systems provide IT infrastructure benefits by providing a foundation to enable present and future business applications, reducing IT costs, and increasing the capability for quick and economic implementation of new applications. Finally, the organizational benefits of ERP systems are related to supporting organizational structure changes, facilitating employee learning, empowering workers, and building common visions. (Shang & Seddon, 2000.)

There are many benefits for companies to use ERP systems in their business operations and it can be clearly seen as profitable as a long-term investment. However, successful implementation of ERP systems requires careful planning, resource allocation, and effective change management. Nah et al. (2001) emphasize the importance of user training, education, and support in the implementation process. Also a clear business plan, vision, and effective communication is needed from the top management. Depending on the nature of the business, some customization might be needed to the system to support the company's business processes. As ERP covers a wide range of organization's functional areas, Nah et al. (2001) suggest that companies have a cross-functional ERP core team.

2.2 SAP S/4HANA

SAP S/4HANA is the newest ERP platform of SAP that is optimized for their in-memory database SAP HANA. It offers multiple advantages for companies to digitize their business processes through intelligent decision making, process automation, and much more. (Saueressig et al., 2021.) Before diving deeper into the technical and architectural points of SAP S/4HANA, it is beneficial to take a quick look at SAP as a company and its software solutions, mainly S/4HANA's predecessors SAP R/2, and R/3.

2.2.1 The history of SAP

An enterprise software company SAP was founded in 1972 in Germany by five system engineers. It started as a small company but has now reached the status as one of the world's leading producers of enterprise software. SAP's name originates from a German phrase "Systemanalyse Programmentwicklung" which is later abbreviated to SAP. Today the company's legal name is SAP SE, where SE stands for societas Europaea, a public company that follows the European Union corporate law. (SAP SE, 2022a.) SAP's first software was developed in 1973 to solve problems in manufacturing and logistics. Over time it expanded into other markets, such as finance and banking, and new business functions were added to it. The system was later called R/1 and it consisted of multiple modules for real-time financial accounting, and material management. (Lau, 2005.)

Over the years, SAP has continuously developed new and updated versions of their enterprise system to tackle the changing challenges of customers' business processes. Saueressig et al. (2021) explain the different software architectures of SAP R/2 and SAP R/3, which have made these solutions successful in their time. SAP R/2 was launched in 1979 and it was developed directly onto customers' hardware, because SAP in its early stages could not afford to purchase their own mainframe. Being in direct connection with the customer led to better understanding of customer's requirements and helped SAP software engineers to implement suitable features to the software. (Saueressig et al., 2021.)

After nearly 15 years, SAP R/3 was launched with a changed architecture. It utilized a client-server technology, which allowed the system to run on many different computer platforms. R/3 was designed using an open architecture approach, so that third-party software companies could easily develop their own software products on top of the system and integrate them to the existing software. It also eased the integration of companies' hardware products, such as barcode scanners and cell phones. (Monk & Wagner, 2006.) The R/3 system had a three-tier architecture, which was a groundbreaking approach for business applications back in the 1990s. The three-tier architecture consists of three levels, also called as tiers: user interface, application tier, and data tier. In SAP R/3's case, the three tiers are graphical user interface (GUI), ABAP (SAP's programming language) application server, and relational database. This three-tier

approach increased the scalability of the system, as each tier could be implemented on their dedicated hardware and scaled independently. (Saueressig et al., 2021.)

Still a widely used solution, SAP ERP, is a newer release based on SAP R/3. While its core remains the same as in R/3, many functionalities have been added to it. Despite these updates, a completely new product was introduced by SAP to meet the requirements of digitalization. The mainstream maintenance of SAP ERP 6.0 will be stopped already by the end of the year 2027, which forces businesses to move into newer systems. However, an optional extended maintenance phase will be carried out until the end of 2030. (Schmidthals, 2022.)

2.2.2 The emergence of SAP S/4HANA

SAP S/4HANA was released in 2015 with the core idea to help global businesses cope in the digital era (Saueressig et al., 2021). The "S" in its name stands for Suite, and the "4" for fourth generation. The complete name is SAP Business Suite 4 (for) SAP HANA (SAP SE, 2021). There are some new features and functionalities defined by Mergaerts and Vanstechelman (2020), that are presented in S/4HANA:

1. A central database SAP HANA, that has capabilities to simplify all SAP components and enhance performance.
2. The core that is designed to be used with Internet of Things, data analytics, and mobile applications.
3. Possibility to co-deploy applications, such as Customer Relationship Management (SAP CRM), and Supply Chain Management (SAP SCM).
4. SAP Fiori user interface, that provides a role-based user experience.

As Saueressig et al. (2021) summarize, SAP S/4HANA's advantages over SAP ERP are a simplified system with a simple user interface, and the in-memory capabilities of SAP HANA such as decision support, embedded analytics, and artificial intelligence. S/4HANA's architecture is designed carefully to function in the digital era, while maintaining the successful capabilities of SAP ERP. (Saueressig et al., 2021.) The simplified functionalities of S/4HANA are displayed in Figure 2.

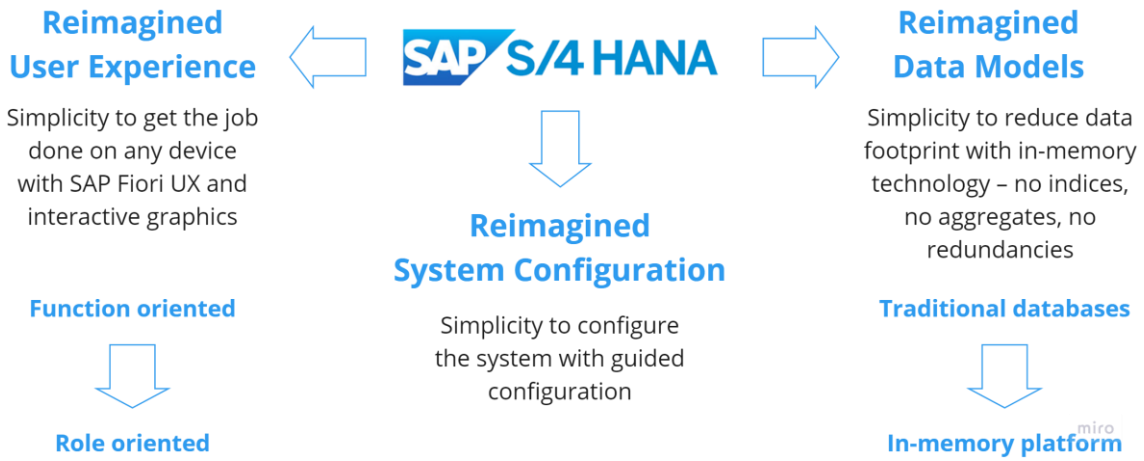

FIGURE 2: SAP S/4HANA Simplicity (in accordance with SAP SE, 2021)

From an IT value perspective, without going too deep into technical aspects of the system, SAP S/4HANA simplifies the landscape dramatically compared to SAP ERP and reduces TCO (total cost of ownership) with SAP HANA. Users leverage from a simple and role-based user experience, which increases productivity and minimizes training costs. Enabled by the HANA database, companies can work with larger data sets in one system, which reduces hardware and operational costs. (SAP SE, 2021.) It is clear that S/4HANA's biggest advantages lie in its database SAP HANA and user interface Fiori. SAP HANA creates the foundation for S/4HANA where all the data is stored and processed, and Fiori builds the interface for S/4HANA applications that creates a unique user experience for users.

2.2.3 SAP HANA

The amount of memory in ERP systems used to be limited because of its high costs, which created a bottleneck in the data flow between disk and the central processing unit (CPU). Fortunately, that is no longer an issue as SAP's database HANA can run on hardware with many terabytes of memory. SAP HANA can store an organization's entire databases in its memory, and it is accessible in real time. In addition to the huge memory, SAP HANA is built on modern hardware that contains high speed multi-core processors. These processors can process multiple complex tasks in parallel and the response times for even complex analytical tasks are minimal. (SAP SE, 2021.)

Data tables in SAP HANA are automatically compressed, which enables huge amounts of data to be stored in a small space. As displayed in Figure 2, aggregates and redundancies are no longer needed in SAP HANA. This means that unnecessary tables and indexes are removed, which were needed in classic databases to meet reasonable response times. The removal of unused content naturally reduces data footprint. Another way SAP HANA reduces data footprint is

by implementing data-ageing strategies. Data can be stored in two different tiers: an in-memory tier (HOT storage), and a disk-based tier (WARM storage). SAP HANA handles the storing internally and users do not need to know where the data is physically located. Data that is used rarely can be moved from HOT to WARM storage, so the less useful data does not take space from the more important one. All data is still available whenever needed, despite its location. (SAP SE, 2021.)

2.2.4 SAP Fiori

SAP Fiori is a design system that provides users a modern, consistent, and role-based user experience. The main idea behind Fiori is to simplify the user interface of SAP S/4HANA applications, which increases productivity, reduces learning time, and minimizes errors made by users. While the simplification is a major benefit in Fiori, it also offers many functionalities to business users that can enhance applications' flexibility and responsiveness. Fiori enables users to access real-time information on multiple devices, and get a fast glance at useful contextual information, such as KPI's (key performance indicator). It also offers UI extensibility options for users to modify views without the involvement of application developers. (Saueressig et al., 2021.)

SAP Fiori was created in 2013 as a response to SAP customers' dissatisfaction with the user experience of SAP GUI. Fiori started as a collection of apps with a new, simplified design and adaptiveness to use on multiple devices (Saueressig et al., 2021). According to SAP Press (2022), SAP Fiori's main focus was to display simple-use apps on mobile devices, and it used to have only 25 apps to begin with. These apps contained the most commonly used transactions of SAP that had been renewed for better usability.

Saueressig et al. (2021) introduce five design principles that guide Fiori's user experience: 1) role-based, 2) delightful, 3) coherent, 4) simple, and 5) adaptive. To open these design principles further, role-based means that applications are designed for each user's needs, and they can access all the applications they need in their day-to-day work. This also prevents the misuse of applications and data, when only the appropriate people have access to applications in their field of business. Delightfulness means that Fiori user experience should make an emotional connection, while coherency ensures that the experience is fluid and intuitive. Simplicity, as explained earlier, increases productivity and minimizes errors, when only what is necessary is included in the application view. Adaptivity refers to one of the main ideas behind the emergency of SAP Fiori, that users should be able to use SAP applications on different devices, especially on mobile devices. It also guides the design of applications to fit on multiple purposes and use cases. (Saueressig et al., 2021.)

2.2.5 SAP S/4HANA Cloud

At the moment, SAP S/4HANA has three product versions: SAP S/4HANA Public Cloud, SAP S/4HANA Private Cloud, and SAP S/4HANA (on-premise). The

on-premise version is managed by the company on their own chosen premises, for example in a datacenter hosted by the company, or in a remote one. Even though the version name may indicate otherwise, it can also be operated from a private or public cloud, depending on the company's preferences. This version gives the most control for customer companies to modify the system. SAP S/4HANA Private Cloud is one step closer to SAP managed product – infrastructure-as-a-service (IaaS). The infrastructure is located in SAP data center's private cloud, and it is managed by SAP. The SAP S/4HANA Cloud, which this thesis is mostly focusing on, is a software-as-a-service (SaaS) offering, and it is highly standardized and fully managed by SAP. This version has two SaaS models for customers to choose from: essential edition (a multitenant offering), and extended edition (a single tenant offering). (Mergaerts & Vanstechelman, 2020.)

The essential edition (ES) of SAP S/4HANA is probably the simplest offering for customer companies, as it is shared among multiple companies and upgraded automatically by SAP every four years. It has the lowest TCO (total cost of ownership), and it supports rapid innovation with the automatic upgrades. With extended edition (EX), the upgrades are not made automatically, but in consultation with the customer company. It also allows some customization, while still quite limited compared to the on-premise version of SAP S/4HANA. (Mergaerts & Vanstechelman, 2020.)

3 ERP MIGRATION

ERP migration is a complex process of transforming enterprise's legacy system into a new or upgraded system. Kremers and van Dissel (2000) define ERP migration as a "major change process resulting from the implementation of a new version of an already installed ERP system". There can be many reasons for companies to migrate to a new system or version, such as getting added functionality for business, keeping the system up to date, or keeping up with changing standards (Kremers & van Dissel, 2000). Sometimes the need for migration comes from the vendor side, if the maintenance and support of an older version is ending.

There is no coherent definition of ERP migration in the literature, mainly because there are multiple different approaches to execute it. Munkelt and Völker (2013) refer migration as ERP system transition and describe that it can be done either with a "Big Bang" or with a phased approach by separating modules or business units. They part the system transition into data migration, system activation, and user training. Since then, cloud ERP has become more and more common, which has increased the amount of migration approaches. Nowadays companies have to consider the most suitable system architecture and platform for their ERP, and if they want to adopt the best practices offered by ERP software vendors. Cloud ERP enables a lot of customization but offers also highly standardized versions that are purely maintained by the vendor.

To choose the correct migration approach, companies have to analyze which approach matches their requirements and capabilities. This can be a challenging task and require a lot of research into both the migration approaches and company's own business processes and data. It is also important to consider the company's strategy and future goals since ERP system is a core part of the business. To help understand this selection process, a systematic literature review was conducted where academic publishments of ERP migration process were collected and reviewed from the past 33 years. The goal of the literature review was to get a broad understanding of different ERP migration approaches and factors guiding the selection of one. This chapters introduces the search procedure and results from the review.

3.1 Literature review

The systematic literature review was conducted based on Templier and Paré's (2015) framework for literature reviews. The first step, formulating the problem, is where review objectives were defined, key concepts were provided and the need for the review was justified. The second step was searching for the literature and in this phase, 233 articles were selected for the review. The articles were searched from a literature database Scopus and the key words used for the search were "enterprise resource planning", "ERP", "enterprise system", and "migration". The literature search was made during November 2022.

In the next step, the applicability of the selected articles was evaluated, and they were either selected or excluded for further review. The relevant articles were selected by evaluating how well they match the chosen subject areas, which were 1) different migration approaches, 2) the factors guiding the choosing of migration approach, 3) the possibilities and challenges of a migration approach, 4) the requirements of a migration approach, and 5) cloud vs. on-premise approaches. In this step, the methodological quality of the articles was also evaluated. By the end of the initial review, 22 articles were selected as applicable, and 10 as possibly applicable.

From the selected 32 articles, 16 studied a specific migration method from legacy system to a new one. The viewpoint varied from data and business process transformation to a new system implementation. Many provided some framework for the migration or part of a migration. The other 16 articles defined characteristics of ERP migration and guided on choosing a suitable approach for migration. From these articles, the relevant information was gathered for further analyzation and synthetization. The following chapters will cover ERP migration from different viewpoints, such as architecture, data, and business processes.

3.2 ERP migration approaches

Many organizations today are migrating their monolithic ERP entities to microservice- and cloud-based systems for better maintainability and scalability (Haugeland et al., 2021; Stanner et al., 2020; Alwis et al., 2020). As Bond et al. (2000) discussed, the architecture of ERP is shifting from single-tiered applications, that are composed in one piece, to a componentized microservice architecture, which consists of smaller independent parts that each have their own responsibility. Slamaa et al. (2021) compare different software architectures and their benefits. Monolithic architecture is a simple way of designing software, as it only consists of one business logic file, database, and interface. However, when developing many new features and business services to the software, service-oriented architecture (SOA) and microservices (MSA) become better options. Both of these architectures break monolithic services into smaller components, but in slightly different ways. In SOA, services are communicated by a synchronous

protocol and can be developed parallel and with multiple programming languages, while in MSA a domain model architecture is used. Domain model means that services are separated based on domains, such as business areas, and function on their own. (Slamaa et al., 2021.)

Microservices architecture is a way to develop services independently, with continuous deployment features (Slamaa et al., 2021). It can be seen as a more finely divided SOA (Stanner et al., 2020). Haugeland et al. (2021) specify that microservice-based applications consist of highly specialized components that are loosely connected together to deliver a functionality. These components are a part of an application and are secured behind a proxy, usually an API-gateway. Saueressig et al. (2021) consider microservices as a way to get the most out of cloud environment. Cloud environment and microservice architecture together enable developers to build applications that are available everywhere and to deploy updated versions with zero-downtime. To take SAP S/4HANA for an example, it enables developers to build independent application extensions to the system, that are connected by APIs. SAP offers its users a cloud environment Cloud Foundry, which provides an application router to navigate to all microservice applications in a secure way. (Saueressig et al., 2021.)

Different approaches and techniques were discovered from the literature to migrate system to microservices, SOA, and generally to cloud environment. The approaches are introduced below.

3.2.1 Migration to microservices

Haugeland et al. (2021) explore the approaches to migrate monolithic single-tenant enterprise applications into microservice applications that are multi-tenant. As multi-tenant services are shared amongst multiple users, it raises an issue with customizing the service to fit every user's own business logic. That is why software vendors need to make tenant-specific customization possible. Haugeland et al. (2021) propose a three-phase approach for the migration, which considers the ability for customization. The approach aims at breaking the application into microservices and extracting existing functionalities from the legacy system, while adding a supporting infrastructure for new services.

The first phase is the analysis, where application modules are identified as microservices and further grouped into bounded contexts. In the second phase, the existing infrastructure is transformed into the new architecture, and if that cannot be made, an additional infrastructure is implemented. The additional infrastructure is a storage that contains different services, such as a gateway to connect external clients (e.g., web-applications) to the microservices, and a back-end communication system. In the final part, the modules from the first phase are connected with the added infrastructure. The ability for customization is achieved with a tenant manager. With the tenant manager, external endpoints for the tenants are retrieved and customized functions can be added to them. After these configurations are added, the tenant manager pushes the updates to the actual service. (Haugeland et al., 2021.)

Another migration approach from monolithic system to microservices is presented by Stanner et al. (2020). The approach is called Microservice Decomposition, and it is similar to the previously discussed approach in a way, that it breaks monolithic application into smaller microservices while also adding new functionalities to support the new architecture. However, the main difference is the use of facades. Facades are used to hide complex internal structures behind a clean interface and replace commonly used patterns with a one, usable interface. The facade is in connection with the complex system logic but provides a simple interface to the client. (Stanner et al., 2020.)

Alwis et al. (2020) study software remodularization as a way to migrate monolithic enterprise systems into microservices. There are different techniques to execute remodularization, but on a general level, it involves automated analysis of different interfaces of the system, such as functional requirements, software structure, and behavior. One way of remodularization is evaluating the classes in the system and analyzing their relationships or similarity. Similar classes are then grouped together to improve modularity. Alwis et al. (2020) introduce their own approach, which focuses on finding business objects from the system's source code. The business objects are then used to analyze their relationship with the classes of the system's structure. The classes are further analyzed to find the optimal combination of classes for microservice development. The researchers found their approach to enhance feasibility of remodularization to build efficient and scalable microservices. However, the highly technical approach was tested only on two enterprise systems, so the applicability is not ensured on systems with significantly different system structure.

All of the above migration approaches focus on finding reusable parts from the existing system and fitting them into the microservice architecture. Another way of transferring to microservices is a so called "Greenfield" approach, in which a fully new system is installed and only the data is kept from legacy system (Mergaerts et al., 2020). This may seem as a more straightforward way for the migration, but as Alwis et al. (2020) state, many organizations rely on their customized applications to manage their operations. Abdellatif et al. (2020) also mention that legacy systems often contain a great amount of hidden knowledge, which is crucial for the organization's business logic.

3.2.2 Migration to SOA

Service-oriented architecture, as well as microservice architecture, focuses on componentizing services for better scalability and agility. The main difference of SOA is that the componentized services communicate with each other through a synchronous protocol, while in MSA the services are separated more finely (Slamaa et al., 2021). The synchronous protocol allows fast development and deployment, as developers are able to implement services in parallel.

Abdellatif et al. (2020) identify service identification as one of the most challenging part of system migration. Its goal is to find reusable parts, for example functionalities, of the legacy system to be transferred as services into the new system architecture. Abdellatif et al. (2020) introduce a new approach to support

the migration from monolithic systems to SOA, that is based on identifying service types. Using a bottom-up approach, they find modules from an organization's source code to categorize them into different service types. Modules in this case can be an object, a procedure, or any other piece of software. An example of a service type that Abdellatif et al. use as a category in their case study is Utility Services. They are services that offer generic functionalities that can be used in many business processes. With Abdellatif et al.'s approach, a laborious task in a system migration can be automated, which helps to define the new system architecture.

3.2.3 Cloud migration

The use of cloud services has increased remarkably in the recent years, and they have become an important factor for businesses. Hustad et al. (2022) have identified that especially large businesses have resistance towards moving to cloud ERP, as the rules and data structures differentiate from legacy on-premise systems. Biggest concerns seem to be renewed ERP processes, migration of legacy data, and new rules and regulations for security. (Hustad et al., 2022.) Different approaches are presented in the literature to manage as seamless cloud migration as possible.

Many scholars are suggesting data driven approaches for cloud architecture migration. Fleig (2017) suggests that crucial business processes are identified rather in a bottom-up manner, than from top to down. He proposes process mining as a way to automate process identification from organization's event logs. In his study, he uses hundreds of gigabytes of raw data from SAP R/3 ERP systems to discover process characteristics. This is done to support the shaping of organization's new process model. Fleig finds that process mining considerably helps organizations in transforming their business processes.

Márquez et al. (2015) are defining key security issues of legacy and cloud information systems for a successful cloud migration. This is done by extracting data from the legacy system with various reverse engineering techniques to find security aspects. These aspects are then modeled based on program units for further analyzation. In the analysis, security requirements are defined based on their applicability in the new cloud environment and made sure, that all requirements are covered. (Márquez et al., 2015.) This approach helps to take security issues into account when migrating to cloud environment.

Das et al. (2011) introduce an Albatross technique as a way for effective, cost-saving, and safe data migration to cloud. The goal is to migrate a database from the legacy system to cloud with minimal negative impact. It involves three phases, in which the source node of legacy system is handed over to the destination node. In the first phase, a snapshot of the database cache is created and copied to the destination node while the source node continues to process transactions. In the second phase, the destination node tries to catch up and synchronize the state of the database cache with the source node in an iterative manner. In the last phase, the exclusive read/write access of the database is transferred from the source node to the destination node. The synchronization in the second phase

minimizes the unavailability window when transferring access from source node to destination node. The technique also ensures data safety in case of failures. (Das et al., 2011.) The approaches presented in literature are compiled in Table 1.

TABLE 1: Migration approaches and techniques from the literature

Destination architecture/ environment	**Approaches and techniques for migration**
Microservices	Enabling system customization by breaking applications into microservices and extracting existing functionalities from the legacy system, while adding a supporting infrastructure for new services (Haugeland et al., 2021). Hiding complex internal system structures by using facades as interfaces, that replace commonly used patterns with one, usable interface (Stanner et al., 2020). Using remodularization, where business objects are identified from the legacy system's source code and regrouped in classes. The classes are combined into optimal microservices. (Alwis et al., 2020.)
SOA	Finding reusable parts from legacy system to transfer into new system by identifying service types. Extracting modules from source code to categorize them into service types and defining system architecture. (Abdellatif et al., 2020.)
Cloud	Automating process identification from event logs with process mining. Discovering process characteristics from legacy system's raw data. (Fleig, 2017.) Identifying security issues by extracting data from legacy system with reverse engineering techniques. Found security aspects are modeled into program units to analyze the security of all system requirements. (Márquez et al., 2015.) Migrating data effectively and safely from legacy system with a three-phased approach. Destination node is created which tries to catch up and synchronize the source node, while source node continues to process transactions as-is. (Das et al., 2011.)

3.2.4 Choosing the migration approach

As ERP system migration is a challenging process to an organization, it has to be planned carefully. Munkelt and Völker (2022) have compiled the main phases of ERP implementation that can help companies choose a correct migration approach. There are five stages presented by Munkelt and Völker, which are 1)

project setup, 2) as-is analysis, 3) conceptual design, 4) customization, and 5) transition.

In the project setup stage, a company has to make sure that their top management offers enough support and change management to the process. The biggest responsibilities of a change management agent are to take care of employee education and manage the changing business processes. (Munkelt & Völker, 2022.)

As-is analysis is the analysis of changing business processes. A company has to analyze if their current (as-is) business processes match the to-be processes. If deviation is found between the two, functional weaknesses of the new system and its IT landscape have to be analyzed. (Munkelt & Völker, 2022.) Slamaa et al. (2021) point out the importance of choosing a suitable system architecture when planning a migration. The analysis of suitable architecture is made by comparing the current system's state and what companies want to achieve with the new system. For example, service-oriented architecture offers scalability and agility, as monolithic architecture can work for small companies with little resources. (Slamaa et al., 2021.)

Munkelt and Völker (2022) recommend companies to avoid developing applications on top of ERP for specific business processes. They suggest that the conceptual design of the new system should be followed rather than extending it too much. Companies may find it simpler to continue their business processes the way they were, but ERP systems' flexibility is limited, and extensions can create a lot of complexity to it.

Three approaches for customization are presented by Munkelt and Völker, which are typically used in ERP system implementation. Codeless configuration is a way to model the future business processes without writing any source code. Many ERP systems offer an environment to configure the system to meet the company's needs. Codeless configuration should be done by in-house IT experts with the help of external consultants. Application development, even though advised to avoid in the previous stage, may be necessary to fill in functional gaps. This should be done by external partners, as it is not sensible cost-wise to have the needed expertise in-house. Key performance indicators and reports can help companies to improve their business intelligence. Standard reports provided by the ERP system must be reconciled with company specific reports already in use. This should be done in-house to maintain the expertise to create reports. (Munkelt & Völker, 2022.)

Lastly, the transition stage can be executed in various different ways. The company can either implement the new system simultaneously to all the business units or carry out a phased implementation. (Munkelt & Völker, 2022.)

Slamaa et al. (2021) discover various success factors of ERP migration in their literature review. In accordance with Fowler (2012) and O'Leary (2000), the five factors of a successful migration are:

1. ERP project success (measured in terms of time, cost, and goals),
2. User satisfaction,

3. System quality (flexible, easy to use, reliable, data integration, efficient attributes),
4. Information quality (understandable, relevant, usable, available), and
5. ERP performance

Slamaa et al. (2021) point out, that the performance of ERP system can be hard to evaluate, as there is not enough post-migration measurement done by the companies.

3.2.5 Migrating to SAP S/4HANA

SAP is offering two editions of their current ERP product: SAP S/4HANA Cloud and SAP S/4HANA (on-premise). SAP S/4HANA Cloud has two options, multitenant and single tenant offerings, which are both highly standardized and maintained in SAP's own cloud platform. The on-premise version can be managed by the company in a data center or cloud of their choosing. This gives more flexibility to the company on extending the system. Mergaerts and Vanstechelman (2020) introduce three different migration scenarios to SAP S/4HANA: 1) New implementation, 2) system conversion, and 3) landscape transformation.

New implementation, also referred to as Greenfield, is a scenario where a completely new system is installed on place and only data is migrated from the legacy system. This scenario is especially useful if a company is migrating from an old system to S/4HANA Cloud. New implementation can lead to a significant change in business processes. In system conversion (known as Brownfield) an old SAP system is migrated into SAP S/4HANA. This means, that all the existing configuration and transaction data is kept and moved into a new system architecture. This scenario is only possible when migrating from an SAP system to an on-premise S/4HANA. The third approach, landscape transformation, is a scenario where either new implementation or system conversion is executed with a selective data migration. This enables companies, with the help of consultation, to select the functioning parts of their legacy system and migrating them into a new system architecture. (Mergaerts & Vanstechelman, 2020.) A company called SNP has trademarked their approach for landscape transformation as Bluefield, and it is marketed as the new and faster way to SAP S/4HANA (SNP SE, 2019).

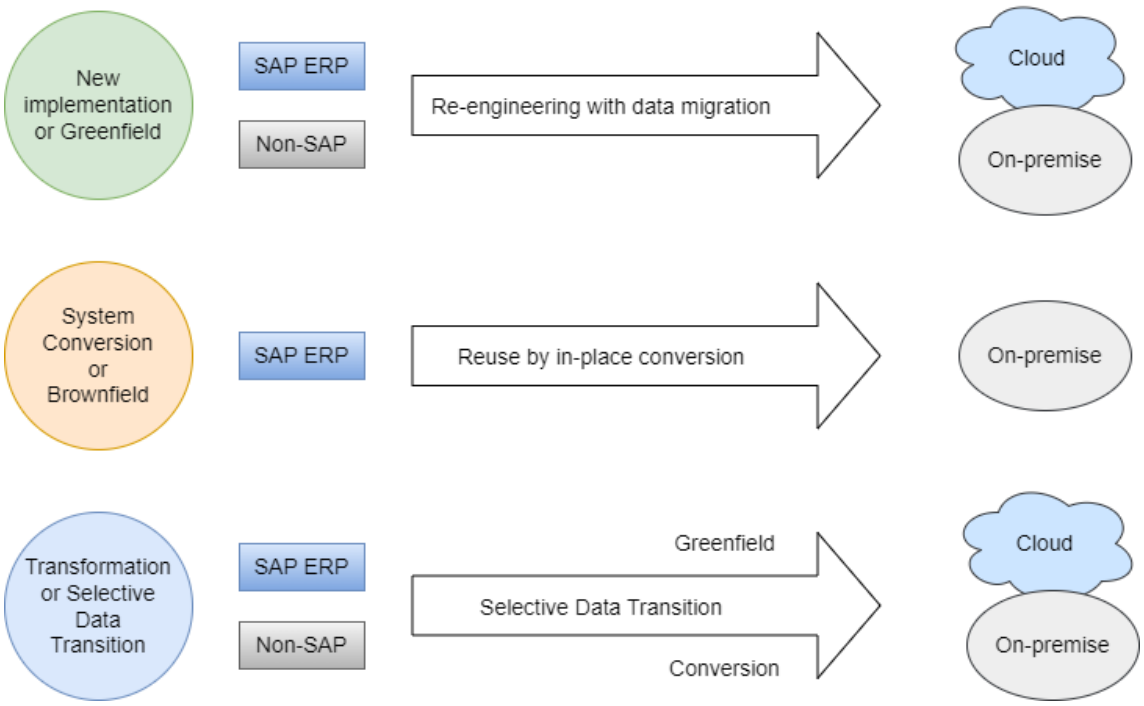

FIGURE 3: SAP S/4HANA Migration Scenarios (in accordance with Mergaerts and Vanstechelman, 2020)

Considering these scenarios for SAP S/4HANA migration and the different ERP migration approaches found from the systematic literature review, it could be analyzed how the approaches fit to the different scenarios. Many of the approaches from literature fit in the scope of Brownfield migration or landscape transformation, as the approaches aimed at finding reusable parts from the legacy system. Some of the approaches focused only on data migration, which is the main intention in Brownfield migration, as the history data is moved from legacy to upgraded system. In new implementation, there were limited approaches discovered from literature, that could be used in the migration process. As new system and new processes are adopted, there is not much need for re-designing the old system or finding reusable parts. In addition to the migration approaches, key aspects to consider in the migration process could be identified from the literature review and fitted for all different migration scenarios. A review table was built to compare the suitability of different approaches to the scenarios. The key aspects to consider regarding ERP migration are also set in place for the three scenarios in table 2.

TABLE 2: Approaches for SAP S/4HANA migration

SAP S/4HANA Migration scenarios	**Migration approaches from literature**	**Key aspects to consider for migration**
New implementation (Greenfield)	Identifying crucial business processes with process mining (Fleig, 2017). System remodularization by analyzing relationships of modules and grouping similar ones together (Alwis et al., 2020).	Change management to take care of employee education and manage the changing business processes. (Munkelt & Völker, 2022.)
System Conversion (Brownfield)	Secure data migration by finding security aspects with reverse engineering techniques (Márquez et al., 2015). The Albatross technique for data migration, where data is swiftly transferred from legacy node to destination node (Das et al., 2011).	Transition stage executed with a "Big bang", simuntaneously to all business units (Munkelt & Völker, 2022).
Landscape transformation (selective data transition)	Finding reusable parts of a system by identifying service types and categorizing modules into them (Abdellatif et al., 2020). Breaking applications into microservices, extracting existing functionalities, and adding new ones to support new architecture (Haugeland et al., 2021; Stanner et al., 2020).	As-is analysis (Munkelt & Völker, 2022) where current business processes are compared with to-be processes to analyze the requirements of the new system landscape.

For Greenfield migration, finding crucial business processes was considered as a suitable approach, as there can be a significant change in business processes when a new system is set in place. It is important for the company to identify the processes that need to be continued with the new system and possibly building extensions in the system to achieve the business requirements. The changing business processes also require strong change management during the migration. For Brownfield, a few data migration approaches were identified, that could help the company in executing a safe and effective migration. It should be kept in mind, that a Brownfield migration is executed in a "Big bang", which requires careful planning from the company.

In the landscape transformation, companies could benefit from finding reusable parts from the legacy system that can be transformed in the new one. Some approaches were discovered from the literature, that help in finding reusable parts and combining them into purposeful modules. The approaches also considered the suitability of the parts from legacy system to the new system architecture. This is especially important to consider when moving to a cloud environment. The as-is analysis by Munkelt and Völker (2022) could benefit companies in choosing the scope for their selective transformation. These three migration scenarios and various techniques used for them are further studied in the following chapters, where a qualitative case study is carried out on the migration to SAP S/4HANA.

4 RESEARCH METHODS

This chapter introduces the used research method and methods for data collection and analysis. The purpose of the research is to answer the following research questions:

- How should companies choose a suitable migration approach to their new ERP system?
    - How the different migration approaches affect companies financially and operatively?
    - What options are there to customize the new system while maintaining its standard functionalities?

4.1 Qualitative case study

The research was carried on as qualitative case study. To first take a look at qualitative research as a concept, Tuomi and Sarajärvi (2018) describe that qualitative research focuses on understanding and describing the studied subject or phenomenon as a whole. Compared to quantitative research, qualitative research tries to understand the subject, rather than explain it. The data for qualitative research is normally collected using natural methods, such as interviews or surveys. Interviews can be structured, semi-structured, or unstructured. (Tuomi & Sarajärvi, 2018.) Unstructured interviews are executed in an everyday conversational style, where participants take the lead and share their stories and experiences. Semi-structured interviews are focusing more on a specific topic and view, using an interviewer as a guide. (Fossey et al., 2002.)

Qualitative case study is described by Baskarada (2014) as qualitative research, where focus is on one or more cases in a certain environment. Case study includes an in-depth analysis of the cases, people, and organization. Thus it offers a method to find analytical answers to the research questions. Baskarada (2014) lists six stages of case study, originally described by Yin (2009), which are:

1. Plan
2. Design
3. Prepare
4. Collect
5. Analyze
6. Share

Planning, designing, and preparing are all leading to the data collection and analysis by forming relevant research questions, defining the cases and theories to be studied, and learning about the subject. In the collection stage data is collected using different methods, such as interviews that were mentioned above. Also other sources, such as documents and archival records can be used. In the analysis stage, collected data is analyzed based on theoretical propositions. (Baskarada, 2014.)

Qualitative case study was chosen as a research method, as a consulting organization was studied based on their consultants' prior work on SAP S/4HANA migration projects for clients. The study contained multiple cases that were client organizations' SAP S/4HANA migration projects. The focus was to understand and describe these cases as a whole and find the underlying features of them. Eriksson and Koistinen (2005) state that getting interviewees voices heard brings quality and content to research. That was an important aspect of this study, as the participants had a strong competence in the studied area.

The data was collected primarily from interviews, but also from documents guiding the migration projects that were given by the participants. The interviews were carried on as semi-structured, where initial questions were prepared to guide the conversation, but participants could talk freely about their experiences. If questions were not clear to the participant, they could be opened up by the interviewer and clarifying questions could be asked. Some senior consultants could even take the lead in the interview, leading to a more unstructured interview, as their experience and knowledge was strong.

4.2 Case: Migration to SAP S/4HANA

The organization participating in this research was a large Finnish consulting company operating mainly in Nordic countries. They have an SAP department with over 100 employees, where one of the main operations is planning and executing SAP migrations to client organizations. The company has a strong competence in SAP S/4HANA migrations for various clients. The consultants operate on various business sides of the system migration, such as selling the solution, planning the system architecture, transforming legacy data, and customizing the software.

The goal of this research was to collect information from the various migration projects, define common characteristics, and enhance understanding of the

challenging process of system migration. The findings could help the consulting company, as well as other companies, plan the migration process better to avoid failures and customer unsatisfaction. The migration methods which were focused on are methods used specifically in SAP S/4HANA migrations, which were introduced earlier in this paper: Greenfield (new implementation), Brownfield (system conversion), and Bluefield (landscape transformation).

The interviewees were chosen among consultants who had participated to at least one migration project in some business area. However, most of the interviewees had experience from many projects with various migration methods. This added to the quality of the research, as the participants could compare the migration methods and their benefits and disadvantages. Some of the participants were senior consultants with wide experience, as some were newer to the field.

4.3 Collecting data

Data for the study was collected with semi-structured interviews (Attachment 1) and documents. The interview consisted of three categories: general knowledge of migration, business value, and customization. These categories were selected to get answers and data for the selected research questions. The goal of the interviews was to get comprehensive answers and create open conversations with the participants. The main themes of a semi-structured interview are planned ahead, but space is left for improvisation and other themes during the interview (Myers & Newman, 2007). As an interviewer, the questions were explained further if needed, and follow-up questions were asked if the topic was relevant to the study. The main focus was on making the situation as relaxed and open as possible, because the nervousness of participants can affect the reliability of answers (Myers & Newman, 2007). The interviews were conducted during the spring of 2023 via Microsoft Teams and took about an hour per interview.

Along with interviews, documentation was used as a research data. The company shared guideline documents, that are used in their work for SAP S/4HANA migrations. These guidelines supported the data collected from interviews and gave more of a technical view on executing migration projects. The interview participants, their roles, and migration project experience are displayed in table 3.

TABLE 3: Interviewees and their roles

	Roles	Participation in SAP S/4HANA migration projects
Participant 1	Business consultant	Multiple projects, evaluating different migration approaches
Participant 2	Lead consultant in SAP finance area	Multiple projects with different migration approaches
Participant 3	Head of SAP department	Projects with Greenfield and Bluefield approaches
Participant 4	Head of sales in SAP	Multiple projects with different migration approaches
Participant 5	Lead solution consultant	Multiple projects with different migration approaches
Participant 6	SAP consultant	Doing Bluefield proof-of-concept for customer
Participant 7	Lead enterprise architect	Projects with Greenfield and Bluefield approaches
Participant 8	Head of solution and business development	Multiple projects, evaluating different migration approaches

4.4 Analysis

The interviews conducted for this research were transcribed to get the research material, alongside the guideline documents. The material was analyzed with content analysis, where themes and concepts were identified from the material. The conceptualized information was then compiled to get the results for this research, which are displayed in the next chapter. These results were further compared with results from the literature review and discussed in the conclusion of this paper.

A directed content analysis was used to analyze the research data, which is one of three content analysis approaches described by Hsieh and Shannon (2005). In directed content analysis, the researcher has predefined categories. The categories are usually derived from prior research, and direct content analysis may aim at strengthening its findings. Key concepts are identified from the prior research and themes from the collected research material are categorized by those concepts. If there are themes in the material that do not fit in any of those predefined categories, new category is created for them. The interview questions in directed content analysis are mostly open, but it allows asking participants more specific targeted questions based on the initially formed categories. (Hsieh & Shannon, 2005.)

4.5 Reliability and validity

The reliability and validity of qualitative research can be difficult to measure. The flexibility and ambiguity of qualitative research methods can risk the reliability of the research. (Patton, 2014.) In the research, special attention was paid to evaluate and improve validity and reliability. During the data collection, this was achieved by using Myers' and Newman's (2007) guidelines for semi-structured interviews.

In qualitative research, it is always important to consider the researcher's role and its implications to collecting and analyzing data (Myers & Newman, 2007). Researcher's beliefs, values, and expectations affect the research, which is why they should be taken into account, accepted, and minimized (Patton, 2014). The effects of the researcher were considered in this research by carefully analyzing the collected data, and not making any assumptions based on researcher's own opinions. However, this is the researchers first time doing qualitative data collection and analysis, which must also be considered. The experience of a researcher can affect the reliability of the research (Patton, 2014). This effect was minimized by external guidance and familiarization of qualitative research methods.

For the reliability of the research, it is important to describe the research process as exactly as possible (Myers & Newman, 2007). This was done earlier in this chapter by describing the research method, data collection, and analysis.

5 FINDINGS

This chapter introduces the findings from the research material. The findings are separated into three main categories: 1) factors guiding the selection of the migration approach, 2) business value, and 3) customization. These categories are further divided into smaller parts based on the analysis of the material. Main themes are presented that emerged during the research, but also smaller observations are unveiled, and the direct answers from each interview participants.

5.1 Choosing the migration approach

The interview participants were asked to describe the main factors they consider when advising a client on the most suitable approach for SAP S/4HANA migration. First, they were asked to list the factors shortly to get an overall understanding of the factors that should be considered. After that the factors mentioned were discussed further to get more detailed answers on why these factors are important and how they affect on choosing a migration approach. While many of the factors were self-explanatory, most mentioned factors were selected to describe their effects on choosing the migration approach more thoroughly. The participants' answers on the factors are combined in table 4 and the effects of four main ones are discussed below.

TABLE 4: Interviewees views on factors guiding the selection of migration approach

Participant	The main factors to consider when choosing a migration approach
P1	The state of legacy system, amount of customization needed, time limitations for go-live
P2	The state of legacy system, the extent of change needed, the need for history data
P3	The state of legacy system/how it fulfills business requirements, amount of customization needed, willingness to adopt standardized processes
P4	The amount of customization needed, the willingness/need to improve business, time limitations for go-live
P5	The state of legacy system, the amount of data, time limitations for the project/the extent of change
P6	The state of legacy system/data, amount of customization needed, willingness to standardize vs. re-engineer
P7	The state and age of legacy system, customer readiness for change
P8	The state of legacy system/how it fulfills business requirements, the organizational scope

As it can be observed from the answers, interviewees views revolved around same topics: 1) The state of legacy system, 2) the amount of customization needed, 3) willingness to standardize or change processes, and 4) time available for the migration.

Other topics that were mentioned by some participants were:

- different ambitions between processes (e.g. logistics want to stay as-is, finance wants to renew processes),
- harmonization needs between business lines,
- amount/need of history data, and
- the anticipated size of investment.

5.1.1 The state of legacy system

The state of legacy system is a crucial part on choosing the migration approach, that most of the interviewees agreed on. Participant 1 stated, that planning the migration needs to start from the system landscape. Customer may have one or multiple ERP systems that may contain data from multiple organizations, in case of mergers or acquisitions. A shared opinion among interviewees was that if the legacy system is well taken care of and the processes work fine, a system conversion (Brownfield) is a sufficient approach. If processes need changing and data objects are replaced, the new implementation (Greenfield) is a better opinion. Bluefield was seen as a compromise between the two, for example when

customer needs some change but is also dependent on history data. Participant 5 commented on Bluefield approach:

> Depends of course on the source, and what kind of changes are needed, but Bluefield is a good choice from ECC that does not require lot of changes and as standard processes.

Participant 8 listed more in-depth reasons to choose different migration approaches based on the legacy system. First of all, if current SAP ECC works fairly well and the scope is somewhat correct for the organization, the customer should go with Bluefield or Brownfield. With Bluefield approach, some changes can be made to the system by cleaning data, shaping organization structure, and making changes to ABAP code. Brownfield can be selected to minimize the investment, but customer has to make the necessary changes, e.g. cleaning of data, before or after the migration. The third approach, Greenfield, should be selected only if current SAP ECC is made for totally wrong organizational scope, or fully outdated after business changes. Participant 3 summarized the state of legacy system in a question:

> How well current system works and fulfills the business requirements today and in the future?

5.1.2 The amount of customization needed

Another significant topic in choosing the migration approach was the amount of customization needed. Participant 4 mentioned different business areas and their need for customization. If the business operations are already standardized, for example financial management, there is not a big need for customization. If the business is innovative and there is a need to stand out from competitors, companies may need and already have a lot of customization in their ERP. In that case, the company might want to go with Brownfield to retain its business crucial customizations. In case the customer already has a lot of customization in their legacy system, many participants considered Brownfield the best approach from migration. As participant 8 stated:

> Most of these [customizations] should be taken also to S/4HANA. Very seldom customers make unnecessary enhancements.

On the other hand, participant 1 suggested that customers should scope their use of customized code long before the migration to see how much it is used. This way it would be easier to choose a suitable migration approach when the usage level of customized code is known. Many interviewees noted that legacy systems may have a lot of unused customization that should not be transferred into the new system. It should also be discussed with the customer if they are willing to adopt standardized processes when migrating to the new system.

One way to discuss with customer about the ability to transfer business critical customization from legacy system to S/4HANA is to offer a proof of concept.

Participant 1 explained that with Bluefield approach, an empty shell conversion can be made to keep customizations in the new system. In the empty shell conversion, a copy of the legacy system is made without master and transaction data to create an empty shell. Then the custom developments can be either erased or made compatible for S/4HANA before upgrading the system. In the proof of concept, the most difficult areas of business-critical custom code are picked up, and analyzed how much time and money it would take to adjust them to the new system. After the analysis, it is easier for customer to decide, whether they want to keep the customizations and go with Bluefield approach or choose another option.

5.1.3 The willingness and need for change

The interviewees described that the willingness and need for change must be clarified with the customer early on the migration project. However, some interviewees mentioned that as a consultant, the real need for change must be observed despite the customer's willingness for a better outcome. Participant 2 gave an example of a customer company that wanted to settle for a smaller change and keep old data and components, so the Bluefield approach was chosen. In retrospect, the customer would have needed a bigger change and the Greenfield approach would have been more suitable. It would have meant more work and investment from the customer company.

The participant company's guidelines for Greenfield approach state, that SAP's standards should always be used, if possible, which can lead to many business process changes for customer companies. However, some participants considered that customers should not rely on S/4HANA capabilities for improved business processes. Participant 8 stated that the difference between S/4HANA and SAP ECC are quite limited, and there are better ways to improve business than the migration. There can also be division inside the company in the willingness of change, as participant 3 stated:

> Different ambitions between processes, for example logistics want to stay as-is and finance wants to renew processes and adopt standard ways of working.

5.1.4 The time available for migration

The fourth topic, time available for the migration, was discussed from multiple different views in the interviews. Firstly, it is meant as the time available for the whole migration from legacy to new system. If the customer company wants a fast transformation, a Brownfield approach was suggested. Participant 4 mentioned, that customer may want transfer to SAP S/4HANA with Brownfield to buy some time, as the maintenance for SAP ERP 6.0 is ending. This way, the data and functionalities can stay similar and end user may not even notice a difference.

Another view of the time available is the duration of go-live. Interviewees noted that if the customer company has critical business processes in their ERP, they cannot afford a long downtime between transition. This means, that a

phased transition must be executed rather that a "big bang". Participant 6 stated that Greenfield approach can be executed in phases, which makes the migration temporarily complex and expensive. However, it minimizes the business risks. Participant 4 gave an example of a warehouse business, where the business must be kept running around the clock every day (excluding Sundays). In this case a Bluefield approach is suitable, as the business can be kept running in the legacy system during migration and the outage time is minimal.

5.2 Business value

The interviewees were asked how they take into account the customer company's expected business value of the migration, and if they use some tools or methods to measure it. The participants' answers are combined in table 5.

TABLE 5: Interviewees views on measuring business value of migration.

Participant	**Ways to measure the expected business value of migration**
P1	Standardized tools by SAP for business value evaluation, KPI
P2	Acceptance tests for customer, defining end results to customer
P3	Stakeholder value map to describe the value impact, benchmark data provided by SAP
P4	Proof of concept to customer
P5	Using different data validation tools and test cases
P6	Comparison between approaches, difficult to quantify
P7	Calculating cloud run costs, considering agile DevOps to adapt new things faster
P8	Qualitative business case that contains expected business benefits in written format

The business value measurement caused the most division between interviews. Many participants mentioned that it is hard to measure the expected business value beforehand. Some participants brought up SAP's own tools for business value evaluation, but it was understood, that those are not widely used. The most common way to evaluate business value among participants was proof of concept to customers, and making sure the customer is aware of the extents of the final solution and results. Quantitative ways of measuring the business value were not mentioned as much as qualitative approaches.

Interview participants were also asked, if they factor in the potential long-term business benefits of the new system, and if they are measured post-migration. The answers for this question are combined in table 6.

Table 6: Interviewees views on long-term benefits of migration

Participant	**Measuring long-term business benefits during and post-migration**
P1	Usually not measured, some KPI's can be agreed with customer
P2	System monitoring to identify performance issues
P3	Usually not measured, customer is responsible for post-migration follow-up
P4	No long-term measurements
P5	Using SAP's own tools (migration cockpit), that customer can utilize in the future after migration
P6	Greenfield is optimal in long-term
P7	Making percent calculations between old and new processes on a high level, using AI tools
P8	Focusing on the technical feasibility of the system

Most of the interviewees agreed, that long-term monitoring of business value and benefits of migration are done by the customer company. Some tools and methods were suggested, but they were not widely used by the participant company. Measuring the long-term benefits during the migration process is usually done on a high level. Participant 8 also added that consultant might look at a migration more from the technical point-of-view and choosing the approach based on what is feasible for the technical execution.

5.3 Customization

Customization was a significant theme that was mentioned repeatedly during the interviews. As discussed above, the amount of existing and needed customization affects the selection of the migration approach. In this section, interviewees were asked how they identify unique business requirements that require customization during the SAP S/4HANA migration. The participants' answers are compiled in table 7.

TABLE 7: Interviewees views on identifying customization needs.

Participant	Identifying customer's unique customization needs on the system
P1	Monitoring the use of custom code before migration, identifying critical business processes
P2	Discussing with customer on potential business value vs. price, and old business processes vs. need for change
P3	Identifying and designing business requirements, assessing design against the business case
P4	Identifying the nature of business – standard vs. innovative
P5	Going through specifications with customer, using SAP tools to identify custom code
P6	Identifying existing custom solutions and unique business requirements
P7	Fit gap analysis via demos, challenging the current state of the business, asking stakeholders' opinions
P8	Analyzing the current system and its important and valuable enhancements

As it can be observed from the answers, understanding the business requirements and processes is seen as a key practice on identifying customization needs. No standard tools for measuring the need of customization were emerged in the interviews, but some participant suggested monitoring the amount of custom code in customer's legacy system. Participant 1 noted that not all existing custom code is good and usable, which should also be observed to possibly redesign the customizations. A general opinion among participants was that if legacy system contains a lot of useful and business critical customization, Brownfield is the most reasonable approach for migration. That way, customer can keep all their customization in the new system. If some redesign is needed or there is no real need for customization, Bluefield and Greenfield are better opinions. However, some participants stated that customers very rarely make unnecessary customizations, which means they should all be transferred into the new system, if they exist.

Another thing to consider when identifying the need for customization is the benefits of system standards. The participant company's migration guidelines suggest using SAP standard always when possible. Participant 3 notes that this mainly applies on Greenfield approach, as in Brownfield approach the existing solution stays in place and S/4HANA standards are not in use. In Bluefield approach, some standard processes can be taken into use. Interviewees were asked, how they can customize SAP S/4HANA based on unique business requirements, while still maintaining its standard functionality. The answers are compiled in table 8.

TABLE 8: Interviewees views on maintaining SAP standard while customizing.

Participant	Maintaining standard functionalities while customizing the system
P1	Using SAP guidelines on customizing outside system core – headless SAP
P2	Fiori application extensions, fitting business processes to standard system – "clean table"
P3	Clear guidelines and good control to manage system architecture
P4	Customizing outside system core, using business integration suite (SAP BTP) to create APIs for custom development
P5	Customizing as little as possible
P6	Customizing outside system core
P7	Customizing outside system core, using SAP BTP for non-standard business needs
P8	Using safe enhancements and add-ons inside system, using APIs, new In-App S/4HANA extensions

While some participants shared an opinion on customizing as little as possible and sticking on the standard functionalities, many suggested extending outside system core to maintain standard functionalities while customizing. Participant 1 stated:

> Our company has developed clear guidelines for custom development while keeping "SAP Core clean". This is based on SAP's standard guidelines for in-app vs. side-by-side approach. Majority of SAP S/4HANA are migrated to a hyperscale environment which offer possibilities for extensions and custom solutions outside of sap.

As many participants stated, SAP offers ways to extent their S/4HANA systems by keeping the core untouched. They mentioned SAP Build as a solution that SAP offers in their business technology platform (SAP BTP). It is a service that can be used to develop technical components, for example apps, on top of the system with low-code or no-code development. Some participants also mentioned headless SAP as a way to extent the standard system. Headless SAP means that the system backend provides APIs that can be connected with any cloud platform that supports this kind of architecture. For example, Microsoft Azure can be used as a middleware to connect SAP APIs to the customized user interface. (Pietiläinen, 2021.)

6 REFLECTION AND ANALYSIS

In this chapter the main observations from the qualitative study's interviews are discussed and analyzed. The findings are compared to the findings from the literature review and the significancy and usefulness of the findings is considered. Finally, the limitations of the research and subjects for further research are suggested based on what was possibly left from the study and which subjects could benefit the scientific community in the future.

6.1 Factors guiding the selection of migration approach

In the literature review, five categories were discovered by Munkelt and Völker (2022) that guide the choosing of migration approach:

1. Project setup
2. As-is analysis
3. Conceptual design
4. Customization
5. Transition

Similar themes were recognized from the interviews, and the comparison between the five categories and interview themes is done below.

6.1.1 Project setup

In project setup stage, a company has to make sure their top management offers enough support and change management to the migration process (Munkelt & Völker, 2022). It was also observed from the interviews that the customer company's willingness for change is a crucial part of the migration. In case the customer needs a big change to their business processes, a new implementation (Greenfield) can be the most suitable approach. Adopting SAP's standardized business processes or developing new enhancements to the new system can

cause a lot of change to the company's operations. Munkelt and Völker (2022) mention that it is important for the company to take care of employee education when business processes are changing. The interviewees pointed out that if data conversion (Brownfield) is carried out, the end users may not even notice the system upgrade. In that case, employee education is not as important.

6.1.2 As-is analysis

In the as-is analysis, the company has to analyze their current processes and see if they match the to-be processes (Munkelt & Völker, 2022). In the interviews, the state of legacy system was a significant theme that also needs to be considered in the as-is analysis. If the as-is and to-be processes match, Brownfield is a sufficient approach for the migration. If the to-be processes are completely different from the current processes, for example after a major business change, Greenfield approach is more suitable. With Bluefield, some changes can be made to the processes. Slamaa el al. (2021) point out the importance of choosing a suitable migration architecture when planning a migration. This can be analyzed by comparing the legacy system's state and what the company wants to achieve with the new system.

In the as-is analysis, it is important to consider moving into standardized processes, if that serves the customer company's business. As Slamaa et al. (2021) mentioned, it needs to be clear what company wants to achieve with the new system. It was observed from the interviews that a consultant company needs to consider the nature of the business to find out what kind of change is needed. Standardized processes can be useful for a company that does not need the leverage in the market from custom processes. However, some companies can have multiple business lines with different needs, which causes complexity in choosing the most suitable migration approach.

6.1.3 Conceptual design

Munkelt and Völker (2022) suggested, that the conceptual design of the new system should be followed rather than extending it too much. That same advice was given in the research company's guidelines for Greenfield migration. This can however lead to a major change in customer company's business operations and processes if in-house solutions have been used in legacy system. The interviewers also mentioned that the nature of the business largely determines if the standard S/4HANA capabilities are sufficient enough. In an innovative and competitive field, custom ERP solutions can be an advantage to the business.

The interviewees opinions on following SAP's conceptual design had some variance. Some stated that the S/4HANA system should be customized as little as possible and the customer company should rather invest in a big change to start their business from a "clean plate" with Greenfield approach. On the other hand, some interviewees though that business-critical customizations are always important and needed, and they should not be removed. One view was also

about the difference between business lines, as some may require customization while others can run well with standard functionalities.

6.1.4 Customization

In the interviews, many participants suggested that the old business critical customizations are kept and transferred into the new system with Brownfield or Bluefield approach. This may require modifying the custom code to make it compatible to the new system architecture. In case the new system is implemented with standard processes, there are ways to extend the system with business-critical custom code. Three ways to customize a new system are presented by Munkelt and Völker (2022): 1) codeless configuration, 2) application development, and 3) KPIs and reports.

Codeless configuration is a way to model business processes without writing any source code. Many ERP systems offer an environment to configure the system to meet company's unique business needs. (Munkelt & Völker, 2022.) As it was mentioned in the interviews, SAP offers some solutions for codeless configuration. With SAP Build, extensions can be built even without any source code. Even though as high coding skills are not required as in traditional development, Munkelt and Völker (2022) state that the configurations should always be done by in-house IT experts or with the help of external consultants.

Application development is not suggested by Munkelt and Völker (2022) but they identify the need for it in certain cases, when functional gaps need to be filled. Headless SAP development was mentioned by the interviewees, in which the system is extended without touching its core. The customization is done in a separate interface that is connected to the system with APIs. Key performance indicators (KPIs) and other reports were also mentioned in the interviews but mostly when talking about measuring business value. They were not identified as part of custom solutions in the system.

6.1.5 Transition

The transition to the new system can be executed in various different ways. Munkelt and Völker (2022) state that the company can either transfer the new system simultaneously to all business units or carry out a phased implementation. Different transition styles were also discussed in the interviews regarding time and budget limitations. A phased transition, meaning that the legacy system is kept running while taking the new system into use, is a sensible approach when the company has business-critical operations that cannot have a long downtime. However, the phased approach is more expensive, as the company has to maintain two systems simultaneously. It was not observed from the interviews, if phased approach is carried out by taking the new system into use one business unit at a time, or by transforming business functions.

As it was discussed in the interviews, Brownfield approach needs to be executed in a "big bang". That is why it is very important to ensure that the content of legacy system is compatible to the new system. Some interviewees mentioned

the use of conversion runs that are done to make the data and code compatible to S/4HANA before the upgrade. Das et al. (2011) also introduced an effective and safe approach for a data migration into a cloud system. In the approach, a destination node is created which tries to catch up and synchronize the source node of the legacy system, while source node continues to process transactions as-is. Table 9 compares migration phases by Munkelt and Völker (2022) with the factors for choosing a certain migration approach to SAP S/4HANA.

TABLE 9: Migration phases compared to migration approaches.

Migration phase/ approach	**Greenfield**	**Bluefield**	**Brownfield**
Project setup	Major need and willingness for change, adopting SAP's standard processes	Some change needed	No need for change, business continues as-is
As-is analysis	To-be processes are completely different from as-is processes, company wants to achieve more with the system, standard processes want to be adopted	Some change needed in business processes	Legacy system is in good condition and business processes benefit the company
Conceptual design	Following the system's conceptual design, starting from a "clean plate"	Various business lines with different needs for custom solutions/standard processes	Existing business-critical customization is needed
Customization	Codeless configuration to keep the SAP core clean, minimal customization advised	Existing customization can be transferred from legacy system, codeless configuration, and application development	Existing customization transferred from legacy system
Transition	Phased approach to keep business running with minimal downtime	Phased or "big bang" approach	"Big bang" approach, content must be made compatible before upgrade

6.2 Considering the business value of the migration

Slamaa et al. (2021) discovered success factors of ERP migration in terms of business value. The five success factors are:

1. ERP project success,
2. user satisfaction,
3. system quality,
4. information quality, and
5. ERP performance.

Slamaa et al. (2021) and the interviewees share the same view on the difficultness to measure actual business value of an ERP system, such as performance. It would require measurement from the customer company before the migration, as well as post-migration. However, some measurement and analyzing techniques were identified in the interviews.

The success of the migration project can be measured in terms of time, cost, and goals (Slamaa et al., 2021). The interviewees mentioned the use of proof-of-concept as a way to display the anticipated results of the migration to the customer. By measuring the time and cost of a small part of the migration process, the size of the whole investment can be clarified to the customer. It was observed from the interviews that the success of the migration project is mainly discussed with the customer naturally, rather than using quantitative methods. User satisfaction is also considered in this part by making it clear to the customer, what they can expect from the migration.

System quality was brought up in the interviews multiple times. The first thing to observe is the customer company's legacy system and its state. If the system is working well, a big change may not be needed. If the system and its processes are totally renewed, it needs to be carefully considered that the scope is correct for the customer company. SAP's standards might be taken into use if they seem to benefit the business. It was mentioned in the interviews that the efficiency of processes between legacy and new system can be measured with percent calculations. However, it gives only a high-level view of the improvements.

Information quality needs to be considered mainly in Brownfield and Bluefield approaches, as history data is transferred into the new system. The interviewees agreed that data must be cleaned by the customer company before migration. As it was mentioned above, measuring the ERP performance requires actions from the customer long before the migration. Some interviewees stated that performance monitoring can be done by the consultant company post-migration, if performance issues are identified in the old system.

6.3 Limitations and further research

The ERP migration process is not a highly standardized process, and it depends on the nature of the customer company. The results of the research may not be applicable for all companies and businesses. The data for the study was collected from one consultant company that may have settled ways of working. However, as a consulting company they are working with multiple customer companies, which generalizes the results. The researcher was also working in the research company during the study, which may have an effect on the observations, analysis, and conclusions of the research. The researcher had not participated in ERP migration projects during the employment.

Hsieh and Shannon (2005) describe the most common limitations of a directed content analysis. Usually the researcher might approach the studied subject with strong presuppositions. This can affect the results, as the findings easily reflect the researcher's presuppositions, while the findings that contradict these presuppositions may be challenging to find. In the interviews, the interviewee might follow the interview questions that are based on predefined categories. The interviewer must observe if the interviewees are able to give their unguided opinion. (Hsieh & Shannon, 2005.) In this research the interview questions were open and did not contain any predefined opinions or assumptions.

The literature review and qualitative study were not fully comparable. There were some insights and themes in the results of the literature review that were not emerged during the qualitative study, and vice versa. One possible reason for this was the fact that the literature review was conducted of the general ERP migration process, while the qualitative study focused solely on SAP S/4HANA. For example, the different migration approaches from the literature were difficult to apply to the migration to S/4HANA. There may have also been a slight difference on the viewpoint that the migration process was observed in literature and in the qualitative study. The migration approaches were described on a technical level in the literature, while in the interviews a more of a high-level view was chosen. It might have required more competence from the researcher to fit the two together to compare them sufficiently.

The scope of the qualitative case study was narrower than the scope of the literature review, as the focus was on one software vendor, SAP. Baskarada (2014) states that the scope of a qualitative case study needs to be decided strategically, as everything does not need to be and cannot be understood from a subject. Focusing on one software in the case study allowed the researcher to gain a sufficient understanding of the migration process in a limited time. By scoping the study, the results are also more accurate with less variation in the collected data. The results may not be generalizable to all other ERP software, but as Baskarada (2014) mentions, one of the drawbacks in case study is the overgeneralization of the findings. The theory of the case study could be strengthened by performing cross-case comparisons (Baskarada, 2014).

7 CONCLUSION

The goal of this research was to enhance the understanding of the migration process from legacy to new ERP system. The main focus was on finding factors that guide the choosing of a suitable migration approach. Also the business value of a migration and the ability to customize a new system were taken into consideration. The findings from qualitative case study addressed three migration approaches used widely in SAP S/4HANA migrations, Greenfield, Bluefield, and Brownfield. The findings were compared to results from a systematic literature review, where ERP migration was studied on a broader level.

The main factors guiding the choosing of a migration approach were identified from the case study: 1) The state of legacy system, 2) the amount of customization needed, 3) willingness to standardize or change processes, and 4) time available for the migration. If the company's legacy system is in a good state and they don't need a big change, the migration can be executed with Brownfield approach, even in a short period of time. This way the company can keep all of their existing customizations and data. If more change is needed and the legacy system does not serve its purpose, Bluefield or Greenfield approaches are better options.

It was observed both from the literature and the case study that the business value of a migration is hard to measure and there are limited existing methods to execute it. Some success factors of an ERP migration project were identified from the literature that can be used to analyze the business value. However, it was recognized that some factors are difficult to quantify in order to measure them more precisely. The best way to analyze the expected business value that was observed from the case study was a proof of concept. With a proof of concept, it can be shown to a customer company, how the new system will work and accomplish business requirements in the future.

The amount and need of customization in the system was identified as an important topic for the migration. Three ways to customize an ERP system were discovered from the literature and the customization techniques from the case study were compared with them. The possibility to customize a new system without touching the system core can encourage companies to migrate a new

system with Greenfield approach, rather than keeping their old custom code with Brownfield approach. This way they might get more business benefit from the system's conceptual design and best practices.

This study contributed to the field of enterprise systems by compiling findings from the literature and case study about the migration of ERP. A systematic literature review was conducted that collected ERP migration literature from the past 33 years. Various migration methods and factors guiding the migration were identified from the literature. Based on these findings, the results of the case study could be analyzed and compared to the prior research. The case study provided the most significant contribution to customizing the new enterprise system. The newest techniques for customizing and extending ERP systems were not recognized from the literature. The use of APIs and cloud solutions has changed the way systems are being customized, which allows the system core to stay untouched.

The biggest gap of information was found in measuring the expected business value of the ERP migration. No standard approaches or techniques were discovered during the research or from the literature review, and it was assumed that the customer company handles the measurements. Some quantitative approaches were described that help the customer company realize the expected business value, but the accuracy of these methods did not become clear in the study. The measurement of ERP migration's real business value could be one viewpoint for further research on ERP migration.

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ATTACHMENT 1 INTERVIEW QUESTIONS

General about migration projects

1. What is your experience with the different migration approaches available for SAP S/4HANA (Greenfield, Bluefield, and Brownfield)?
2. Shortly describe the main factors you consider when advising a client on the most suitable approach for SAP S/4HANA migration?
3. How do you ensure that the chosen migration approach aligns with the client's business objectives and long-term goals?

Business value

1. What methods do you use to quantify and measure the expected business value of the SAP S/4HANA migration for the client?
2. Do you factor in the potential long-term benefits and value of the system when evaluating the business value of the migration approach?
    a. Are the achieved benefits measured post-migration?

Customization

1. How do you identify the client's unique business requirements that require customization during the SAP S/4HANA migration?
2. What is your approach to customizing the SAP S/4HANA system while still maintaining its standard functionality?