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ERP IMPLEMENTATION

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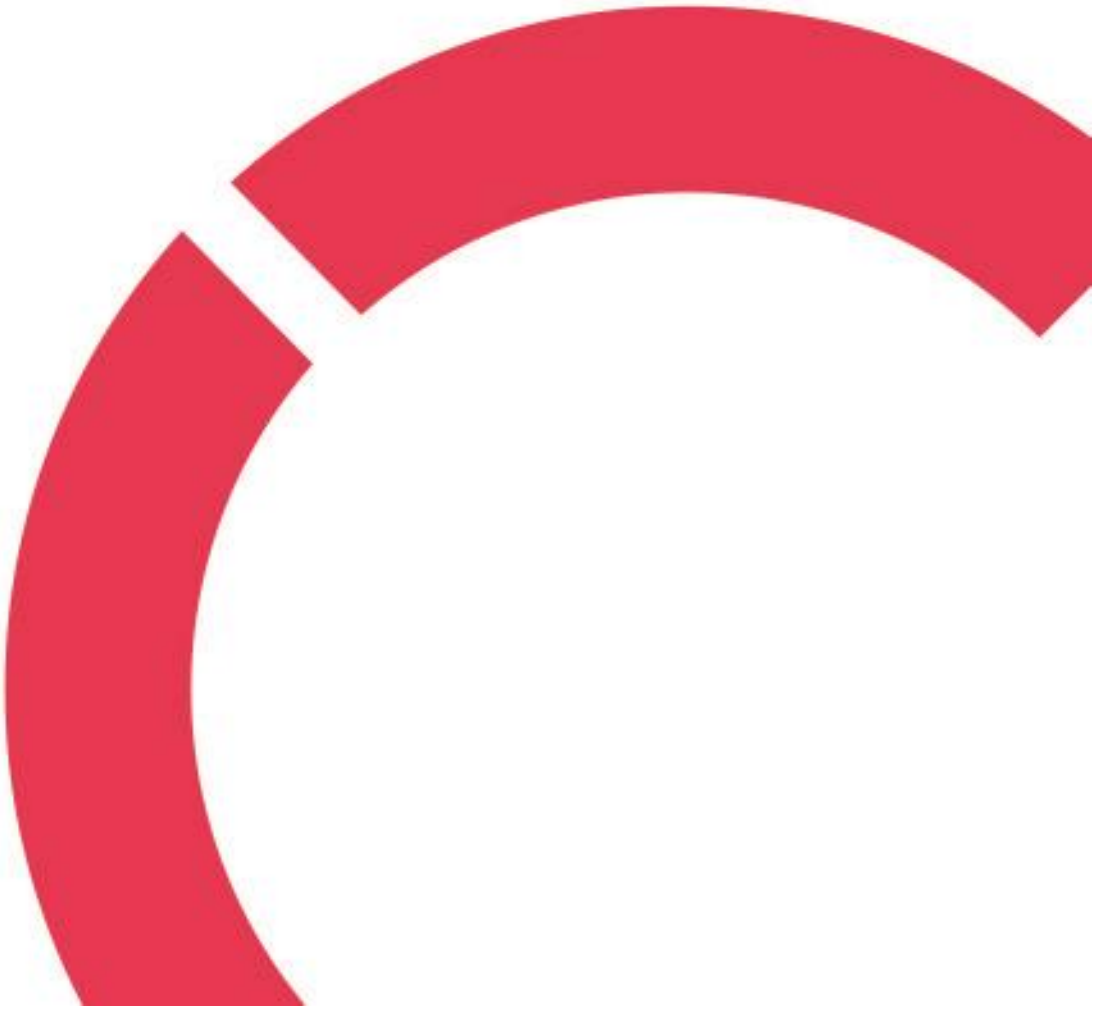

ABSTRACT

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This thesis analysed ERP implementation for businesses.

ERP system vendor selection is a big task for a company, as choosing the right system can mean the difference between a successful business and a bankruptcy. Nowadays there are more and more different ERP system vendors and choosing the right vendor can be difficult.

The theoretical framework analysed ERP systems in detail and talked about the differences between the systems. The framework also presented the advantages and disadvantages of ERP systems.

The thesis proposed a step-by-step plan for a company to implement ERP system. Each step was explained in depth and the possible challenges were discussed and solutions to those challenges were presented.

Recommendations for implementation best practices were also given.

Keywords
Enterprise Resource Planning, ERP, ERP Implementation, IoT, MRP

CONCEPT DEFINITIONS

API

Application programming interface

CAGR

Compound annual growth rate

ERP

Enterprise resource planning

IoT

Internet of Things

iPaaS

Integration platform as a service

MRP

Material requirement planning

ROI

Return on investment

ABSTRACT
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1 INTRODUCTION

The topic of this thesis is ERP system implementation. This thesis aims to answer, what is the optimal way to implement a new ERP system for a business, and what are the possible problems that might arise during the implementation. A part of this thesis also focuses on finding solutions to those problems.

ERP systems are a type of computer software that companies use to manage their business activities. ERP software can include systems to manage accounting, procurement, project management, and supply chain management. Different ERP systems tie together a company's business processes and enable data flow between them. By using ERP software, the company can have an accurate and current overlook of all the company's operations and cashflows. (Oracle 2022.)

Why are ERP systems important? Nowadays, choosing the correct ERP system is more important than ever for a company. The ERP system is the core of business operations management. A fully integrated ERP system can combine information flows from many different departments. The ERP system streamlines many processes, and it also helps to automate some of the functions. Key benefits of ERP systems include cost savings, resource optimization, and reducing human errors. By using a modern ERP system, a company is able to succeed in today's data-driven environment. (Microchannel 2022.)

ERP implementation is a critical step in any company's business operations. By carefully and correctly implementing the system, it is possible to avoid the common pitfalls encountered in the implementation phase. For the implementation, a step-by-step framework should be established first, as this will guide the company through the implementation as smoothly as possible.

The purpose of this thesis is to research ERP implementation in detail. What the implementation includes, how it is done and what should be considered. What are ERP implementation best practices? An implementation framework will be presented and also a framework for selecting the optimal ERP system vendor is created.

I have chosen this topic for my thesis, as I am interested in finding the optimal way to implement a new ERP system for the company I work for currently, and I also believe that ERP systems are an important resource for any company and close attention should be given to the selection and implementation of the system.

2 ENTERPRISE RESOURCE PLANNING THEORETICAL FRAMEWORK

ERP system is a broad software package that tries to combine and integrate all business processes and functions to give a complete view of the whole business from one IT system. ERP systems try to replace different standalone IT programs a business might use for instance for finance, inventory, logistics, HR, etc. with one unified system that is split into different modules. These modules operate as a standalone system, but each module is also linked to the other modules, sharing data between them. (AboAbdo, Aldhoiena & Al-Amrib 2019.)

ERP systems use a single, main database, that contains all the business information and data. This database acts as the main location for storing and sharing data between different business departments and business processes. ERP systems provide the ability to process and store huge amounts of data and they also provide steady and real-time information sharing with the customers. ERP systems are also easily scalable to respond effectively to changing customer behaviour and demand. (Prakash, Savaglio, Garg, Bawa & Spezzano 2022.)

ERP systems allow the automation of many business activities and help the users to have information available at the right time, which supports the decision-making needs of the organization. This information gives the user an overview of the organization's current situation, globally and also in each business unit, and along the whole value chain. (Azevedo, Romao & Rebelo 2012.)

ERPs can exist in different forms, from extremely configurable systems to industry specific systems with pre-set templates. The different forms of ERP systems comprise of varying levels of industry best practices and standards to guide the business operations. Also, ERP systems can be provided to clients in many different forms, such as a product or a service. (Vuorenmaa 2015.)

2.1 ERP advantages

There are many advantages in using an ERP system. Among them, the main ones are: Increased efficiency. With the automation features that ERP systems offer, many routine business tasks can be automated, which frees up employees to concentrate on other tasks. This increased efficiency can also bring

shorter lead times and a more responsive supply chain management, which leads to business growth. (Finch 2021.)

Another benefit of ERP systems is improved collaboration. As the ERP systems use a shared database for all the information, each employee has on-demand access to operational data, leading to improved communication and employee engagement. This collaboration also leads to improved efficiency, which in turn means cost savings. (Finch 2021.)

Enhanced reporting and real-time information is an important advantage of ERP systems. Due to the shared database of ERP systems, the user is able to access real-time information and generate accurate, up to date reports. With these reports, it is possible to compare operations between different business units more easily and to monitor inventory levels. (Finch 2021.)

Flexibility and scalability is another advantage. Modern ERP systems are comprised of many different modules for various business functions. This means that the ERP applications can be used singularly or together as a full software suite. A company using the ERP system can choose which modules it needs for its business. This mean that they do not have to acquire the modules they do not need, leading to cost savings. (Finch 2021.)

Modern ERP systems provide also regulatory compliance. ERP systems have built-in financial reports with validated data. This is an obvious advantage, as maintaining accurate financial records is necessary in order for the company to be regulatory compliant. Some ERP system providers even take specific financial regulations into account, when providing financial reports. (Hayes 2017.)

Forecasting is an advantage of ERP systems. The systems can combine a range of historical data and from that data it can predict future demand, revenues and expenses. These forecasts tends to be quite accurate, due to the amount of data the ERP systems have on the business. (McCue 2022.)

2.2 ERP disadvantages

Despite the numerous advantages that the ERP systems offers, there are some disadvantages. One of the main disadvantages is the long implementation time of the system. In large businesses, the implementation can take 3 to 5 years, which is a considerable length of time. (Azevedo, Romao & Rebelo 2012.)

Another big disadvantage is the cost of the system. On average, the total cost of the implementation project is between 150.000 and 750.000$ for large businesses. (Peatfield 2021). The maintenance cost of the system is also something that has be taken into account, when selecting the system. These costs are normally about 15-20% of the initial purchase price (Tyndall 2019).

Another disadvantage is the training requirements when implementing a new ERP system. The complex nature of the ERP systems brings additional requirements for the staff that uses the system. Learning to use the system efficiently can take considerable amount of time and effort, and this training time is away from other work. Mastering the whole system is a huge work, and only a few employees should reach this super-user level of proficiency. (Roznovsky 2021.)

Some ERP systems have too many features, which might be a disadvantage especially for smaller companies implementing the system. By having too many features or modules from the start, the cost of the system is higher, and the implementation time is longer. A feature heavy ERP system will place additional stress on the employees learning the new system. (Baumann 2022.)

2.3 ERP markets

The value of the ERP software market in 2020 was approximately $43,72 billion and it is expected to grow to over $117 billion by the year 2030 with an annual CAGR of 10%. The Covid-19 pandemic increased the need for companies to implement new ERP systems as more and more employees had to work from home. This had a major impact on the ERP software vendors. (Keshav, Pramod & Vineet 2022.) Some of the biggest ERP system vendors by revenue are SAP, with revenue of $7,079 billion; Oracle; with revenue of $3,901 billion; Workday, with revenue of $2,325 billion; Sage, with revenue of $2,048 billion, and Infor, with revenue of $1,72 billion. There are numerous smaller ERP vendors that make up a big part of the total ERP software market. (Wilson 2019.)

In the year 2020, of the top ten fortune 500 companies, seven used SAP ERP systems, and two used Oracle ERP systems. One of the top ten companies, Amazon, uses an in-house ERP system. (Pang, Markovski & Ristik 2021.)

The top three consumers of ERP systems by industries are: Manufacturing 33,66%, Information technology 14,85%, and Financial services 13,86% (The 2020 ERP report 2020).

Below is a chart that details the market share of the biggest vendors in the ERP market.

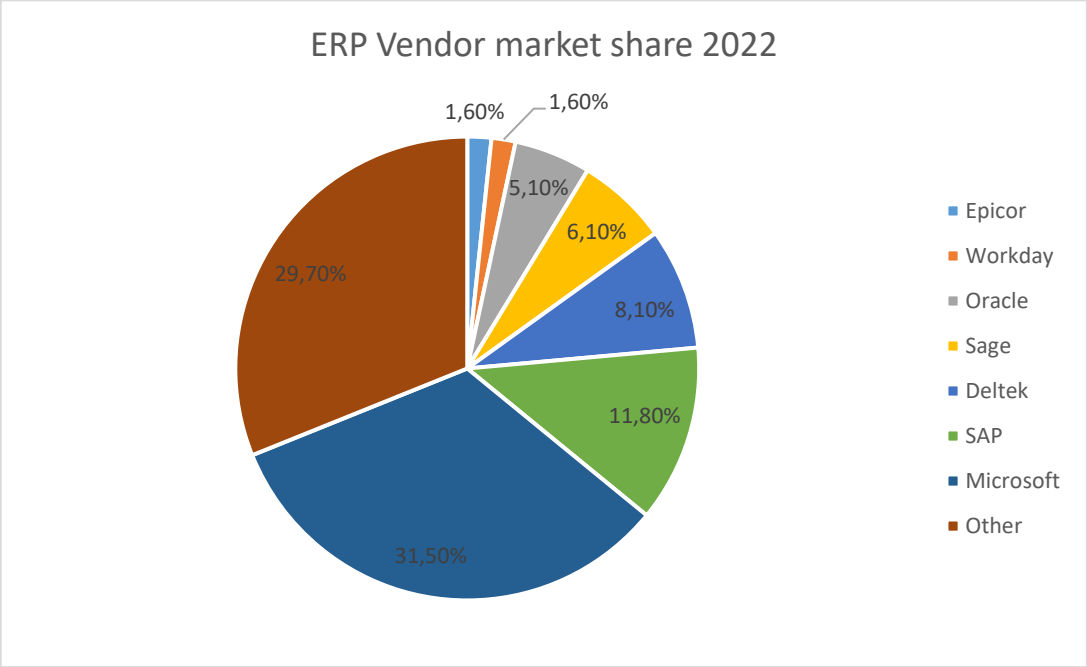

FIGURE 1. ERP Vendor market share 2022 (adapted from Davidson 2022)

From this chart, it can be seen that the biggest ERP system vendor is the Microsoft, with 31,5% market share. Their main product offering is the Microsoft Dynamics ERP system. The second biggest market share goes to group other vendors, which include companies such as Aptean, Infor, Odoo, and Acumatica. The vendor with the third biggest market share is SAP, with 11,8% market share. Their products include the SAP Business One, SAP S/4HANA, and SAP Business ByDesing. The fourth biggest market share goes to Deltek, with 8,1% share. Their main ERP product is the Deltek Vantagepoint. Rounding out the top five ERP vendor market share for 2022 is Sage, with 6,1% share. Their two main ERP products are the Sage 300 and Sage Intacct ERP systems. (Davidson 2022.)

2.4 On-premise ERP systems vs cloud-based ERP systems

There are two different types of ERP systems, On-premise ERP and Cloud-based ERP. The main difference between them is where the ERP system servers are installed. On-premise ERP system servers are installed locally, on the businesses own computers and servers. Cloud-based ERP systems are hosted on the vendor's servers and are normally accessed through a web browser. Some other differences are the pricing. Cloud-based ERP systems are usually invoiced with a monthly or an annual subscription, and on-premise systems are invoiced with a one-time continuous license. Usually, cloud-based ERP systems have a lower cost of entry, so this kind of system might be more attractive especially for smaller companies. Security is another key difference between these two kinds of systems. On a cloud-based ERP system, all the data is located at the vendor's servers, so they are responsible for the data security. On the on-Premise ERP systems, the data is located at the user's servers, so data security is the responsibility of the user. An on-premise ERP system is usually more customizable than a cloud-based ERP.A cloud-based system vendor normally offers the same version of the system for all the different companies, whereas an on-premise system is customized to each users' preferences individually. Typically, implementation is faster for a cloud-based system, as all the software is already on the vendor's servers, they only have to give access to the buyer. On-premise system hardware has to be installed locally at each buyer's premises, which takes more time. (Hale & Cox 2020.)

As can be seen, there is no one correct answer when selecting either an on-premise ERP system or a cloud-based system. It all comes down to which of the two options provide the optimal features and price for the company. Both systems have their advantages and disadvantages. It should be mentioned that more and more companies are choosing cloud-based systems, as according to the 2022 ERP report by Panorama consulting group, 65% of businesses choose cloud-based ERP systems, and 35% choose On-Premise ERP systems. (The 2022 ERP report 2022.)

2.5 Evolution of ERP systems

The history of ERP systems dates back to the 1960s. Manufacturers needed a way to track the inventory and a software system called Material Requirements Planning was developed for this need. These MRP systems helped the manufacturers monitor the inventory and they also allowed some limited purchasing and delivery operations. From the 1970s more and more manufacturers started to use this kind of MRP systems, and the systems developed quite rapidly from there. By the 1980s, the systems

evolved into MRP II systems which were a lot more sophisticated and had advanced functions. (Mulvenna 2018.)

MRP II systems were a functional replacement of the previous generation of systems. They contained all the features of the previous systems and then built upon that. MRP II systems included features to manage logistics, marketing, and finance. With MRP II systems, it was also possible to manage the human resources of an organization. The systems included functions to manage both machine and personnel capacity. Another important function of MRP II systems was demand forecasting. MRP II systems were able to help companies to calculate optimal sales levels of products or services. (CFI 2022.)

By the 1990s, the first ERP systems were developed. These systems expanded on the feature set of the MRP systems and also, they had the capability to consolidate different business units into the same system. This was the time, that big businesses started to implement the ERP systems. Unfortunately, many smaller and mid-size companies were unable to implement them, due to the high upfront cost. During this time, the ERP term was coined, first used by the Gartner Group. (ERP information 2023b.)

In the 2000s, the ERP systems started to include more advanced internet functionalities. This means that the systems were able to better communicate and exchange data with other business IT systems, such as customer relationship management systems. These connected ERP systems adapted technological improvement with services-oriented architecture. (ERP information 2023b.)

The current phase of ERP systems is cloud-based ERP systems. More and more ERP systems vendors are starting to offer systems that work in the cloud, meaning that the buyer of the system doesn’t have to install a on-premises system. This means that all the data is stored in the cloud and is accessible from anywhere with an internet connection. (Fryer 2020.)

As for the future of ERP systems, even more vendors will offer cloud-based systems. It has been predicted that in the future, almost all new ERP systems will be exclusively cloud-based systems. Another development will be the inclusion of the Internet of Things features into the ERP systems. This means that the ERP systems are directly connected to other devices such as warehouse truck and product packaging. This provides benefits such as improved forecasting, improved asset management, advanced business intelligence and many more benefits. (Hayes 2022.)

Future ERP systems will also include better data analysis features, thanks to the falling cost of data storage. This means that it will be possible to collect even more business data which helps with creating advanced reports. Artificial intelligence will be another important aspect of future ERP systems. Artificial intelligence will help to automate data driven decision making, freeing up management for more strategic work. Future ERP systems will also incorporate blockchain technology, which will improve data integrity in business agreements with multiple parties. (ERP information 2023b.)

2.6 Success factors in ERP implementation

ERP systems have a strategic importance for businesses, as the systems integrate into main business processes and as such, they have direct impact on business performance. Due to this importance, many companies have strategies that are underpinned by ERP systems and great deal of attention is paid that the ERP system is implemented correctly. It has been estimated that businesses spend from 1,5 to 6% of their annual revenue on ERP implementation. Due to the complexity of the implementation projects, many companies are not satisfied with the implementation, and they don’t reach the promised benefits of the system. Only about 10 to 15% of businesses are satisfied with the performance improvement the new ERP system has provided. (Ke & Wei 2007.)

ERP systems impose big challenges on the implementing businesses, in terms of material and organizational resources, a possible change in business processes and workflows. The implementation also requires numerous tasks, such as software configuration, testing, data conversion and user training. Because of complexity, the result of the ERP implementation project is a multifaceted concept, and it consists of numerous aspects. (Ke & Wei 2007.)

Due to these aforementioned challenges in ERP system implementation, there are critical success factors that must be taken into account. Below are discussed some of the main critical success factors, that have been identified in studies.

Project strategy is the first success factor in ERP implementation projects. It is of significant importance to form a sound strategy for the implementation project. The strategy will help the project managers to better understand, what are the requirements and desired outcomes of the implementation. This will help to create actionable plan and to allow the implementation to progress. (Indeed 2022.)

Project team is another important success factor to have, and it should be composed of full-time employees, who are in charge of the implementation. The team should include a project manager with strong experience in similar projects. The team should have members who represent the core areas of the business. By having a good project team with well-defined responsibilities, it will set up the implementation project for success. (Waynick & Stensrud 2014.)

Scope control means that the implementation project has clear, well-defined targets and objectives, and they are easily measurable. This will help the implementation team to focus on the main issues, which ensures that they are finished on time. This also gives a way to measure the progress of the implementation. (Stone & Zhang 2021.)

Human factor is an important success factor as it has been studied, that inadequately trained staff during the implementation leads to a greater risk of failure of the implementation. Studies have shown, that well trained staff leads to better user adoption and improved satisfaction in the ERP system. (Stone & Zhang 2021.)

Change management is a factor in the implementation project, and it starts with managing the staffs' attitude towards change. The staffs' attitude is a big obstacle in system implementation projects. The reasons is that any change to an IT system usually changes the way the employees perform their work on said system and this can lead to dissatisfaction if the change is not properly planned. If change is not managed well, it can change the employees' attitude towards the ERP system implementation to be negative. (Stone & Zhang 2021.)

A realistic budget for the project is a success factor, as without sufficient monetary resources, the implantation is destined to fail. The budget should include all the costs of the project, such as software, hardware, and human resources. The used budget should be constantly monitored, throughout the project. (Waynick & Stensrud 2014.)

Communication is factor that must be considered from the beginning in every ERP implementation project. It is essential to keep the entire company well informed about the new ERP system and the progress of the implementation. This can be achieved by having clear communication throughout the process. This will help the staff to prepare for the new system. (Indeed 2022.)

Data quality is another factor, as it influences the users' perceived usefulness of the information from the system. Errors in the data might result in great costs for the organization. (Stone & Zhang 2021.)

Performance measures must be kept in mind, when thinking about success factors as it is important to set specific performance measures for the implementation. This will help to assess, how the project is advancing. This can be achieved for instance by measuring, if the project is adhering to the implementation timeline, or by calculating the budget used. (Indeed 2022.)

Management support is one of the most significant factors to achieve a successful ERP implementation. Especially, top management leadership is a decisive success factor in the implementation project as their involvement sets the tone for the project. As the project usually takes a long period of time, the top management needs to show correct leadership behaviour in order to motivate other managers and regular staff in the implementation. The top management has to also resolve possible conflicts and reward beneficial conduct of the staff towards the implementation. As the impact of top management on the implementation project is considerable, more studies on the matter have begun to emerge and its importance is clearer than ever. It might be the one success factor that is the most important and it is also decisive between a successful implementation and a failure. (Shao, Feng & Hu 2016.)

ERP system vendor selection is an important success factor, as no one ERP system package can provide all the necessary functions a company needs. Thus, the company should choose a vendor that can customize the system to the specific needs of the organization. The selected ERP system should fit with the business processes of the company. (Al-Fawaz, Al-Salti & Eldabi 2008.)

It is critical to identify the stakeholders from the beginning of the project. They should be categorized by their interest in the project versus how much they can influence the project. By categorizing the stakeholders, a strategy can be formed on how to manage them. Many implementation projects have failed due to insufficient attention to stakeholder management. (Mallampalli 2022.)

Data management and data migration is one of the most important factors in any implementation project. This will ensure that the data in the new system is correct and complete. Incomplete data in the new system might lead to detrimental result or even project failure. Many implementation projects fail to plan sufficient time for data migration, and due to the importance of this factor, it should be prioritized. It is important to understand what data needs to be migrated into the new system. Some of the

data in the old system might not be needed anymore, in which case it should not be migrated. (Mallampalli 2022.)

Timeline planning is an important success factor. Many companies are trying to rush the implementation, due to the associated costs. This is never a good idea, and normally a rushed implementation will only be more expensive for the company, as there might be some issues that have to worked out after the implementation, which is usually more expensive. A realistic timeline can be set by breaking down every phase of the implementation into actionable steps, and the setting a timeframe for each step. (Catraio 2021.)

As can be seen from the above points about ERP implementation success factors, they play a huge part in the project, and so they should be studied in detail before the implementation. The factors might differ somewhat from one project to another, depending on the size and industry of the business implementing the system, but the above-mentioned factors are most common ones in any ERP implementation project. (Stone & Zhang 2021.)

2.7 ERP modules

Modern ERP systems contain many different modules, which means that they can perform many different tasks that the company might need. An ERP module is programmed to perform a specific business operation, such as front and back-office functions. Each module then connects into the main ERP system, so the module has always up to date data available. By having different modules available to add to the ERP system, is it possible for the company to add new functions as the company grows. Below are the main modules that different ERP system providers offer. (McCue 2022.)

Accounting and finance module, it is the main module of ERP systems, as it provides the users a financial outlook of the company. This modules main features are monitoring accounts payable and accounts receivable and managing the general ledger. The module is also able to automate some financial tasks such as billing and vendor payments. (McCue 2022.)

The procurement module handles the materials or products the company needs in order to manufacture the goods it sells. The module has automation features to request quotes from providers and then track those request for a quote. (McCue 2022.)

Another module is the manufacturing module, which can plan the production and track all the necessary raw materials and machine capacity. The module can analyse the average production time for an item and then compare that to the demand forecast in order to plan the optimum production levels. (McCue 2022.)

Inventory management module handles the inventory by analysing product quantities and locations. The module provides information of current and future inventory with integration with the procurement module. The inventory management module helps to calculate inventory costs and it makes sure that the company has suitable stock without tying too many resources in inventory. (McCue 2022.)

Another important module is the supply chain management module, which monitors the movement of products in the supply chain, from suppliers to consumers. It can also keep track of return merchandise authorizations. (McCue 2022.)

The customer relationship management module saves the client and prospective client data. All the communication and purchase history between the customers and the company is stored in this module. This module also can be used to handle sales leads and opportunities and can analyse what clients should be targeted for promotions. (McCue 2022.)

Human resources management modules' main task is to track all the records of the company employees like performance reviews and job descriptions. It also keeps track of work hours and sick leaves. (McCue 2022.)

The sales module has features that helps to track sales and schedule deliveries. The module also maintains and updated the client information, such as shipping instructions and invoicing details. (ERP information 2023a.)

As can be seen from the list above, ERP systems include many different modules, and not all modules are necessary for all businesses. Depending on the industry or the size of the company, it might make more sense to start with only few modules and then include more modules, as the business grows. By having fewer modules in the beginning, the implementation might be easier, and the initial price might be lower. (McCue 2022.)

2.8 ERP and globalization

ERP systems have had an undisputed role in the globalization of the world economy. ERP systems are an important part for any business globalization strategy, due to importance of the ERP systems in supply chain management. As the ongoing globalization trend has happened in part due to advances in supply chain management, it is important to note how ERP systems directly integrate with different supply chain management processes, and thus contribute to globalization. (Seres & Tumbas 2014.)

A good ERP system is an essential requirement for creating a well-functioning supply chain management system. An ERP system that supports the demands of globalization should include features such as multi-currency activities, data consolidation, software localization, and intercompany stock transfer, among other features. These features will facilitate the integration of the ERP system with supply chain management systems. Organizations with business activities in multiple countries usually function as multiple entities. The differences in keeping the financial ledger, different currencies and other special aspects of individual countries pose a considerable challenge for ERP systems with regard to presenting a consolidated view of business operations, both financial and non-financial key performance indicators. (Seres & Tumbas 2014.)

The way many companies try to combat those above-mentioned challenges is by having multiple instances of the same ERP system, each tailored to the exact requirements of the specific country. This way, it can be made sure that the system complies with all the necessary requirements and supports optimally all business activities. It has been studied that 71% of large corporations have in use more than one ERP instance, and 26% use four or more ERP instances. The benefit of this multiple ERP instance strategy is that each country department can select an ERP package that suits their needs. (Seres & Tumbas 2014.)

2.9 Value of ERP systems on organizations

There have been numerous studies about the importance of ERP systems for businesses, and it has been well documented that a successful ERP implementation results in considerable business advantages for the implementing organization. In fact, the concept that ERP systems provide, integrated real-time business data in every process of the company, has been mentioned to be one of the most important development in the business usage of information technology. The ERP systems consolidate

the organizations data flows and supply a range of real-time operations data for management, which translates into more efficient productivity and speed of operations. ERP systems are thought to be an essential tool for any competitive company. (Vuorenmaa 2015.)

ERP Systems can provide both operational advantages and indirect business benefits by facilitating innovations. These aspects can lead to value creation and possibilities for long term benefits for businesses. According to research, ERP systems can produce considerable benefits for a company, such as operational benefits, financial benefits, and investor benefits. ERP systems can also create value for company by only the announcement of a new implementation project. There have been cases where a company's market value has been observed to raise, only by announcing a new implementation project. (Vuorenmaa 2015.)

Some businesses have used ERP systems to change organization culture. It has been well documented that some businesses use ERP systems to create a more disciplined organizational culture. This can be achieved by having more managerial control over the operations, thanks to the possibility of real-time data access of the ERP systems. This real-time data access feature of ERP systems have also been used to create a more transparent and democratic organization, creating businesses with less hierarchy. (Vuorenmaa 2015.)

Even though the advantages of ERP systems that are the easiest to observe are associated with process coordination, ERP systems also offer intangible advantages, that are more difficult to quantify. One of those advantages are the decision support systems that many ERP systems provide. These systems give a view of real-time company functions, which help management to make informed decisions about business operations. This feature is possible thanks to the enhanced coordination and communication between multi-participant decision makers, which the ERP systems provide. (Vuorenmaa 2015.)

As can be seen from the above points, ERP systems can have an enormous value for businesses on various different organizational levels. The value formed by ERP systems is multifaceted, some advantages are difficult to measure accurately, except on the total increase of profitability. It is known that it is difficult to calculate an accurate ROI for ERP implementations, and many businesses understand that there are numerous intangible advantages of ERP systems that can't be correctly measured. It has been studied, that 38% of businesses that had implemented an ERP system agreed on the statement that ERP systems have more intangible than tangible advantages. (Vuorenmaa 2015.)

2.10 ERP integrations

ERP integration means to connect the ERP system with other systems. These integrations facilitate information flow between those different systems. This system connectivity helps with business process automation, which leads improved productivity and information can be shared between departments quickly. The most common methods to achieve ERP integration are customs integration, which means a business develops its own core integration. Native integration refers to integration which is built by the system vendor directly to the system. Integration as a service is a cloud-based integration method. (Keenan 2021.)

ERP systems can be integrated with numerous different business functions, such as customer relationship management. This integration gives companies a complete customer view, which then helps to improve the customer experience, which in turn leads to improved customer relationships.

Another business function that benefits from ERP integrations is business intelligence software. This kind of software is developed to analyse and report data and to provide business insights. Some ERP systems include business analytics capabilities, but usually those features are not enough for full business analytics operations. By integrating business analytics software with ERP systems, it is possible to access the business insights that the software produces straight from the ERP systems, providing the ERP users direct access to important business analyses. Project management software is also commonly integrated to ERP systems. This kind of integrations provide multiple benefits, such as reduced project costs and instant project updates, leading to improved efficiency. (Keenan 2021.)

There are two different methods to integrate the ERP system with existing company software. The first method is to connect them through application program interfaces, API. APIs are a procedure that facilitate two different software programs to communicate with each other. APIs achieve this by using a predetermined set of definitions and protocols, that both programs understand. (Amazon Web Services 2021.) The other method to integrate ERP is by using an approach called integration platform as a service, iPaaS. IPaaS are a group of automated tools that connect software programs though cloud. (Churchville & Bigelow 2021.)

From this explanation of ERP integrations, it can be seen that in many cases it is advantageous for companies to be able to integrate their existing business software to their ERP systems. It will lead to numerous benefits and might also reduce operating costs.

3 ERP IMPLEMENTATION

ERP implementation is one the most critical business processes a company has to make, as the system is the core of all business operations. The implementation is a significant investment decision, and therefore care must be taken when choosing what system to implement and how to plan the implementation. If a wrong system is selected, or the implementation is not well planned in advance, this can produce unsatisfactory results which can lead to detrimental business performance for the company. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

3.1 ERP system selection

There are many different considerations to be taken into account when selecting the system, among them the most important are: price, functional fit, technology, scalability, industry experience and references. The price is the first thing that should be considered when choosing a new system as the price range of the different systems is quite considerable. A return-on-investment rate for the ERP system should be calculated, as this can guide the selection process. The functional fit is another important issue, as there are numerous different ERP systems, and the decision between the systems should be narrowed down to those systems that best fit with the business of the company that is acquiring the new system. The technology aspect is important to consider. The new ERP system should be compatible with the IT systems company is using, and it also should be user-friendly and secure. Scalability means that the selected system is able to be scaled accordingly. If the company grows its operations, it is important that the chosen ERP system is also usable in the future. When choosing the system, the industry experience of the vendor should be considered and also the references of the system. Some systems are more industry specific and so they might be better for the company. Also, it is important to research what kind of references the system has. If the system has other satisfied users within the same industry, this might be a sign that the system is suitable. (Terillium 2020.)

3.2 ERP system selection framework

Here is presented a framework that details the steps needed for a successful ERP system selection. The first step is to establish the need of a new system. In this step, the need of new system should be

established. The company should have clear view on why it needs a new system and what is wrong with the current system. By answering these questions, it will help to build a preliminary requirement list for the system. (Hayes 2018.)

The next step is collaboration. In this step, a task force should be formed. This task force is in charge of establishing the requirements of the new system. It should include personnel from many different departments, so that all the different needs of the company are taken into account. (Hayes 2018.)

The third step in the framework is define. This is the step when the master requirement and feature list is created. It defines all the different aspects the system should include and what are the technical requirements. (Hayes 2018.)

The following step is selection. This is phase when the system providers that best meet the requirements should be selected. A shortlist of suitable providers should be created and the analysed how well they comply with the feature list. (Hayes 2018.)

The next step is justification. This is the step where an evaluation should be performed. It should be evaluated, if the shortlist of system providers is justified and the company wants still to continue with the implementation. (Hayes 2018.)

The following step is verification. In this step, the different providers on the shortlist should provide demos, use cases and proof of concepts of their systems. The providers should prove that their system is suitable for the needs of the company. The providers can be given scores, according to their offer and their system. (Hayes 2018.)

The penultimate step in the framework is ranking. The systems providers should be ranked, according to the scores they received from their demos, use cases, and proof of concepts. This rating can the help to choose the provider with the most suitable system. (Hayes 2018.)

The last step is negotiation. This is step when the provider has been chosen and the system contract can be negotiated with them. The total cost of ownership should be taken into account when considering the offer from the provider. (Hayes 2018.)

This framework is a good start for ERP system selection process. It goes over all the steps that should be considered when choosing the system. For instance, it explains in detail what information or details are needed to start the project. The framework also includes steps that look at the technical requirements of the system and what information is needed from the system vendor. I believe that these are important aspects to consider when selecting the proper system. All in all, the system selection framework is quite detailed and thorough, but at the same time it is important to keep in mind that it is only a general framework, and each ERP system selection project should be customized to the needs of the company acquiring the system.

3.3 General ERP implementation framework

Process analysis is the first step of the framework. The goal is to determine the present workflows of the company. This means mainly reviewing the current documents and work processes. It is important to include the key users in this step, as they have detailed information how the current processes work in the existing system. The users are also able to identify the main issues within the existing system. The input of this first phase is the review of the documents in use currently. The output of this step can then be translated into a map of the current workflows and if there are any additional system requirements. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The second step is to prepare the scope of work. In this step, the goal is to define the scope of work of the workflows of the company. The input of this step comes from the output of the first step, understanding the current workflows of the company The main task in this step is to organize meeting between the system key users and the system vendor, in order to come to an understanding of the system requirements and if there is some need for system customisation. The output of this step is to have a document that includes the system milestones and deliverables that are to be delivered by the system vendor. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The third step is to create a project plan. This is the step where a project plan for the ERP implementation should be formed. The input of this step is the output of step 2, the milestone and deliverables document. Creating the project plan is achieved by having regular meetings between the key staff of the company acquiring the system and the system vendor. The aim of those meetings is to create a comprehensive software modification document. This can be achieved by determining the features de-

tailed in the previous step, and what necessary functions are not available in the basic software package. The output of this step is a project work plan that covers all the activities of this implementation plan. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The fourth step is to build the system. In this step, the goal is to program the ERP system according to the project plan. This is an important step, as it decides the system features in detail. The input for this step are the forms and reports in use in the current system and this should be done by gathering the current system documents and templates and the modifying them for the new system. The necessary system customization to the needs of the company are also done in this step. The output of this phase is the finalisation of the workflows for the system. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The fifth step is to prepare the standard operating procedures. In this step of the implementation plan, the standard operating procedure documents are planned and created. The input for this step is the project plan. The key processes of the company are documented in the previous steps and standard operating procedures are then created for those key processes. The key users of the system should review and validate the procedures formed in this step and propose possible modifications according to their use-cases. The output of this step is a thorough standard operating procedure with concise instructions for the users on how to perform their work tasks. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The sixth step is to create a data migration plan. In this step, a data migration plan should be created. This is a critical step in the implementation plan; thus, it is important to plan it correctly. The input for this step is the current data in use. The available data from the different business units should be collected and classified. This collected data should then be compared with the system target data in a predefined file format decided by the system vendor. Then this data should be translated into the new system. The data should also be analysed in order to eliminate redundant data and to clean it in order to eliminate corrupt data. As this is a time-consuming step, it can be done simultaneously with the other steps of this implementation plan. The output of this phase is the current company data that is uploaded into the new ERP system. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The seventh step is the user acceptance test. This is the step when the key users test the system and the standard operating procedures. The input for this step are the standard operating procedures created earlier. The testing is done by running the workflows and processes corresponding to the standard operating procedures and making sure the procedures reflect the actual tasks the users have to perform.

The output of this step is the creation of a concise operating manual for the new ERP system. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The eight step is user training. The aim of this step is for the key users to receive training from the system provider, so they are able to use the new system and also to train the other staff at the company. The input for this phase is training sessions with the key users. The key users should have those training sessions with the system provider for each work process. This user training step takes place in a test system, but with live data. The output of this step is a well-trained and prepared staff for the new ERP system. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

The ninth and last step of ERP system implementation framework is the Go-Live. This is the step when the system becomes operational, to go-live. The IT infrastructure of the company should be updated to assure that the company hardware are able to adapt to the ERP system. The input of this step is the updated data that is uploaded into the new ERP system. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

I believe that the above general framework for ERP implementation is a good starting point for any ERP implementation plan. By following it, many usual implementation challenges can be avoided. I especially like the way it is broken down into small actionable steps, and each part of the plan is well explained. I have seen many frameworks that in my opinion are quite ambiguous, leaving many of the steps open to interpretation. A well planned out framework with actionable steps is a requirement for any successful implementation project. (Phdata 2022.)

One of the risks I see in using the framework for ERP implementation, is that a company would follow it too closely. As it is only a general framework, each step should be customized to the needs of the implementation project. This is especially true if the company implementing the ERP system is a smaller company, without so many resources to allocate for the project. They might follow the framework blindly, without taking into consideration their specific needs for the ERP. I believe that this pitfall can be avoided by hiring external project managers who have experience in implementation projects. They will help to customize the framework to the implementation project.

In the framework, I like that it includes many of the critical successful factors I have identified previously. As those factors are paramount for the implementation to be successful, I believe that the framework is quite complete, and it would be a good starting point for the implementation of ERP systems.

The below table explains the different steps in the ERP system implementation guideline.

TABLE 1. ERP system implementation guideline (Alaskari, Pinedo-Cuenca & Ahmad 2019)

Step	Input	Process	Output
Step 1	Current documentation review	Key users' discussions in order to have knowledge of the current processes	Workflow map and system requirements
Step 2	Step 1 output – Current workflows	Meetings between staff and system provider to establish the main features of the new system	System milestone and deliverables documentation
Step 3	Step 2 output – Document with system milestones and deliverables	Meetings between staff and system provider to create a software modification document	Project work plan
Step 4	Collecting the currently used forms and reports	Modify the current documents and templates for the new system	System workflow finalisation
Step 5	Preparing the project plan	SOP documentation creation	Work task instructions
Step 6	Gathering all the current data in use	Current data collection and translation and migration into the new system	Uploading the old data into new ERP system
Step 7	Creating the SOP documentation	System testing according to the SOP's	Operating manual creation
Step 8	Key user training sessions	Key user training sessions for each work process	Key staff well trained

(continues)

TABLE 1. (continues)

Step 9	Upload the new system to company IT infra-structure	System go-live	System go-live

This implementation guideline explains all the different steps along the implementation project. It analyzes what is the input, process, and output in each step. The input is always the output of the previous step. In my opinion, this guideline clarifies the steps in the implementation and offers an opportunity to see how each step affects the implementation. As this only a general guideline, the step should be modified to the needs of the specific implementation plan.

According to the authors of this guideline, it has been used in successful ERP implementations. It highlights important issues that need attention during the project such as a clearly defined scope, good project planning, and minimal customization. The guideline is especially useful for SMEs implementation projects. (Alaskari, Pinedo-Cuenca & Ahmad 2019.)

4 ERP IMPLEMENTATION PROBLEMS AND SOLUTIONS

Due to the complexity of ERP implementation projects, there are many challenges that must be addressed before and during the project to achieve satisfactory results. As the system will be used by business units across the organization, it is of utmost importance that the project goes through with the minimum number of problems and delays. Otherwise, it might affect the bottom-line of the company and there have been cases where a whole company has gone bankrupt due to a failed ERP implementation. (360 Cloud Solutions 2019.)

It has been studied, that about 90% of ERP systems were delivered late or the project went over the budget. Only about 26% of ERP using businesses were satisfied with the ERP system provider. As many system vendors are only promoting the successful implementations, it is highly important to plan the implementation in detail and prepare for possible challenges. (Coşkun, Gezici, Aydos, Tarhan & Garousi 2022.)

4.1 Problems and solutions

It has been documented that many ERP implementation projects have suffered from the same usual problems. By recognizing beforehand the possible problems, a plan can be made to avoid them, thus increasing the probability of a successful implementation. Below are listed some of the most common ERP system implementation problems. Possible solutions to those problems are also discussed.

4.1.1 Budget overrun

Budget overrun is one of the most common problem, affecting numerous implementations. This problem usually occurs when the project is expanded in scope or additional technology, or feature requirements are added during the implementation. This problem can be overcome by planning the project correctly from the beginning. (Coşkun, Gezici, Aydos, Tarhan & Garousi 2022.)

It has been calculated, that over half of ERP implementations have gone over budget. Many times, there are some hidden costs that have not been budgeted at the beginning of the project. Some of them

are for instance, staff overtime pay, consultancy fees, and hardware upgrades. By taking these and other hidden costs into account in the beginning, the project is much more probable to not go over the budget. (Beeson 2022.)

Usually, the price of an ERP system consists of at least the following elements: user numbers, training, features and modules, customization, testing, upgrades, license fees, upgrades, data migrations, and installation. The most important ERP implementation costs are normally the number of users, and the ERP architecture options. For the implementation budget to be correct, it is not only important to figure the current number of users, but also to correctly predict the future number of users, as some vendors might charge higher fees for adding users later. (Peatfield 2020.)

The architecture options are numerous for ERPs, many system vendors offer all-in-one systems, which might include features that are not necessary to acquire. It might be difficult to correctly assess, what features are necessary, so care must be taken not to over buy unnecessary features. (Peatfield 2020.)

Also, the ERP life cycle costs should be taken into consideration, when choosing the system vendor. There are costs related to usage and maintenance phase, which might differ quite much from one vendor to another. Even though this costs are not directly related to the implementation project, they should be at least considered when calculating the budget. (An ERP Life-Cycle Cost Model 2017.)

4.1.2 IT requirements

There are many possible challenges in the IT requirements of the ERP implementation plan. Among them is data integration, which is a big part of any ERP implementation, as it migrates the data from the old system into the new system. Inevitably this phase is challenging, as many legacy systems store their data in different formats than the new system. (Caldwell 2020.)

Another problem regarding data integration might be that the data might be spread over numerous systems from different departments. All the necessary data has to be first found, so that it can be migrated into the new system. A successful data integration can be achieved by planning well in advance and by having all the necessary data on hand before the implementation. (Caldwell 2020.)

Data integration is also an expensive and lengthy process, as there is much manual work entailed that can't be automated. One way to combat this is to prioritize the integration of core business processes first, and then scale the integration to other business processes or business units. This way the system can be operational before all data is integrated. (Biedron 2022.)

Another challenge in the IT requirements is inaccurate system requirements. Often, companies don't have exact knowledge of what they need from the new system in the beginning. They might have unrealistic expectations on how they system functions and what features it includes. It is important for the project managers to meet frequently with the system provider and to create master feature list. By knowing from the beginning of the project what is exactly required from the system, it is easier to select a suitable system provider. Some providers might specialise on for instance manufacturing or healthcare ERPs. By selecting a provider that has experience on ERP projects from the same industry as the company acquiring the system, the odds of a successful implementation rise significantly. (Miller 2022.)

Lastly, testing is an important part of the ERP IT requirements. Testing before the system go-live is an important part of any implementation project. Many times, companies try to go through this phase as quickly as possible as this is one of the last stages of the implementation project, and the project managers are in a rush to deploy the system to receive a return on the investment. This is a problem as thorough testing is necessary in any project. The solution is to dedicate enough time for testing, in order to find possible problems and bugs in the system. Much of the testing can be performed by automated robotics software, which reduces the workload on personnel, but testing by live users is also a must in any ERP implementation project. (Miller 2022.)

4.1.3 Data quality and management

Data quality is an important aspect to consider because many departments across the whole organization interact with the same customers and orders and there might be duplicate versions of the same information. Also, the information might be stored in different formats or there might be a deviation in addresses or name spellings for instance. There might be also obsolete or erroneous data, that is not needed anymore and can be discarded. The data quality can be assured by validating the data and removing the duplicates. Optimally, this will be done before the implementation. (Caldwell 2020.)

As ERP systems are integrated, a possible data quality error might have grave consequences. For instance, if a wrong price is entered into the ERP system during the migration phase, the company might end up receiving the incorrect amount for a product. Due to integrated nature of the system, the data quality error could go through the whole system unnoticed, which then might lead to substantial losses for the company. This is a great example on why data quality issues should be taken into account during the implementation. (Xu, Nord, Brown & Nord 2002.)

Data management should be well planned, due to the possible large volume of data. Many organizations have massive amounts of data in the ERP systems, so the implementation project should then take this into account. By adequately managing data, it is possible to better categorize the data, which in turn leads to better understanding of the client behavior and market trends. (Malak 2022.)

An organization might have multiple data storages, which is a considerable challenge in the implantation project, and it should be planned accordingly. For instance, some companies might store their data in separate systems that don't exchange data. Efficient data management plan takes this into consideration, and consolidates the data in the new system, which speeds up the new system, and helps to make data-driven choices more efficient. (Malak 2022.)

When migrating from the old ERP system to the new system, an important part of data management is to categorize the data into the following groups: business partner master data, item base data, employee base data, and finance master data. By having the data correctly labeled, the migration will be more straightforward, and data management in the new system easier from the beginning. Data management is not a one-time process, which can be done and then forgotten, but it is a constant process. Data management is a critical success factor in the ERP implementation. (Juneja 2022.)

4.1.4 Project strategy and management

There are a few things to keep in mind regarding possible strategy challenges during the implementation. Among them is managing change, which is the most important human related factor in the implementation. People, by nature, resist change and learning the new ERP system forces the personnel to come out of their comfort zone. To achieve successful results, the personnel need a change in their attitude along with the work process. This challenge can be solved by educating the personnel about the new system and its importance for the business and the expected results. They should also be made

aware of benefits of the system for the users. The top management should lead the employees through the change, as they are the best fit to manage the change. (Tranquil 2021.)

An effective change management looks out for red-flag issues and handles them proactively. Some issues that might come up during the implementation might be for instance that employees are asked to change too fast, this might lead to confusion on part of the employees. Another possible issue is that inadequate information about the project is provided to the staff. A big issue is that decisions about the system is made without consulting the staff that is going to use the system. An efficient change management will proactively identify the above-mentioned issues and will handle them before they have to possibility to affect the implementation of the system. (ERP Software Blog 2021.)

A part of the implementation strategy is to set clear objectives, when selecting and implementing an ERP system. It is important to set realistic and concise objectives. If the desired outcome of the new system is not clearly established, it is going to be that much harder to obtain good results. The system vendor should know exactly what is needed from the system and what is the nature of the business of the implementing company. With sufficient knowledge of the objectives, the ERP system can be customized to the exact needs of the company. (Shymko & Murauka 2022.)

One way to clarify the objectives for the implementation is to first set the overall goal of the ERP project. This can be done by answering the question, what the company wants to achieve with the new ERP. As that question is quite general, it might help to break it down into smaller parts, as this will help to answer that question. Some of those smaller questions could be for instance: Does the company want to save funds by reducing inventory; Is the company trying to improve billing accuracy; Does the company need better visibility throughout the organization; Is the company trying to make invoicing process more efficient. The answer to those questions will help to answer the question what the company wants to achieve with the new ERP. (Ippolito 2020.)

It is also important to measure if the objectives are met. Some metrics should be established, in order to know if the implementation is successful. It should be noted that some objectives might be unmeasurable, but they still contribute to the successful implementation of the ERP. (Ippolito 2020.)

4.1.5 Leadership and HRM

Insufficient human resources are an issue that comes up in many implementation projects. Often, the company implementing the ERP system decides to allocate inadequate resources for the project, and this can lead to unsatisfactory results. The project should have enough human resources, either by hiring outside contractors or assigning own personnel on the project. The company's own personnel is used, care must be taken to reduce their workload on other tasks for the duration of the project. (Miller 2022.)

Training the users of the system before the go-live is an important step in the implementation project, and something that is many times not given enough importance. As modern ERP systems are highly complex, without proper training, the implementation will fail. The efficient use of the system requires meticulous training. It has been found that proper training and education will decrease the user's anxiety and stress about the new system, and they are able to understand better the advantages of it, all which leads to more efficient and faster implementation. Training is also a great way to provide information about the new system and how it differs from the old one. (Rajan & Baral 2015.)

For the training to be as successful as possible, two different kinds of training should be used, In-person, and E-learning. Both methods have their pros and cons, and by combining them, it is possible to reach a satisfactory level of training. (Beeson 2022.)

As training is quite costly, some part of the implementation budget should be earmarked for it from the beginning, due to the importance of it. It has been studied, that an investment of about 17% of the total implementation budget to training leads to more successful implementation. Organizations that allocate 13% or less of the total budget to training are three times more likely to exceed the implementation timeline. (Purr 2022.)

4.1.6 Unrealistic timeline

Many companies take longer to implement ERPs than was planned. This is mainly due to unrealistic implementation timeline. Timeline overrun has many implications for the company, as it affects the budget of the implementation and also it might affect the overall business, if the legacy system is not working properly anymore. This challenge can be overcome by consulting the system vendor about the

timeline and setting a realistic schedule for the implementation. If there are going to be delays in the implementation, it is important to communicate this delay to the staff. As more than 50% of companies experience delays in the implementation, it might be a good idea to prepare for timeline disruptions in the initial implementation plan. (Synoptek 2016.)

In order for the implementation project timeline to be correct, the following should be taken into account. Company size, as bigger companies on average take more time to successfully implement an ERP system. The following thing that should be considered is operational complexity, as the more diverse the business operations of the company are, the longer the implementation will take. The next thing that should be taken into account are the number of users, if the organization has many different business units with numerous ERP users, more time should be allocated for the project. The legacy system should also be considered, if the old ERP system is outdated, it will take more time to gather all the necessary master data from it and migrate into the new system. By considering the above-mentioned issues before the implementation, it is possible to set an accurate timeline from the beginning. (Jobman 2022.)

Typically, an ERP implementation project can take from 6 months to over 2 years, depending on the above-mentioned factors. This timeline is from the initial project plan to the system being fully operational. Due to the big variance in the time taken to implement the system, it is important to establish a timeline from the beginning and trying to stick to it. (Archerpoint 2015.)

One way to shorten the implementation timeline is to use an out-of-the-box ERP system. Usually, these systems are faster to implement, but at the same time the systems are then quite generic and might not include all the necessary features. These kinds of systems might be more suitable for smaller companies who are willing to accept the mentioned trade-offs. (Beeson 2022.)

4.1.7 Customization

Customizing the ERP system is a double-edged sword. On one hand, it can provide much needed functionality for the company acquiring the new ERP system, but at the same time, it can introduce problems which were not taken into account during the implementation. Customization also usually increases the price of the system. Modifications to the system also pose risks for system updates, as the

customizations might not be compatible with new system versions. The best way to combat this problem is to not have any system customizations in the first place by redesigning current business processes to fit with the native features of the ERP system, which eliminates any need for customization. (Chen, Law & Wu 2010.)

If the organization is still sure that customization of the system is needed, it is important to understand the different types of customization available and not to confuse customization with configuration. Some of the different types of ERP customization include User interface, Documents and templates, Integrations, and Functionality modifications. As already mentioned previously, it is important to take into consideration that the more the system is customized, the harder it will be to update the system in the future, as not all customizations will be compatible with newer software versions. (Hale 2019.)

It has been well documented that over-customization is a big reason why many companies decide to change their current ERP, as the system has been customized so much, that it affects the usability, leading to user dissatisfaction. Over-customization is known to lead to system failures, so in general, companies shouldn't customize the systems, if possible. (Quirk 2020.)

As can be seen from these above points, there are many possible problems that might be encountered during any implementation project. Knowing those problems before even starting the project goes a long in avoiding them. As has already been previously stated, it is of utmost importance that well-formed implementation plan is prepared, as it is the key to a successful implementation.

4.2 Interview with Toni Savolainen about ERP systems

I had an interview regarding ERP systems with Toni Savolainen, the systems and processes manager at Kuehne + Nagel Oy Ltd. We talked about the ERP system that Kuehne + Nagel Oy Ltd is currently using. I asked if the company encountered any of the common problems in ERP implementation and how they solved the possible problems. The ERP system for Kuehne + Nagel Oy Ltd, called Salog, was developed in-house specifically for the needs of the company. The system was implemented over 10 years, starting from the air import department in the year 2012. From there the system was expanded to the sea import department by the year 2014, then air export in 2018 and finally sea exports in the year 2022. Implementation per each business unit took approximately 6-8 months. (Savolainen 2023.)

This timeline of over 10 years for ERP implementation is a drastic example of an extremely long timeline for an implementation project. According to Toni Savolainen, the general timeline for the implementation was exceeded, but some of the business units were migrated into the new system within the given timeline (Savolainen 2023). As the usual timeline for an implementation project is between six months and two years, the project should have been done in a timelier fashion (Archerpoint 2015). Of course, as the implementation project included many departments, it is logical that the timeline is longer than in a project with only few departments.

The human resources used for the implementation of the ERP system at Kuehne + Nagel were quite low, there was only the systems and processes country manager available throughout the project and at times there were two extra persons on site to help with the implementation (Savolainen 2023). I believe this might explain the long timeline for the implementation. As the human resources were quite low, it is understandable that the timeline was longer than usual.

Toni Savolainen (2023) mentions that no major problems occurred during the implementation of the system. This is quite surprising, as the majority of ERP implementations face some kind of problems. Maybe this might have something to do with the timeline, as the implementation was not rushed, and it was properly tested. Before the go-live, the system was tested with a set of test cases that simulated the business scenarios of each business unit. The testing was done on separate mirror version of the production versions. Many implementations fail due to lack of testing, or it being done too quickly, so I would attribute the lack of problems during the implementation to the testing of the system.

Toni Savolainen (2023) explains in the interview that the system includes many customizations as it is designed for Kuehne + Nagel by outside programmers. This is in contrast to the above-mentioned points about the risks of customizations. It is a positive aspect that the implementation did not suffer any major setbacks due to the number of customizations.

According to Toni Savolainen (2023), the user training on the system was done both online and in live training sessions. This is a good way to train the users, as the live training sessions include an instructor who can help with any questions the users might have. This is in line with the implementation training best practices as it has been documented that by combining both methods of learning, in-person, and e-learning, will reduce the staffs stress about changing to the new system, which will lead to a

more efficient migration (Rajan & Baral 2015). This proper training stage might have something to do with how successful the implementation was.

From this interview, interesting points can be seen about ERP implementations in corporations. Many of the topics discussed in the interview are in contrast with ERP implementation best practices, and still the company is satisfied with the system and the implementation. This means that all the implementation guidelines are just that, guidelines. As each project is unique, it is important that the project is tailored to the specific needs of the company, and implementation frameworks are not followed exactly, but are used as a general guidelines only. The implementing company should be free to demand all the features it wants from the system.

5 CONCLUSIONS

The topic of this thesis was ERP implementation. I wanted to analyse how the ERP systems are implemented in organizations and to see if there is something to improve in the implementation process. During this thesis, I have gone over all the steps in the implementation process and also studied what the common problems are that affect the implementations. I have also found out the optimal solutions to those possible problems during the implementation.

I have created an ERP implementation framework for this thesis. The framework goes over all the necessary steps during the implementation, from the initial project plan to the final go-live step. A general implementation guideline has also been created for this thesis which guides the implementing company through the process. Another framework for selecting the proper ERP system has been created. By following the framework, an adequate system can be selected.

I believe ERP implementation is an important topic to research, due to the huge importance of the system in the modern business environment. As companies of all sizes are using ERP systems, their significance cannot be overstated. It has been studied, that many companies are not satisfied with the implementation results, and some companies have even gone out of business due to a failed implementation. I believe that by researching the common problems encountered during the implementation process, an optimal way for the process can be created. It must be noted that each implementation project is individual, so a one size fits all solution cannot be created. Instead, a general guideline has been developed, and by following it, optimal results can be possible. (360 Cloud Solution 2019.)

As has been previously stated, ERP systems have a long history in being used by corporations from all kinds of different industries. From the first material planning systems in the 1960s, to the modern cloud-based ERP systems, the evolution of the ERP system has been interesting and most importantly, highly effective. As the importance of having some kind of a process planning systems for companies became evident in the 1960s, many resources have been allocated to the development and research of the systems. This has contributed to the development of the modern highly connected cloud-based ERP that is in use today. It has been interesting to find out how the systems have evolved and the different systems that have been in use during the decades.

As for the future of the ERP systems, the systems will be more complex than ever and including more functionalities, meaning that even more attention should be paid to the implementation phase.

It has been predicted that in the future the ERP systems will evolve to be mainly cloud based systems. This means that more and more features and modules will be included in the system, making the development more difficult. Also, other new technologies such as Internet of Things and blockchain will be included in the future ERP systems, making it possible to add even more functionality and modules to the ERP systems.

According to analysts, the ERP market will keep growing in the future, and by the year 2026 the global ERP software market is projected to reach 78,4 billion USD. This means that it is more important than ever to research the optimal way to implement the system, as even a bigger number of companies will be adopting an ERP system. (SAP 2022.)

The main point of this thesis first and foremost is the importance of the ERP systems. The significance of the systems cannot be stressed enough, as the highly connected global economy could not exist as we currently know it without the modern ERP systems. Due to this importance of ERP systems, the implementation must be carefully planned. (Seres & Tumbas 2014.)

I have discussed in detail with Toni Savolainen, the systems and processes manager at Kuehne + Nagel Oy Ltd, how the implementation process went at the company. I have reflected on what he said about the process with the usual problems in an implementation project and have given my opinion on how the problems that Kuehne + Nagel Oy Ltd encountered during the implementation could have been solved. The interview was a great example on how each implementation project is an individual process, and not all implementation best practices have to be followed at all times. Their implementation project was at times quite challenging, and the company encountered many of the usual problems. In my opinion, the process was not done in an optimal way, but even so the results were good, and the company is satisfied with the results.

All in all, ERP implementation is a highly important topic due to the significance of the systems in the modern business environment. As the systems develop to be even more complex and their importance for companies is also growing, it is important to implement the systems efficiently.

Due to the size of the subject, it is not possible to do an exhaustive study on the topic. Mainly, it is a general overview on how the implementation projects should be planned, and I believe more research on the topic is warranted, especially as the ERP systems evolve to cloud based systems with numerous new modules and features.

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Appendix 1 – Interview questions with Toni Savolainen about ERP systems

Q1. How long was the implementation timeline of the ERP system at Kuehne + Nagel?

Q2. Were the implementation costs of the system inside the given budget?

Q3. Did Kuehne + Nagel hire outside help for the implementation project?

Q4. What human resources were needed for the implementation. E.g. the number of staff?

Q5. What kind of ERP system is used at Kuehne + Nagel? E.g. on-premise or a cloud system and why this type of system was chosen?

Q6. What kind of testing was done on the system before the go-live?

Q7. Was the timeline of the implementation project accurate?

Q8. Were there any major problems during the implementation of the ERP system?

Q9. Is there any customizations in the system?

Q10. How often the ERP system is updated?

Q11. What are the main benefits of the ERP system?

Q12. What kind of training is provided for the users of the ERP system?

Q13. How is the training done? E.g. in classrooms, online,

Q14. How do you choose the ERP system vendor?

Q15. What kind of different modules are there in the ERP system?