Challenges faced by European finance departments during the implementation of an Enterprise Resource Planning (ERP) system

Master thesis

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Abstract

Enterprise Resource Planning (ERP) software implementations are difficult, expensive, and require a lot of effort from the organization. It exposes the business process and willingness to change from the employees. On the other side, an ERP system is often necessary to facilitate the growth of the organization. Finance departments are the core of any organization and use several business processes to retrieve information from other departments. Of course, other departments are also of great importance, however, they have in general less data and less strict regulations to deal with. Financial regulations are stricter to prevent fraud and crisis, therefore accountants and governments require more information to approve the annual report, which verges more from the systems. Especially by specifying it to the challenges European finance departments face during an ERP implementation. Therefore, the following research question has been formulated: *"What are the most important challenges of European finance departments during the implementation of an ERP system?"*

To answer this question, experiences about ERP implementations and their challenges were gathered via literature and a survey. The selection was based on frequency across the literature and interviews. Those challenges were measured in the survey based on the five-point Likert scale. The survey resulted in 63 usable responses from different 6 countries.

Based on the data from the questionnaire which was analyzed in SPSS. Human challenges were found the only category as significant ($p < 0.05$) during the study. The amount of aftercare was by far perceived as the biggest challenge during implementation. Followed by the lack of technical support from the ERP consultants. Organizational- and technological challenges are not significant, according to the survey, during implementation. However, those are still relevant during implementation, but the focus should be more on the challenges related to people.

Even though the study is conducted with care, it has some limitations. 75% of the respondents came from the Netherlands, which could cause bias. Second, the survey is sent to companies located in Europe, the response rate was very low from other countries besides the Netherlands and Germany. The P-value is set to 0.05, however other researchers may argue that a P-value of 0.005 is more appropriate, as with 0.05 the chance is 5% of rejecting a true null hypothesis. But, even with a P-value of 0.005 the same conclusion holds.

Future research could focus on other departments, or continents to expand the knowledge about ERP implementations. This enables us to compare implementations and find differences and similarities which might be due to culture or other socio-demographic circumstances. Another opportunity is to ask survey respondents to argue for their answers. This allows better insight into the thoughts behind certain answers which clarifies the topic and allows consultants to adapt their implementation strategy to this.

Content page

1 Introduction

This thesis is about a topic that is also often described as 'the central nervous system' of an organization, called the ERP system. The Enterprise Resource Planning (ERP) system allows an organization to integrate all its primary business processes into one system, to improve efficiency and maintain competitiveness. Successful implementation requires knowledge, money, time, and flexibility. ERP implementation is substantially different from traditional information systems due to its integrated nature which requires changes in workflows, organizational structure, and how people do their jobs. It requires substantial capital investments, organizations expect a successful outcome, and employees have high expectations. However, all factors are difficult to manage due to the complicated process. This makes it a challenging task with high risks and costs.

The idea for this subject came via HoSt Bio-energy systems. HoSt recently implemented an ERP system and throughout the process, it became clear that implementing an ERP system is not an easy job, but a complicated process across all departments. As the process progressed the implementation required more time as planned, and consultants had less knowledge than expected. HoSt is a company that is active in the bio-energy market, it engineers, constructs, and maintains bio-energy installations all over the world. Those systems generate energy from waste and biomass. The company is growing at a rapid pace and is expecting to grow from 160 to 600 employees in the coming ten years. The old IT systems were primarily standalone systems, focusing on a single business aspect, for example, sales, purchasing, or warehousing. Combing the systems by transferring data, became very time-consuming as the number of projects grew. Therefore, HoSt implemented a new Enterprise Resource Planning system (ERP) called 4PS construct, which runs on the platform of Microsoft Dynamics 365.

Enterprise Resource Planning (ERP) system is "a process-based Information Technology (IT) infrastructure. It is a process by which a company manages and integrates the important parts of its business. An ERP management information system integrates areas such as planning, purchasing, inventory, sales, marketing, finance, and human resources." (Borshch & Sukhvitri, 2017)

According to Aboabdo et al. (2019), an ERP system can be defined as an IT-based computer platform that allows the integration of various business processes to increase efficiency, thus profits. In more detail, this means that an ERP system replaces all standalone software packages in finance, HR, planning, inventory, etc. with a single unified software package that is divided into several modules. All modules are linked together and share information and data. The ultimate goal of ERP software is to have more ability to share effectively business data and information using flexible modules.

However as mentioned before, ERP implementation is regarded as a very complex, costly, and time-consuming process, which often exceeds the initially estimated resources. The process puts a magnifier on the business processes of the organization. The implementation is a long and difficult process that involves several steps; selection of the best available software, which matches the requirements of the enterprise; configuration of the systems; training of staff; and customization of the software to match the organization's needs. The implementation period starts with selecting the software package and ends when the organization can fulfill its daily operations without the help of the consultants (Ahmad & Pinedo Cuenca, 2013).

An implementation should be carried out without affecting the daily operations of the organization. This can only be done with having an effective plan for the implementation and a good procedure in place to measure and evaluate the project throughout the implementation process.

In June 2022, HoSt rounded the first phase where the ERP system is implemented in the Dutch and French subsidiaries. After the implementation in the Netherlands and France, the goal is to implement the system in other foreign subsidiaries. However, this is the first time HoSt is implementing an ERP system in the organization. Therefore, the finance department is wondering which aspects are important to consider while implementing Microsoft Dynamics 365 into its operations and which challenges other companies have faced. This will help to overcome unforeseen situations in advance. To make the research generalizable to all European companies implementing an ERP system, the main question will focus on ERP in general. However, classification questions in the survey allow focusing on specific ERP systems if desired. Therefore, the following research question is defined:

What are the most important challenges of European finance departments during the implementation of an ERP system?

The research objective is to offer European finance departments and consultants a recommendation with the most important challenges of an ERP system implementation. By clarifying this, more focus can be given to certain aspects during implementation, which will smoothen the process. To end up at the desired result; the most important challenges of ERP implementation are defined, a list of challenges is made based on the literature and an interview is conducted. After this, a questionnaire was conducted of which the results are analyzed in SPSS. Sub-question one, two, and three are answered based on the outcomes of the survey. The summary of the survey answers can be found in Section 4 Resultsand the full survey is available on request. The challenges are ranked by the mean value which shows the importance of the challenges per category. Sub-question four is answered using the Wilcoxon Signed Rank Test, which is conducted in SPSS. Those four sub-questions are then combined which will answer the main question.

European finance departments is a general term, but in this research, the term is used to describe finance departments in Europe that have their own finance department (not outsourced). It concerns all kinds of organizations from listed companies to governments.

Current research has found Critical Success Factors for ERP implementation, complexities of finance departments, and investigated the challenges of implementing other financial systems. However, there is no research conducted about the challenges of European finance departments implementing an ERP system.

The specialization to finance departments is interesting because they are complex, and the core of any organization. It uses many different business processes to retrieve information from the departments and comply with the regulations. Besides this, it also deals with many people who want information. Colleagues are curious about how the project is going while vendors want to know when their invoice is being paid. Smooth implementation is essential to keep the data reliable and stakeholders updated. From a legislative context, the EU financial regulations are getting more strict to prevent fraud and crises in the future. (Vaquer, 2019) Therefore, accountants and governments require more information to approve the annual report. This demands more from the (financial) systems in an organization. Old systems are not always able to keep up with all the regulations, which makes it necessary to upgrade to an ERP system to comply with the rules.

2 Literature review

2.1 Critical challenges of ERP implementation

As described in the previous Section, the goal of this research is to find out the most important challenges for European finance departments. This is achieved by conducting a survey and analyzing the results. To get input for this questionnaire, articles from other researchers are used as a base. Various researchers, e.g. (Menon et al. (2019), etc.) have investigated the challenges of ERP implementations. Those papers were about specific ERP systems, cloud ERP adoptions, or implementations in other continents. In this research, those papers will be used to investigate which challenges an organization can probably face. The challenges will be used in the questionnaire to see whether those were also applicable to European finance departments. A challenge is defined by Cambridge University (n.d.-a) as: "something that needs great mental or physical effort in order to be done successfully and therefore tests a person's ability".

Specific ERP systems have already been researched, SAP is one of them. Menon et al. (2019) researched the critical challenges of implementing this ERP system. This research is based on a case study in the Canadian Oil and Gas Industry. The study identified a list of 60 critical challenges, out of which 12 are selected using the highest frequency, those are discussed in detail in the report. The respondents got the possibility to indicate which challenges were critical according to them. As a result, a list of 60 critical challenges[1] was generated. The challenges were grouped into three dimensions: Human, technological, and organizational. The article by Gupta et al. (2017) is a good addition to this paper because an online survey was conducted to identify the challenges and their ranking during the implementation of cloud ERP. Data from 93 Indian respondents were analyzed to differentiate between the challenges of Small and Medium Enterprises (SMEs) and large organizations. The answers were measured on the Likert scale and ranked based on the mean value. 18 challenges[2] were identified for cloud-ERP implementations. The study shows that SMEs and large organizations differ in most of the challenges and that ERP implementation is most beneficial for SMEs.

Unlike the previous articles, Momoh et al. (2010) conducted an in-depth literature review where they researched the factors which caused an ERP failure. Nine factors were found critical: excessive customization, poor data quality, the dilemma of internal integration, lack of change management, poor understanding of business implications and requirements, misalignment of IT with business, hidden costs, limited training, and lack of top management support. Appendix 7.4 shows a graphical representation of the percentage of each failure factor in relation to the total of all critical factors.

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[1] Appendix 7.1 Critical challenges in ERP implementation (literature review)
[2] Appendix 7.3 Challenges of cloud-ERP implementations in ERP

The research of Babaei et al. (2015) is similar to this research, as the same data collection methods were used and the data is also measured on the Likert scale. Babaei et al. (2015) conducted a questionnaire and interviews to collect the data. The responses were measured via the Likert scale, and analyzed in SPSS, using a one-sample t-test. The results show that organizational barriers, for example, lack of human resources, are the most important challenges during ERP implementation.

The second most important challenge was technological issues, such as a complex, not-user-friendly interface. The last challenge was individual factors, like lack of management involvement. See Appendix 7.5 for an overview of the challenges and their weighted averages. To overcome these issues, Babaei et al. (2015) provided a suggestion:

1. Providing the necessary infrastructure and resources including a proper software package.
2. ERP will result in changes in organizational processes. Therefore, Business Process Re-engineering (BPR) should be a prerequisite for successful implementation.
3. Clearly define what the benefits are of the use of the new ERP system. This helps users to understand why they should use the ERP system.
4. The ERP system should be easy to use. A complex system decreases its usefulness and restrains employees to use it.
5. Managers and experts should have a high commitment to ERP implementation. To make it successful and encourage employees.

The research of Fernandez et al. (2018) used the same data collection and measurement methods as this research. However, the research objective of Fernandez et al. (2018) is different as the focus is on the challenges of ERP implementation in Malaysia[3]. This study distributed a questionnaire to which 52 people responded, and answers were measured on the five-point Likert scale. The main challenge was the complexity of the existing working structure in meeting the ERP requirements, followed by a change in the way people work after ERP implementation. The third challenge was a lack of experience and appropriate skills in implementing an ERP system. Fernandez et al. (2018) highlighted that all organizations should do a thorough analysis of the strengths and weaknesses before deciding on adopting ERP. Some issues could have been prevented by increasing the readiness before implementation in case of technical, management, and financial terms. This paper will be used to strengthen and expand the statements mentioned in the literature, as a different continent might have to deal with other challenges.

2.2 Success factors for ERP implementation

CSFs also called Critical Success Factors indicate what the most important factors are in a project. Cambridge University (n.d.) defined a CSF as; "one of the most important things that an organization must do well for its business or work to be successful". During implementation, a Critical Success Factor can cause the aimed goal is not reached. Challenges faced by employees can also have a negative effect on the implementation process. Therefore, both terms are important to consider when researching ERP implementations. And are used in this paper to get as much information as possible.

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[3] Appendix 7.6 Challenges of ERP implementation – questionnaire results

Mahraz et al. (2019) made a systematic review of the Critical Success Factors (CSFs) of ERP implementations. By reviewing the literature, Mahraz et al. (2019) identified more than 40 CSFs, of which 12 are selected, based on frequency[4]. The factor with the highest frequency was top management support. Top management plays an important role during implementation to succeed in a project. Their main task is the establishment of clear objectives and goals for the ERP implementation project, this helps to get all parties in the same direction. The second factor based on frequency was project management. This is the application of skills, knowledge, techniques, and tools to the project to meet the project requirements. The use of skills and knowledge for the coordination of scheduling and monitoring of the activities is of great importance, to ensure that the stated objectives are met.

Proper continuous project management ensures focus on the important aspects of the implementation process and ensures that the schedule and planning are met (Mahraz et al., 2019). The third factor based on frequency is training and education. Training employees is a vital part of making an ERP implementation process successful. The objective of ERP training is to reskill employees so they can use the new ERP system as well as the new workflows that are created by ERP implementation. By increasing system effectiveness, employees increase performance, which automatically leads to an overall increase in organizational performance. Therefore, establishing a good training plan for employees is important for the acceptance of the system (Mahraz et al., 2019).

In addition to this, Finney & Corbett (2007) also conducted a literature review of 70 articles of which 45 applied to the research. After selecting categories and categorizing variables, 26 categories of Critical Success Factors of ERP implementation[5] were left. The CSFs are divided into strategic- and tactical CSFs. Strategic factors are those that address the larger picture. Tactical factors involve skillful methods and details that lead to achieving the goal. The factors have substantial overlap with the article of Mahraz et al. (2019), which strengthens the research.

2.3 Complexities of finance departments

Roper (2021) investigated which challenges are specific to finance departments in general. Finance departments have different challenges than other departments and it is therefore important to incorporate relevant information into the research. Finance departments that grow have bigger volumes, variety, and velocity of data. Someday, it becomes too much and requires a change to keep up with the growth of data. A solution can be a new ERP system.

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[4] Appendix 7.7 Ranking of CSFs based on the frequency
[5] Appendix 7.8 Strategic- and tactical CSFs

The article by Roper (2021) lists five challenges faced by finance departments in general.

1. Small teams: finance departments are often small, compared to other departments, depending on the company. This makes finance managers often wear various hats, to ensure that the objectives are met.
2. Embracing new technology: an increased focus on technology has moved financial employees away from traditional spreadsheets and more towards automated solutions. This requires the willingness to change from the employees.
3. Reporting and providing real-time data: data is important in all areas of business, especially finance. The requirement for real-time data can pose challenges for finance departments. They need to deal with inaccuracies and poor data quality, to ensure the data is usable.
4. Communicating with other departments: finance departments not only have to work with fellow finance workers. They also need to communicate and collaborate with other departments in the company, as well as stakeholders. Which requires time and extra knowledge.
5. Rules, regulations, and compliance: Every industry must deal with regulations, rules, and compliance, but perhaps none more than the financial industry. The balance between compliance and profitability is presented as the most difficult one. To keep up, financials often work long hours, outsource tasks, or hire extra people to keep up with all the rules, regulations, and compliance. (Roper, 2021)

Furthermore, Ghosh (2019) researched the challenges which are specific to finance system implementations. Ghosh (2019) conducted a case study at a company that upgraded to a new accounting system to accommodate growth. However, they faced several challenges despite careful planning. The first three challenges were about data, the imported data was not fully accurate and up to date, and too many templates to be transferred to new templates including the necessary accounting entries. And even after the implementation, the finance team would still have to important key data manually, which did not increase the ease of a new system. The building blocks of the new system were very different, which was a new concept for the team and required some thoughts on how to implement it to get the richness of reporting as desired. The team was unknown with the system and need to get used to the new procedures which requires the willingness to change. Another issue was the level of vendor support, the vendor team was not permanently on-site during the critical stages of the project which gave some risks, the online support was also bad and took too much time. If this was known in front, the company would have made a different arrangement with the vendor.

The objective was not to get to the destination in the shortest time, but at a pace, that was realistic for the organization. Something they learned from the implementation they could have arrived more quickly at the goal if there was a full-time project manager to ensure all risks were being managed and more focus on critical points. "The smoothest and most effective implementations are those that have strong organizational buy-in; ensuring continuous support from the management team and appointing a dedicated internal change manager is essential." (Ghosh, 2019)

2.4 Summary and discussion

The goal of this study is to discover the challenges of implementing an ERP system in European finance departments. Therefore, the existing literature on this topic was collected and reviewed, based on relevancy. This forms the basis for the survey and helps to derive the research gap and formulate the hypotheses.

The first Section was about the challenges of ERP implementation in general. This highlights which challenges other researchers have found during comparable research. However, this research was focused on other social demographic circumstances. Which makes it irrelevant to draw the same conclusion for European finance departments. But it is a good addition for the basis of the survey in which all challenges are combined.

Mahraz et al. (2019) and Finney & Corbett (2007) conducted literature reviews that highlighted the CSFs of ERP implementation. Several CSFs also popped up in the literature review of Section 2.1. Since more sources have mentioned those factors, it strengthens the basis for the questionnaire. Roper (2021) researched the challenges of finance departments in general and Ghosh (2019) finance departments implementing other IT systems. However, no research has been conducted on finance departments implementing an ERP system. Parts of the process and challenges may correspond with the implementation of other systems for finance departments. But not every system is the same of course, especially not so complicated as an ERP system. The conclusion is that current literature is about financial systems in general, ERP implementation in other countries, case studies or specific industries.

The overlap between focusing on achieving success using critical success factors (CSFs) and mitigating risks of implementation with the help of knowledge on challenges is that they both aim to ensure successful implementation of a project or initiative. CSFs help to identify the key factors that are crucial for achieving success, while knowledge of challenges helps to identify potential risks and obstacles that may hinder successful implementation.

The difference between the two approaches is their emphasis. Focusing on CSFs places a greater emphasis on identifying and optimizing factors that contribute to success. While mitigating risks of implementation with the help of knowledge on challenges places more emphasis on identifying and addressing potential obstacles or risks that may disturb successful implementation. In summary, both approaches are essential for ensuring successful implementation, and they should be used together. By focusing on CSFs and mitigating risks, organizations can increase the likelihood of successful implementation while reducing potential negative impacts.

No research has been conducted about ERP implementations in European finance departments. Even though there are organizations and consultants in Europe which are curious about the most important challenges during an ERP implementation. Therefore, researching ERP implementations in finance departments would enrich the literature by closing the research gap.

The following research question is defined which will help to close the research gap:
What are the most important challenges of European finance departments during the implementation of an ERP system?

3 Methodology

The methodology is based on the paper of Verschuren & Doorewaard (2010) and amplified with literature and theory about hypothesis testing. The research took a deductive approach as existing theories are used and moving it to a more specific one by own research. (Sheppard, 2020). At first, the research design will be explained after which the main- and sub-questions are presented. The definitions are described to clarify the terms used in this research. Based on the literature, three hypotheses are formulated and additionally, the methods of testing are explained. At last, the different methods of data collection and substantiation of how the data is tested and used for the sub-questions.

3.1 Research design

A descriptive quantitative study was conducted to analyze the challenges of implementing an ERP system in European finance departments. The purpose of descriptive research is to gain an accurate profile of events, situations, or persons (Saunders et al., 2018). The aim of this research is to discover the challenges of specifically European finance departments during an ERP implementation. Primarily, literature was used to get an understanding of the critical success factors, challenges faced when implementing ERP systems, and complexities of finance departments. In addition to this, a questionnaire was distributed to employees of European finance departments, to gather information about the challenges faced during the implementation of their ERP system. This information is consolidated into one report, which helps companies who are implementing an ERP system focus on the right aspects. The challenges retrieved from the articles in the literature review will be divided into three categories (human-, organizational- or technological challenges), which are defined in Section 3.2.

Main question:
> *What are the most important challenges of European finance departments during the implementation of an ERP system?*

The main question is split up into four sub-questions, to be better able to answer the main question.
1. What are the human challenges for European finance departments, during the implementation of an ERP system?
2. What are the organizational challenges for European finance departments, during the implementation of an ERP system?
3. What are the technological challenges for European finance departments, during the implementation of an ERP system?
4. Which categories have a significant influence on the success of an ERP system implementation in European finance departments?

The division of the challenges into three categories is based on the article by Menon et al. (2019). This article is used as a guideline together with the definitions in Section 3.2. The challenges mentioned in the articles of the literature review were critically judged to find similarities. Sometimes, challenges were stated differently in the articles while they mean the same. E.g. insufficient training of end-users (Menon et al., 2019) and training & education (Momoh et al., 2010) are combined to; insufficient training of end-users. The selection of synonyms is based on the usage of terms and the story around it. In case the researchers mean the same, the challenges are incorporated as one. When a challenge is at least mentioned in two articles, it was incorporated into the survey. The outcomes of the survey are ranked per category, based on the mean value (high to low). This ranking is used to answer sub-question one to three. The goal of sub-question four is to find out which category has the most influence during an ERP implementation. Therefore, a statistical test is used, the Wilcoxon Signed Rank Test which is further explained in Section 3.5. The answers to the sub-questions one to three will lead to the most important challenges per category. Those sub-questions combined will result in the answer to the main question.

The population contains people who experienced the implementation of an ERP system in a European finance department. To reach the target group, the survey was distributed via several social media platforms, relatives, and companies located in Europe. The survey was published in Dutch, English, and German to make it accessible to everyone and reach the target group. This resulted in 87 responses, of which 24 were discarded because not all questions were answered, or respondents did not work in Europe. This resulted in 63 usable responses which were suitable to be analyzed. Unfortunately, the response rate was lower than expected, this was probably due to the fact there are not many people who have experienced an ERP implementation in a finance department.

The sampling criteria are required to filter the population and keep the research relevant and reliable. The target group is made up of people who have experienced an ERP implementation and are working in a European not-outsourced finance department. To obtain valid data, respondents were asked if they had experience with an ERP implementation in a not-outsourced European finance department. By accepting the terms in the survey, the respondents agreed with these criteria. The survey was sent to companies that are located in Europe and have their own finance department (not outsourced).

3.2 Definitions

To clearly define terms used in the methodology. The following definitions will be helpful.

Variable: "A variable is a characteristic that can be measured and can assume different values." (Statistics Canada, 2021)

In this research, the variables[6] are all the challenges that are given in the survey. Those challenges are grouped into categories (human-, organizational- or technological challenges).

Category: "A group of people or things that have similar features." (Cambridge University, 2022a)

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[6] Appendix 7.10 List of variables including sources

In this research, the categories are human-, organizational-, and technological challenges. To correctly classify the challenges, also called variables, into the right category, the following distribution is made to cover all challenges. This distribution is made based on the definitions of Cambridge University (2022b) and the article of Menon et al. (2019).

Human: Everything which, involves a person, or has a direct- or indirect effect on the employee. Or has to do with communication and change management.

Organizational: All the processes, budgets, strategies, time, project team, and integration factors during implementation. Everything that has to do with planning or implementing the system as efficiently as possible.

Technological: Everything around technology, software, data, or migration.

3.3 Hypotheses

Hypothesis testing is: a "*Classical approach to assessing the statistical significance of findings from a sample*" (Saunders et al., 2018).

Based on the literature, the following hypotheses are designed which will be tested in the statistical software platform, SPSS. The process of hypothesis testing is based on the book of Saunders et al. (2018). The three hypotheses are used to answer the fourth sub-question. The hypotheses are designed to research whether a category is important during implementation. A category can be considered as important when the median is significantly higher compared to the category in which all variables are combined, this is tested using the Wilcoxon Signed Rank test. The process of testing is described in detail in Section 3.5.

Hypothesis 1
H_0 = Human challenges do not have a significant effect on the implementation process of European finance departments.
H_a = Human challenges have a significant effect on the implementation process of European finance departments

Hypothesis 2
H_0 = Organizational challenges do not have a significant effect on the implementation process of European finance departments.
H_a = Organizational challenges have a significant effect on the implementation process of European finance departments

Hypothesis 3
H_0 = Technological challenges do not have a significant effect on the implementation process of European finance departments.
H_a = Technological challenges have a significant effect on the implementation process of European finance departments.

Setting a significance level in research is important because it allows researchers to ensure a degree of confidence that their findings are reliable, real, and have a low possibility of chance. Increasing the p-value would lead to a higher chance of committing a type I error. A type I error occurs when the researcher incorrectly rejects a null hypothesis. A type II error is the opposite, the researcher failed to reject the null hypothesis. The likelihood of making a type I error can be reduced by setting a low significance level however, the likelihood of making a type II error is then increased.

There is no universally accepted significance level in social sciences. But generally, a P-value of 0.05 is used to indicate statistical significance. However, the choice of a significance level may depend on specific research questions, sample size and the type of statistical analysis being used. Some researchers may choose a more stringent significance level of 0.01 or 0.005 to reduce the risk of a type I error. While others may use a less stringent P-value of 0.10 to increase the likelihood of finding significant results. In this research the decision is made to use a significance level of 0.05 which limits both errors and maintains power (Saunders et al., 2018).

3.4 Questionnaire

The questionnaire, made in Qualtrics, started with a small introduction. This introduction was designed to set expectations for the participants, e.g., time and number of questions. But also, to set a condition; participants were required to tick the button "agree" to go further. By selecting this, participants promised that they have been involved in an ERP implementation.

The statements, used in the survey were retrieved from articles in the literature review. All challenges mentioned in the papers were combined into one Excel file[7], only the challenges which were mentioned by at least two papers were used in the survey. Often statements are only mentioned in one out of twelve papers, this indicates a very low possibility that this challenge is perceived as challenging during implementation. To be sure all elements are in and correctly operationalized, three interviews are conducted at Host Bio-energy systems to see what they found challenging during the implementation process. All interviews were unstructured and conducted during an informal conversation to retrieve as much information as possible. The choice is made to conduct unstructured interviews to gather honest and broad information for the questionnaire. Informal conversations lead to more information and openness from the interviewee (Zhang & Wildemuth, 2009). The interview guideline and topics can be found in Appendix 7The first interviewee is a junior controller who was a normal user during implementation. The second interviewee was a senior financial controller and sub-core user during implementation, with some experience in other ERP systems. The third interviewee was a financial manager and point of contact for the financial department. The challenges mentioned in the interview were added to the survey and checked for overlap with the literature.

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[7] Appendix 7.10 List of variables including sources

As mentioned above, the challenges were reviewed, and a list was made of in total 43 challenges. Those were incorporated into the survey and measured on the Likert scale. The Likert scale is a universal method of collecting data, which is easy to understand (Cornell, 2022). It is used to measure the variables on a scale from one to five. One or two means that the respondent disagrees with the fact that this was a challenge during implementation. Three is undecided in the used Likert scale, this means the respondent neither agrees nor disagrees with the statement.

Table 1: Likert scale levels

Likert scale	
1 =	strongly disagree
2 =	somewhat disagree
3 =	neither agree nor disagree
4 =	somewhat agree
5 =	strongly agree
6 =	not applicable

Respondents can fill in six when the statement does not apply to him/her. This can be the case when he/she is not responsible for the budget. This answer will then be marked as a missing value in SPSS. Likert scales are frequently used in education and are considered as an ordinal measurement level. The differences between "agree", "strongly agree" and "neither agree nor disagree" are not necessarily equal. This means we cannot assume that the difference in responses has an equal distance. However, when the research is composed of four or more Likert-scale items that represent similar questions, it can be combined into a single variable/category. This allows the grouping of the variables into categories (human, organizational, and technological), based on the mean value (Sullivan & Artino, 2013).

"A valid questionnaire will enable accurate data that measures the concepts that you are interested in to be collected." (Saunders et al., 2018) The validity is secured by comparing the answers with the literature, looking for inappropriate answers, a strong research design and having enough respondents. Respondents also could come up with their own challenge(s), to ensure the data is as complete as possible.

Reliability is about the robustness of the questionnaire and whether it will produce consistent findings at different times and under different circumstances. The consistency of the questionnaire will be measured using Cronbach's alpha in the pre-test. The pre-test is conducted before the survey is sent to a large group of people to check for reliability and if it is working properly. This statistic measures the consistency of the responses. The alpha coefficient can take a value between 0 and 1. A value of 0.7 or higher indicates that the questions combined in the scale are consistent in their measurement (Saunders et al., 2018). In SPSS, the pre-test of Cronbach's alpha is conducted with 11 responses, the results are given in the table below. As shown, Cronbach's alpha is above the desired level of 0.7, this indicates that the categories be considered reliable

Table 2: Pre-test Cronbach's alpha

Pre-test Cronbach's alpha

	Cronbach's alpha α	No. of items
Human challenges	0.717	19
Organizational challenges	0.814	17
Technological challenges	0.783	7

3.5 Testing the data

Sub-question 4 *"Which categories have a significant influence on the success of an ERP system implementation in European finance departments?"* is answered using a statistical test, the Wilcoxon Signed Rank Test. It is a non-parametric test, and can be used to compare two sets of scores that are from the same participants. (Ramachandran & Tsokos, 2021). The three categories (human, organizational and technological) are tested against all challenges combined. This shows which categories have the most influence on the success of an ERP implementation.

For a Wilcoxon Signed Rank Test, three assumptions need to be met. The dependent variable should be measured at an ordinal or continuous level. The Likert scale is an ordinal measurement level; therefore, this assumption is met. The independent variable should consist of two categorically related groups, this means that the same subjects are present in both groups. The same participants are used in the test; therefore, this assumption is also met. The third assumption is that the distribution of the differences between the two related groups is symmetrical in shape. The SPSS distributions of the differences are symmetrically shaped around the center, therefore the final assumption is also met[8] (Ramachandran & Tsokos, 2021).

When conducting the Wilcoxon Signed Rank Test, only rows are used which have no missing values. As the variables are computed into categories, one missing value of a respondent will cause the answers of the participant are not included. However, the rest of the answers given by this respondent are still relevant to the research. Therefore, missing data will potentially reduce the power and accuracy of the analysis. Therefore, the Item Mean Substitution method (IMS) will be used to avoid this. The IMS method replaces the missing value with the item mean score of a particular item. By using this method, all scores of the participants can be included, even though there was a missing value in it. The downside of this method is that it does not preserve the relationship between variables, such as correlations (Downey & King, 1998).

The Wilcoxon's Signed Rank test, tests the following hypotheses:

Hypothesis 1:
   H_0: median of human challenges = median of the total category
   H_a: median of human challenges > median of the total category

Hypothesis 2:
   H_0: median of organizational challenges = median of the total category
   H_a: median of organizational challenges > median of the total category

Hypothesis 3:
   H_0: median of technological challenges = median of the total category
   H_a: median of technological challenges > median of the total category

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[8] Appendix 7.12 SPSS distribution of the differences

4 Results

This Section starts by providing the socio-demographic- and ERP-related characteristics of the respondents. After this, the outcomes of the survey will be ranked based on the mean value. The items were measured on the Likert scale from one to five, the mean value reflects the average value of the respondents. A Wilcoxon Signed Rank Test is conducted to see which categories have a significant influence during implementation. Finally, the hypotheses are tested and the results are presented in Table 10.

4.1 Characteristics of the respondents

This sub-section describes the socio-demographic characteristics of the survey participants, followed by the company- and ERP-related information.

Table 3: Socio-demographic characteristics of the respondents

Socio-demographic characteristics of the respondents (N = 63)

		N	%
Age			
	18 years or younger	0	0
	19 – 25 years	36	57.1
	26 – 35 years	13	20.6
	36 – 45 years	9	14.3
	46 – 55 years	4	6.3
	56 – 64 years	1	1.6
	65 years and older	0	0
Gender			
	Male	32	50.8
	Female	31	49.2
	Other	0	0
	I'd rather not say	0	0
Education (completed)			
	Elementary school	0	0
	Secondary school (VMBO, HAVO, VWO, etc.)	0	0
	Secondary Vocational Education (MBO)	11	17.5
	Higher Professional Education (HBO)	25	39.7
	Scientific Education (WO)	27	42.9
	Otherwise		
Country			
	The Netherlands	47	74.6
	Germany	7	11.1
	Belgium	1	1.6
	France	4	6.3
	Austria	3	4.8
	Spain	1	1.6

As shown in the table below. 4PS, which runs on the platform of Microsoft Dynamics 365 is the most used ERP system by the respondents. Followed by Afas and SAP. This was expected because all companies on the website of 4PS were contacted to participate in the questionnaire. Almost 50% of the respondents had a function as an administrative assistant. In finance departments, there are often two or three administrative assistants per controller, so the numbers make sense. The number of employees of the company is equally distributed as expected. 62% of the respondents use a cloud-based ERP system which is very upcoming nowadays. 38% of the respondents still use the locally installed ERP system. ERP systems are relatively new, therefore 76% of the respondents work at an organization who have implemented the ERP system less than five years ago. Overall, the ERP-related characteristics are justifiable and do not show strange differences.

Table 4: ERP-related characteristics of the respondents

ERP-related characteristics of the respondents (N = 63)

		N	%
ERP system			
	Microsoft Dynamics 365 (4PS)	23	36.51
	Microsoft Dynamics 365 (Shipvision 365)	10	15.87
	Afas	11	17.46
	Oracle	3	4.76
	SAP	11	17.46
	Sage	2	3.17
	IFS	1	1.59
	Infor	2	3.17
	NetSuite	0	0
Function in the finance department			
	Administrative assistant	31	49.2
	Controller	17	27.0
	Manager	6	9.5
	CFO/management	7	11.1
	Intern	2	3.2
Number of employees in the organization			
	0 – 49	14	22.2
	50 – 199	18	28.6
	200 – 499	17	27.0
	500 – 999	6	9.5
	1000+	8	12.7

Locally installed or cloud-based ERP system			
	On-premise (installed locally on own servers and computers)	24	38.1
	SaaS (cloud-based/via internet browser)	39	61.9
When was the system implemented?			
	0 - 2 years ago	25	39.7
	2 - 5 years ago	23	36.5
	5 - 10 years ago	11	17.5
	10 - 25 years ago	4	6.3
	25 - 50 years ago	0	0
Role in the project group during implementation (if applicable)			
	Management	14	22.2
	Project manager	10	15.9
	Core user	16	25.4
	Not applicable	21	33.3
	Value stream lead	1	1.6
	Sub-core user	1	1.6

4.2 Ranking of the challenges

The outcomes of the survey are ranked per category, based on the mean value of the challenge. The challenges were measured on the Likert scale. Besides the Likert scale from one to five, there was also an option 'not applicable'. When this option was selected, the statement did not apply to that respondent, or he/she did not have an opinion about it. It could also be that he/she did not know about it, for example, the budget. Therefore, the N-value is not always equal to the number of respondents, 63.

In the table below are the mean scores, standard deviation, and Cronbach's alpha shown per category. Human challenges have the highest mean score, followed by organizational challenges, and technological challenges last. All Cronbach's alpha scores are above the minimum score of 0.7, this means that the scales are consistent in measurement (Saunders et al., 2018).

Table 5: Descriptive statistics categories

Mean score, SD, and Cronbach's alpha per category (n=63)

	Category	Mean	SD	Cronbach's alpha
1	Human challenges	3.6423	0.6107	0.824
2	Organizational challenges	3.5020	0.6388	0.783
3	Technological challenges	3.4503	0.7418	0.751

Tables 5, 6, and 7 contain the number of respondents, mean values, and standard deviations of the challenges per category, human-, organizational-, and technological challenges.

Table 6: Ranking of human challenges

Ranking of human challenges based on the mean value

Nr.	Rank	Variable name	N	Mean	SD
V9	1	Too little aftercare	57	4.11	0.939
V8	2	Lack of technical support from appointed ERP consultants	59	3.80	1.186
V6	3	Collaboration with external parties	54	3.78	1.058
V7	4	Knowledge of consultants	57	3.77	1.180
V18	5	Too less training after go-live	57	3.77	1.035
V2	6	The poor management on changes	59	3.68	0.990
V1	7	Colleagues' resistance to change	61	3.67	1.248
V14	8	Learning curve of the new system	59	3.63	0.998
V19	9	Gap between expectations and perception of the system	58	3.57	1.028
V4	10	Lack of proper communication about the status	60	3.57	1.198
V15	11	Usage of the new system compared to the old system	56	3.54	1.078
V18	12	Too less training after go-live	59	3.53	1.291
V10	13	Management changes during implementation	56	3.52	1.250
V3	14	Team morale and motivation	59	3.46	1.317
V16	15	Stress during implementation	58	3.45	1.273
V5	16	Manners between employees	61	3.39	1.229
V13	17	Insufficient communication from management	58	3.17	1.300
V12	18	Management did not understand the complexity of the implementation	59	3.07	1.285
V11	19	Lack of management commitment	60	2.98	1.321

Too little aftercare is the highest-ranked challenge in the category of human challenges. Aftercare is the phase after the go-live period, which is also called the support phase. Not all issues are fixed at go-live, therefore the experience and help of the consultants is very useful. Secondly, the lack of technical support from the appointed ERP consultants is often not sufficient during implementation. This causes delays in the process and frustration with the employee as the system is not performing as hoped for. In third place, the collaboration with external parties was challenging during implementation. Many external parties are often involved during the process, and smooth collaboration is key to success as many of the components depend on external parties.

Table 7: Ranking of organizational challenges

Ranking of organizational challenges based on the mean value

Nr.	Rank	Variable name	N	Mean	SD
V27	1	Lack of testing & real live simulations	61	3.77	1.131
V31	2	The time schedule	60	3.75	1.019
V20	3	Changed business processes	60	3.75	0.985
V22	4	Costs of the implementation	55	3.71	1.066
V26	5	Integration of the ERP processes in the organization	63	3.70	1.010
V32	6	Application of skills, tools, and knowledge to meet the requirements	58	3.64	0.986
V24	7	The go-live phase	56	3.59	1.023
V25	8	The accumulated backlog	58	3.55	1.157
V30	9	Duration of the implementation process	60	3.55	1.016
V21	10	The complex structure of the organization	61	3.52	1.074
V23	11	Budget overrun	55	3.51	1.103
V33	12	The poor knowledge transfer from the project team to end users	60	3.48	1.066
V29	13	Regulations and compliance with new procedures	56	3.41	1.141
V36	14	Changes in strategy and direction during implementation	56	3.14	1.167
V34	15	Composition of project team/teamwork	61	3.11	1.127
V35	16	Thoughtless business plan and vision behind the implementation	60	3.07	1.87
V28	17	The legal aspect	50	2.98	1.134

The highest-ranked organizational challenge is the lack of testing and real live simulations. During implementation, many checks and testing are done to make sure the system is working properly. The goal is to simulate real life situations; however, this is often not done or not possible. This causes that after implementation, problems pop up which could have been prevented by proper testing. The time schedule is in second place as a tight deadline often puts more stress on people besides the existing stress which comes with an implementation. The changed business processes, ranked third, are difficult for people as they need time to familiarize themselves with the new way of working.

Table 8: Ranking of technological challenges

Ranking of technological challenges based on the mean value

Nr.	Rank	Variable name	N	Mean	SD
V37	1	The amount of customization	59	3.78	1.131
V40	2	Data conversion and integrity	60	3.60	1.108
V38	3	Interface issues	60	3.53	1.081
V41	4	Data migration between different systems	60	3.52	1.081
V42	5	Alignment between IT and the organization	60	3.27	1.191
V39	6	Use of too many templates	61	3.20	1.108
V43	7	IT infrastructure was not suitable	57	3.14	1.315

In the category of technological challenges, the amount of customization is in the first place. Customization is the ability to change the system as desired. Often this is a good thing, however, too much customization makes the software too complicated, slow and it increases the costs. Therefore, it is important to find a trade-off. Data conversion and integrity are in second place as much of the implementation relies on the ability of the data team to transfer the data as accurately as possible. Bad input gives bad output, and the conversion is therefore very important and challenging. Interface issues are ranked third. Interfaces not working as desired can be very frustrating and slow down the daily processes as it is not working ideal.

Below are the results of the Wilcoxon Signed Rank Test. All variables were combined and computed in one category which is called 'total'. In this category, the averages of all variables are combined. The other categories are compared with the total category to see, which categories are significantly different. The Z-values of organizational- and technological challenges are based on negative ranks, which means that the difference between the two observations is negative. Human challenges are also the only category, which is significant, and has a positive rank. Organizational- and technological challenges are both not significant as the p-value is above the critical value of 0.05.

Table 9: Wilcoxon Signed Ranks Test results

	Z	N	Sig.	Negative Ranks[9]	Positive ranks[10]	Ties[11]
Wilcoxon Signed Rank Test (one-tailed)						
Human	-2.783[a]	63	0.0027	23	40	0
Organizational	-0.212[b]	63	0.4160	33	30	0
Technological	-1.526[b]	63	0.0635	37	26	0

[a] Based on positive ranks
[b] Based on negative ranks

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[9] Total median < categorical median
[10] Total median > categorical median
[11] Total median = categorical median

4.3 Results of the hypotheses

Table 10: Hypothesis testing

A	Null hypothesis	Alternative hypothesis	P-value (P< 0.05)	Statistical conclusion
H1	Human challenges do not have a significant effect on the implementation process of European finance departments.	Human challenges have a significant effect on the implementation process of European finance departments.	0.0027	Reject the null hypothesis (P-value, 0.0027 < 0.05)
H2	Organizational challenges do not have a significant effect on the implementation process of European finance departments.	Organizational challenges have a significant effect on the implementation process of European finance departments.	0.4160	Failed to reject the null hypothesis, (P-value, 0.4160 > 0.05)
H3	Technological challenges do not have a significant effect on the implementation process of European finance departments.	Technological challenges have a significant effect on the implementation process of European finance departments.	0.0635	Failed to reject the null hypothesis, (P-value, 0.0635 > 0.05)

A one-tailed Wilcoxon Signed Rank Test was performed to compare the median of all variables to the median of the category. The result of the Wilcoxon test for human challenges was *(Z=-2.783, n=63, p=0.0027),* this indicates that there is a statistically significant *(P = 0.05)* difference between the median of all categories and the median of human challenges*.* The Wilcoxon test result for organizational challenges was *(Z=-0.212, n=63, p=0.4160)*, this indicates that there is no statistically significant difference between the median of all categories and the median of organizational challenges. The result of technological challenges was *(Z=-1.5263, n=63, p=0.0635),* this means technological challenges have no significant difference between the total median and the median of technological challenges.

5 Conclusion and discussion

The conclusion and discussion are a combination of the literature and the outcomes of the survey. First, four sub-questions will be answered after which the main question will be concluded. Subsequently, the limitations of this research are discussed, and finally the recommendation for future research. The objective of this research was to answer the following question: *"What are the most important challenges of European finance departments during the implementation of an ERP system?"* Before answering the main question, the sub-questions will be answered which will lead to the main question in the end.

Please take into account that it cannot be fully guaranteed that all participants have experience with an ERP implementation as the only way of validating this is by agreeing with the conditions in the survey.

5.1 Key findings

Sub-question 1: *What are the human challenges for European finance departments, during the implementation of an ERP system?*

Human challenges were defined as; everything which, involves a person, or has a direct- or indirect effect on the employee. Or has to do with communication and change management. Too little aftercare is by far the highest-ranked challenge on the list with a mean score of 4.11[12]. After the go-live phase, the last phase of an implementation project is started, called the support phase. The system is often not functioning well right after going live, minor mistakes need to be fixed and users need to get familiar with the system. Without fast and proper aftercare, users have trouble performing their daily tasks, which is very frustrating. In the field for additional remarks, a survey participant (nr. 8) mentioned that the number of error messages from the system and the effort it takes to get things solved was very challenging for him.

Seven out of twelve input sources from the literature found that a lack of technical support from the appointed ERP consultants was challenging during implementation. This challenge was ranked second in the survey results *($\overline{X}$ = 3.80)*. Working with a new system is difficult, especially when it is not functioning well. Due to the complexity of the software and lack of knowledge and experience, the best solution is to seek assistance from external consultants (Fernandez et al., 2018).

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[12] Table 6: Ranking of human challenges

Eight out of twelve input sources indicated that the knowledge of the consultants was insufficient during the implementation process. In the survey results, lack of knowledge from the consultants is in the fourth place $(\overline{X} = 3.77)$. Consultants did not have enough knowledge to answer all the questions and problems of the employees. Unanswered questions and problems lead to delays on the work floor, and this can even influence the customers, by having delayed orders for example. Therefore, a lack of knowledge can cause delays and cost overruns, which leads to extra pressure on the employees and requires more from the organizational resources (Momoh et al., 2010).

Collaboration with external parties is ranked third on the list of 19 challenges. Stiff collaboration between external parties can slow down the implementation process and cause stress. External parties can be software suppliers, consultants, or IT companies. This can also be linked to the challenge above, due to the complexity of the ERP system, help from external parties is necessary. However, when this cooperation is not going well, it can cause problems. Four out of nineteen challenges are described in detail above. For a list of all human challenges, please have a look at Table 6.

Sub-question 2: *What are the organizational challenges for European finance departments, during the implementation of an ERP system?*

Organizational challenges were defined as, all the processes, budgets, strategies, time, project team, and integration factors during implementation. Everything that has to do with planning or implementing the system as efficiently as possible.

The highest-ranked organizational challenge from the questionnaire is the lack of testing and real live simulations $(\overline{X} = 3.77)$[13]. From all organizational challenges, this statement is also mentioned most frequently in the literature sources. In the end phase of implementation, a lot of testing and checks are often done to make sure the system is working as desired. This is to ensure smooth transitioning. However, the testing conditions are often not matching the 'real life' conditions. Menon et al. (2019) mentioned that tests are often passed without correct and real data. This makes everything look fine during the testing phase, but after go-live, the problems pop up. Therefore, it is important to simulate real situations with real data from the company. An interviewee has mentioned that the test situation in ERP must be exactly equal to the reality, during the implementation this is often not the case. The challenge ranked second is the time schedule of the implementation $(\overline{X} = 3.75)$. A tight schedule puts extra pressure on the employees, especially because such an implementation is often an extra addition to the normal workload. The schedule and a long implementation process causes more stress and a higher chance of failure. Momoh et al. (2010) stated that less than 10% of ERP implementations succeed within the cost budget and timeframe. Consequently, many companies have canceled their ERP projects due to this.

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[13] Table 7: Ranking of organizational challenges

Changed business processes are in third place $(\overline{X} = 3.75)$. It is mentioned in the literature by four sources; Mahraz et al. (2019), Momoh et al. (2010), HoSt 2 (2022), and HoSt 3 (2022). In the remarks field of the questionnaire, respondent number 52 mentioned that the employees should have enough time available to familiarize themselves with the system and new way of working. The processes are often different than before, so employees need time to adapt to it. Mahraz et al. (2019) stated that ERP systems are built on best practices for the specific industry and to successfully implement the ERP system. All processes in a company must conform to the ERP system.

In addition to this, Momoh et al. (2010) stated that all business processes are linked to each other and the ERP system. Implementing these incorrectly may lead to very poor integration between modules of the system. This will affect the daily operations and efficiency of the business. Table 7 contains an overview of the organizational challenges ranked based on the mean value.

Sub-question 3: *What are the technological challenges for European finance departments, during the implementation of an ERP system?*

Technological challenges were defined as everything around technology, software, data, or migration. The amount of customization is the highest-ranked technological challenge with a mean score of 3.78[14]. The need and requirements of every organization vary and thus customization is needed. Customization makes the software package more complicated for consultants, but also employees. Some companies want the ERP system to be customized, while others use the standard software package. Customization will increase the costs of the ERP package and firms, therefore, have to make a tradeoff between costs and customization. (Gupta et al., 2017)

Data conversion and integrity $(\overline{X} = 3.60)$ is ranked second by employees of finance departments, this challenge is also mentioned by five out of twelve literature sources. Nowadays, data is the core of any organization. Finney & Corbett (2007) mentioned that much of the success of an implementation process relies on the ability of the team to ensure data accuracy during the conversion process. Bad input gives bad output and therefore is data conversion very important. Data conversion is a time-consuming process due to the immense amount of data finance departments have. Interface issues are ranked third $(\overline{X} = 3.53)$. Menon et al. (2019) mentioned that some interfaces did not work as expected even after all testing. Interfaces were not doing what they were meant to do, which could be very frustrating.

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[14] Table 8: Ranking of technological challenges

Sub-question 4: Which categories have a significant influence on the success of an ERP system implementation in European finance departments?

A category was compared to the total category which contains all variables, as explained in Section 3.6. When the median of the category is significantly higher than the test value, we can state that this category has a significant influence on the success of an ERP implementation. As shown in Table 10, hypothesis 1 has a p-value (0.0027) which is below the critical value of 0.05 which means that H1(null) is rejected. As a result, human challenges have a significant influence during the implementation of an ERP system in European finance departments.

Hypothesis 2 (null) is failed to reject with a p-value of 0.4160. This is due to the fact that the category has almost the same amount of negative (33) as positive (30) ranks. The Wilcoxon Signed Ranked test compares the differences between the two groups, as the number of positive and negative ranks are almost the same, it results in a Z-value close to zero (-0.212) and a p-value of 0.4160. This Z-value indicates that the groups are almost evenly distributed, and the distribution of values between organizational challenges and total category are close to each other. Therefore hypothesis 2 is failed to reject and organizational challenges have no significant influence on the success of an ERP implementation in European finance departments.

The median value of technological challenges is at 37 out of 63 respondents lower than the median of the total category. The outcome of the Wilcoxon test had a P-value of 0.0635, which means that hypothesis 3 is failed to reject. As a result, technological challenges have no significant influence on the success of an ERP implementation in European finance departments.

The only category which is found significant are human challenges. This research shows that organizational- and technological challenges have no significant influence on an ERP implementation in European finance departments. As this research is aimed at researching which challenges have a significant influence during an ERP implementation, no explanations of the respondents are collected during this research. However, by combining the literature and the survey outcomes, a reasoning of the results is possible.

Human challenges have a direct or indirect effect on the employee; therefore, employees perceive this faster as challenging during an implementation as this affects them directly and their daily work. Mahraz et al. (2019) and Finney & Corbett (2007) had drawn the same conclusion in their research. However Babaei et al. (2015) concluded that organizational challenges have the most impact during an implementation. This difference can be since this research was focused on large organizations in Iran which affects the results due to a different culture. Which was not the case with Mahraz et al. (2019) and Finney & Corbett (2007) as those were literature reviews without a geographical focus.

Organizational challenges affect the organization and its processes, like the schedule of the implementation and the budget. Employees suffer less from this which could be an explanation of the insignificance of organizational challenges. The same situation applies to technological challenges as those are about the functioning and possibilities of the system. Indirectly this has of course an impact on the employee if the system is not functioning as desired but has less impact on the employee and is therefore less challenging in their eyes.

5.2 Conclusion

The research is concluded by answering the main question, which is the coherence of the sub-questions.

Main question: What are the most important challenges of European finance departments during the implementation of an ERP system?

When looking at the categories, the only category found significant was human challenges. Organizational- and technological challenges were not significant, which means that those categories do not have a significant influence during the ERP implementation process in European finance departments. Consultants and organizations should focus more on human challenges and focus less on organizational- and technological aspects. However, this does not mean that those categories are not important, they are still relevant. Human challenges have a bigger impact during the implementation process as this has a more direct influence on the employee and their work. Therefore, when implementing a new ERP system, organizations should focus extra on everything which has a direct- or indirect effect on the employee.

The biggest challenge perceived by participants of this survey is too little aftercare $(\overline{X} = 4.11)$. Aftercare is "the support or advice, offered to a customer following the purchase of a product or service." (Oxford Advanced Learner's Dictionary, n.d.). The challenge is often mentioned by people when discussing this subject. After the go-live phase, several processes and functions need to be fine-tuned and discussed with the consultants. People have a lot of questions about the working of the system and the error messages. Without good aftercare, the system is likely to become a failure.

Lack of technical support from the ERP consultants $(\overline{X} = 3.80)$ is ranked as second. A new system is difficult for every employee, especially an ERP system can be complicated. Without technical support, it can be very difficult to work with a new system. People have done their daily duties for many years in a system and switching to a new system that is not working properly can be very frustrating. A new system also has often teething problems, which can prevent certain tasks to be performed. Collaboration with external parties $(\overline{X} = 3.78)$ is ranked as third and is related to the number two challenge. As ERP consultants are also an external party. Stiff collaboration will slow down the implementation process and cause stress in the organization. A stable and trustworthy relation between the external parties and the organization is key to the success of an ERP implementation. Without external parties it is almost impossible to implement an ERP system, which makes it even more important to make good and clear agreements.

As aftercare was proven as very important during this research, companies who are implementing an ERP system should focus more on the aftercare and support period on the forehand. Without proper aftercare, people are getting frustrated because the system is not working as they were hoping and cannot perform their daily tasks. Second, technical support from the appointed ERP consultants is important according to the survey results, implementing a new ERP system is difficult, especially when not having the appropriate level of technical support. Ranked third is the number of customization possibilities. It is important to find the balance between customization and changing organizational procedures, customization does not always lead to a higher efficiency. Therefore, finding a balance between keeping it standard and customization is of great importance.

5.3 Limitations

Even though the study is conducted with great care, it has some limitations which can affect the results. The goal of this research was to find out what the challenges of European finance departments are during an ERP implementation. However, this limits the target group which resulted in a reduced number of respondents. Focusing companywide would have led to more respondents. However, it would also make the research very broad. Therefore, it could have been better to broaden the survey and after that pick some departments which can be compared with each other.

Almost 75% of the respondents came from the Netherlands, this can cause some bias as culture and way of working play an important role. Every culture is different and has different norms and values, which makes what they find important. Therefore, other countries have different things which they find important in life. This can differ immensely between countries, and therefore this research is hard to generalize to all European finance departments. To overcome this, the questionnaire was sent to many different companies. Unfortunately, the response rate from other countries, besides the Netherlands and Germany was not as hoped for. By conducting interviews, the response rate would have been higher, but it would have led to even fewer respondents as it is very time-consuming.

Some researchers argue that a P-value of 0.05 is a limitation in social research, as the chance is 5% of incorrectly rejecting a true null hypothesis. This means believing that a relationship exists when it actually does not. However, by using a smaller P-value of 0.005 still means that the conclusion holds.

The three interviews were conducted as a basis for the survey, in combination with the literature. Where only conducted at HoSt-Bio energy systems, since the organization was implementing the system at that moment and employees had the challenges very fresh in mind. Other organizations also had the chance to mention extra challenges in the free input field. Also, the diverse combination of literature sources, made it redundant to conduct more interviews.

5.4 Future research

Based on the key findings and limitations, several recommendations can be made for future research.

Other departments

This research was solely focused on financial departments due to the educational focus on financial management. Every department has its specific challenges during implementation. Therefore, other research can be focused on other departments within an organization to discover differences between the departments. This gives an insight into how departments differ from each other which enables consultants to adapt to this.

Continents

Most of the participants were from Europe, however, also some respondents were working outside Europe. Those were filtered out due to the scope of this research. However, it can be interesting to research what effect culture has on an ERP implementation. Other cultures have different manners which may result in different outcomes. Those differences can be compared with each other to discover the differences between continents.

Reasoning of the answer

The survey participants answered the statements on the Likert scale from one to five. However, there was no room to mention a reason for the given answer. More in-depth qualitative research would be interesting to find out the reasons behind the ratings, which help to improve future implementations. This gives consultants a more detailed insight into what should be done differently next time.

6 References

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7 Appendices

7.1 Critical challenges in ERP implementation (literature review)

Dimensions	Critical challenges	Findings				
		Sumner	Themistocleus et al	Ehie & Madsen	Momoh et al.	Stanciu & Tinca
Technological	Excessive customization		X		X	
Organizational	Dilemma of internal integration				X	
Organizational	Poor understanding of business implications and requirements				X	
Human	Lack of change management				X	
Technological	Poor Data Quality				X	
Organizational	Misalignment of IT with the business				X	
Organizational	Hidden costs				X	
Human	Lack of senior management support	X		X	X	X
Organizational	Failure to redesign business processes to fit the software	X				
Human	Insufficient training and reskilling / Limited Training	X		X	X	X
Human	Lack of ability to recruit and retain qualified ERP system developers	X				
Human	Insufficient training of end-users	X				
Organizational	Inability to obtain full-time commitment of 'customers' to project activities and management	X				
Organizational	Lack of integration	X	X			
Organizational	Lack of a proper management structure	X				
Human	Insufficient internal expertise	X				
Human	Lack of a champion	X				
Human	Lack of business analysts	X				
Human	Failure to mix internal and external personnel	X				
Technological	Failure to emphasize reporting, including custom report development	X				
Human	Insufficient discipline and standardization	X				
Human	Ineffective communications	X				
Technological	Avoid technological bottlenecks	X				
Organizational	ERP vendor selection				X	
Human	Internal implementation team				X	
Human	Project opposition				X	
Human	user training				X	
Organizational	Project management principles			X		
Technological	Feasibility/evaluation of ERP project			X		
Human	Human resource development			X		
Organizational	Process re-engineering			X		
Technological	IT infrastructure			X		
Human	Consulting services /Client consultation			X		
Human	Employees resistance to change		X			
Human	Conflicts with Consultants		X			
Human	Internal Conflicts		X			
Human	Conflicts with Vendors		X			
Organizational	Conflicts with business strategy		X			

Note. The list is based on the research findings from foundational literature (Sumner, 2000; Themistocleus et al., 2001; Ehie & Madsen, 2005; Momoh, Roy, & Shehab, 2010; Stanciu & Tinca, 2013).

Source: (Menon et al., 2019)

7.2 60 challenges of ERP implementation

Critical Challenges in ERP	Senior Leader	Project Manager	Project Team Member	Business User
Bad feelings about how employees were dealt with	–	–	1	–
Change management	1	–	1	–
Change request controls are very strict	–	–	–	1
Changes to strategy and direction	1	–	–	–
Communication	–	1	1	–
Consultants did not share knowledge	–	–	1	–
Consultants lack of knowledge of other systems	–	–	1	–
Cultural differences	–	2	–	1
Data cleanse	–	1	1	1
Data migration across different systems	–	–	0	1
Data quality issues	–	–	1	1
Data readiness	–	–	2	–
Data validation without understanding the data	1	–	–	1
Engagement with users didn't provide a whole lot of detail	–	–	–	1
Ensuring external stakeholders are aware of the change	–	1	–	–
ERP implementations are not cheap	1	–	–	–
Excessive customization is sub-optimal	1	–	2	–
Implementation causes stress on people	–	–	3	1
Inconsistent KPI reporting across the organization	–	1	1	–
Interface issues	–	–	–	5
Issues after go-live were like a tsunami	–	–	–	1
Lack of access to people who know the information	–	–	1	1
Lack of access to the system	1	–	–	1
Lack of business ownership	–	1	1	–
Lack of business buy-in from internal stakeholders	–	1	2	1
Lack of experienced subject matter experts	2	–	–	–
Lack of integrated testing & real live simulations	–	–	2	–
Lack of integration	–	–	1	–
Lack of resources	–	–	1	–
Lack of training	1	–	–	1
Lack of understanding of business requirements	–	–	1	–
Leader has to champion stability	–	–	–	1
Leadership changes during project	1	–	–	–
Leadership commitment to the standard global template was lacking	1	–	–	–
Leadership didn't understand the complexities	–	1	2	–
Learning new system was challenging to end users	–	–	–	2
Local management didn't pull the right people	–	–	–	1
Management did not want to hear bad news	–	–	–	1
Manual interventions	1	–	–	1
Massive re-organization before an ERP implementation	1	–	–	–
Misunderstanding of scope	–	–	1	–
No accountability or checks in place to get the right data	–	–	–	1
No knowledge transfer from project team to business	1	–	–	–
No proper testing	–	1	3	1
Offshoring causes delays	–	1	–	3
People are resistant to change	1	–	1	2
People are not working towards the same goal	–	–	1	–
Perception that new system should behave like old system	1	–	–	–
Personality issues	–	–	1	–
Pressure to be "green" on the dashboards	–	–	1	–
Project team was disbanded very quickly	–	–	4	2
Project was too long	1	–	1	–
Respecting no-fly zone	–	–	–	1

Short hyper-care support period	1	–	2	1
Thin line on budget	–	1	–	–
Time zone limitations	–	2	–	3
Took long time to address the backlog	–	–	–	1
Unable to deploy resources back to business	–	1	2	–
Use of too many templates	–	–	–	1
Zero experience with SAP	1	–	–	–
Total	19	15	43	40

Note. The table shows 60 critical challenges encountered by the case organization during ERP implementation. This is based on high-frequency count across all role groups. A dash indicates that no group member reported the critical challenge.

Source: (Menon et al., 2019)

7.3 Challenges of cloud-ERP implementations in ERP

Rank 1: security	Rank 2: network dependencies	Rank 3: subscription costs	Rank 4: awareness	Rank 5: perception	Rank 6: integration
Rank 7: customization	Rank 8: long-term costs	Rank 9: performance	Rank 10: data extraction	Rank 11: business complexities	Rank 12: integrity of provider
Rank 13: monitoring	Rank 14: legal issues	Rank 15: limited functionality	Rank 16: organizational change	Rank 17: migration	Rank 18: loss of IT competencies

Source: (Gupta et al., 2017)

7.4 Pie chart with percentages per failure
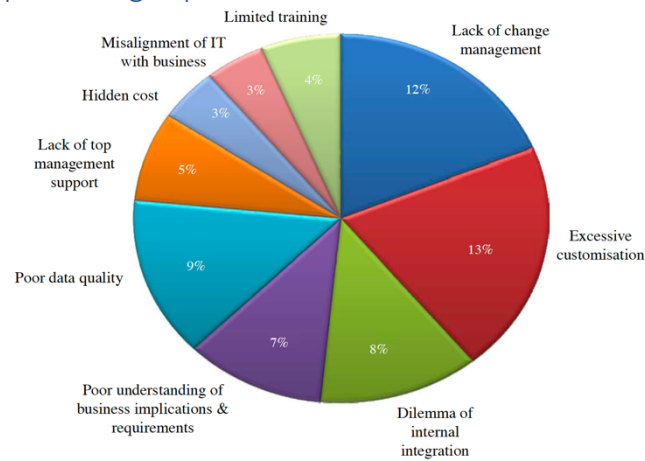
Source: (Momoh et al., 2010)

7.5 One sample t-test results of ERP implementation challenges

Weighted average	LHR	SRC	LES	LFU	ABP	DCT
	290.5	66.5	52.5	83.8	84	87.5

LHR: Lack of human resources

SRC: Staff reluctance and resistance to change

LES: Lack of senior executives and management involvement

LFU: Lack of flexibility and a good understanding of the all organization dimensions to align processes with ERP

ABP: Absence of a balanced combination in the project teams

DCT: Difficulty in coordinating and training software for ERP implementation

Source: (Babaei et al., 2015)

7.6 Challenges of ERP implementation – questionnaire results

Construct	N	Min	Max	Mean	Std. Deviation
Complexity of existing working structure (i.e. protocols, bureaucracy, etc.) in meeting ERP requirements.	52	1	5	3.8077	0.9083
Change the way people work after ERP implementation.	52	2	5	3.6731	0.6484
Lack of experience and appropriate skills in implementing ERP.	52	3	5	3.6154	0.5991
Insufficient ICT infrastructure to implement ERP in the local authority.	52	2	5	3.4423	0.7253
Lack of technical support from appointed ERP consultants.	52	1	5	3.4231	0.9568
Inadequate budget for ERP project.	52	1	5	3.2500	0.9676
Confusion over issues in accounting treatments due to migration from cash to accrual accounting basis.	52	1	5	3.1923	0.8174
Total				3.4863	0.8033

Source: (Fernandez et al., 2018)

7.7 Ranking of CSFs based on the frequency

Order	CSF Description	Frequency
1	Top Management Support	33
2	Project Management	29
3	Training and Education	28
4	BPR management	27
5	Project Team composition/Team Work	27
6	Effective Communication	26
7	Change management	26
8	Business plan and vision	22
9	ERP Choices	19
10	Technical implementation/IT infrastructure	19
11	Project champion	15
12	Legacy systems consideration	14

Source: (Mahraz et al., 2019)

7.8 Strategic- and tactical CSFs

Strategic critical success factors	Tactical critical success factors
Top management commitment and support	Balanced team
Visioning and planning	Project team: the best and brightest
Build a business case	Communication plan
Project champion	Empowered decision makers
Implementation strategy and timeframe	Team morale and motivation
Vanilla ERP	Project cost planning and management
Project management	BPR and software configuration
Change management	Legacy system consideration
Managing cultural change	IT infrastructure
	Client consultation
	Selection of ERP
	Consultant selection and relationship
	Training and job redesign
	Troubleshooting/crises management
	Data conversion and integrity
	System testing
	Post-implementation evaluation

Source: (Finney & Corbett, 2007)

7.9 Interview guideline

The interviews were unstructured and informal. Therefore, several topics which came forward in the articles were used as a guideline. The purpose of those topics was only to make sure all topics were addressed. The subjects which the interviewees found challenging are shown in the last three columns of Appendix 7.10 (HoSt 1, HoSt 2, and HoSt 3).

- o After-care
- o Business processes
- o Communication
- o Consultants
- o Costs/budget
- o Customization options
- o Data migration
- o Feelings
- o IT infrastructure
- o Management
- o Preparation
- o Project team
- o Schedule
- o Testing
- o Training

Nr.	Measurement type	Category	Variables	Count	Menon et al. (2019)	Roper (2021)	Mahraz et al. (2019)	Babaei et al. (2015)	Gupta et al. (2017)	Momoh et al. (2010)	Fernandez et al. (2018)	Finney & Corbett (2007)	Ghosh (2019)	HoSt1	HoSt2	Host3
V1	Likert scale	Human	Colleagues' resistance to change	2	x		x									
V2	Likert scale	Human	The poor management on changes	4	x		x					x				
V3	Likert scale	Human	Team morale and motivation	2	x		x					x				
V4	Likert scale	Human	Lack of proper communication about the status	4	x	x	x					x				
V5	Likert scale	Human	Manners between employees	2	x			x								
V6	Likert scale	Human	Collaboration with external parties	2	x				x							
V7	Likert scale	Human	Knowledge of consultants	8	x		x	x	x		x	x		x	x	x
V8	Likert scale	Human	Lack of technical support from appointed ERP consultants	7	x		x	x	x		x	x		x	x	x
V9	Likert scale	Human	Too little aftercare	2										x	x	x
V10	Likert scale	Human	Management changes during implementation	2	x		x									
V11	Likert scale	Human	Lack of management commitment	6	x		x	x	x		x	x				
V12	Likert scale	Human	Management didn't understand the complexity of the implementation	2	x		x									
V13	Likert scale	Human	Insufficient communication from management	2	x		x									
V14	Likert scale	Human	Learning curve of the new system	2	x		x									
V15	Likert scale	Human	Usage of the new system compared to the old system	2	x				x							
V16	Likert scale	Human	Stress during implementation	3	x				x					x		
V17	Likert scale	Human	Insufficient training of end users	5	x		x	x	x		x					
V18	Likert scale	Human	Too less training after go-live	2					x					x		
V19	Likert scale	Human	Gap between expectations and perception of the system	2		x	x									
V20	Likert scale	Organizational	Changed business processes	4		x	x		x					x	x	x
V21	Likert scale	Organizational	The complex structure of the organization	3										x	x	x
V22	Likert scale	Organizational	Costs of the implementation	3					x	x		x				
V23	Likert scale	Organizational	Budget overrun	2						x				x	x	x
V24	Likert scale	Organizational	The go-live phase	2										x	x	x
V25	Likert scale	Organizational	The accumulated backlog	2										x	x	x
V26	Likert scale	Organizational	Integration of the ERP processes in the organization	3			x		x			x		x	x	x
V27	Likert scale	Organizational	Lack of testing & real live simulations	5			x		x			x		x	x	x
V28	Likert scale	Organizational	The legal aspect	2										x	x	x
V29	Likert scale	Organizational	Regulations and compliance with new procedures	3		x	x			x		x		x		
V30	Likert scale	Organizational	Duration of the implementation process	2					x			x		x		
V31	Likert scale	Organizational	The time schedule	2										x	x	
V32	Likert scale	Organizational	Application of skills, tools and knowledge to meet the requirements	5			x	x	x		x	x		x		
V33	Likert scale	Organizational	The poor knowledge transfer from project team to end users	2				x				x				
V34	Likert scale	Organizational	Composition of project team/teamwork	3			x	x			x	x			x	
V35	Likert scale	Organizational	Thoughtless business plan and vision behind the implementation	2								x				
V36	Likert scale	Organizational	Changes in strategy and direction during implementation	2	x		x		x			x				
V37	Likert scale	Technological	The amount of customization	3	x		x		x	x						
V38	Likert scale	Technological	Interface issues	2	x										x	
V39	Likert scale	Technological	Use of too many templates	2	x											
V40	Likert scale	Technological	Data conversion and integrity	5	x				x	x		x	x			
V41	Likert scale	Technological	Data migration between different systems	3	x		x		x				x			
V42	Likert scale	Technological	Alignment between IT and the organization	2					x				x			
V43	Likert scale	Technological	IT infrastructure was not suitable	6	x	x	x		x	x	x					
V44	Likert scale	Human	Human challenges total													
V45	Likert scale	Organizational	Organizational challenges total													
V46	Likert scale	Technological	Technological challenges total													

7.11 Survey questions

Variable	Questionnaire items
Classification questions	
Age	Wat is your age?
Gender	What is your gender?
Level of education	What is your highest level of education? (Only completed)
Work country	In which country do you work?
ERP system	At which ERP system did you experience the implementation?
Time ERP implementation	When was the ERP system implemented?
Function	What is your function in the finance department?
Number of employees	Number of employees (whole firm)
Sort of ERP system	Locally installed or cloud-based ERP system?
Project group role	What was your role in the project group during implementation of the ERP system?
Human challenges (Likert scale 1-5)	
V1	Colleagues' resistance to change
V2	The poor management on changes
V3	Team morale and motivation
V4	Lack of proper communication about the status
V5	Manners between employees
V6	Collaboration with external parties
V7	Knowledge of consultants
V8	Lack of technical support from appointed ERP consultants
V9	Too little aftercare
V10	Management changes during implementation
V11	Lack of management commitment
V12	Management didn't understand the complexity of the implementation
V13	Insufficient communication from management
V14	Learning curve of the new system
V15	Usage of the new system compared to the old system
V16	Stress during implementation
V17	Insufficient training of end users
V18	Too less training after go-live
V19	Gap between expectations and perception of the system
Organizational challenges (Likert scale 1-5)	
V20	Changed business processes
V21	The complex structure of the organization
V22	Costs of the implementation

|	
V23	Budget overrun
V24	The go-live phase
V25	The accumulated backlog
V26	Integration of the ERP processes in the organization
V27	Lack of testing & real live simulations
V28	The legal aspect
V29	Regulations and compliance with new procedures
V30	Duration of the implementation process
V31	The time schedule
V32	Application of skills, tools, and knowledge to meet the requirements
V33	The poor knowledge transfer from project team to end users
V34	Composition of project team/teamwork
V35	Thoughtless business plan and vision behind the implementation
V36	Changes in strategy and direction during implementation
Technological challenges (Likert scale 1-5)	
V37	The amount of customization
V38	Interface issues
V39	Use of too many templates
V40	Data conversion and integrity
V41	Data migration between different systems
V42	Alignment between IT and the organization
V43	IT infrastructure was not suitable

Five-point Likert scale options:
1) Totally disagree
2) Somewhat disagree
3) Neither agree nor disagree
4) Somewhat agree
5) Totally agree
6) Not applicable

7.12 SPSS distribution of the differences

Differences between human challenges and total challenges
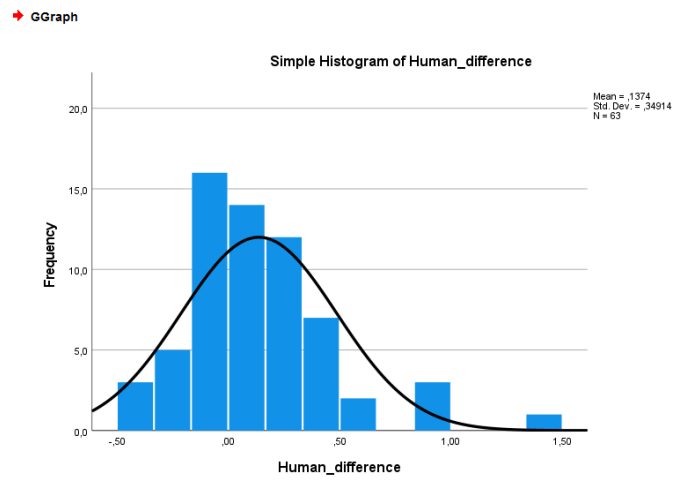
Differences between organizational challenges and total challenges
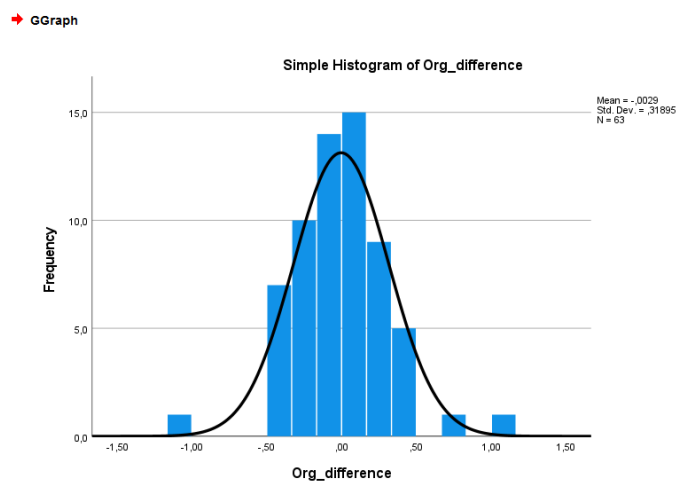
Differences between technological challenges and total challenges