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Factors that affect effectiveness in the use of Enterprise Resource Planning Systems

Reality in Portugal landscape

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Factors that affect effectiveness in the use of Enterprise Resource Planning Systems

Abstract

This research paper serves as a tool to understand what impacts the process of ERP system selection by enterprises and what are the real benefits from this implementation. Ultimately, we will gain insight on how firms prioritize these systems based on their own needs. To do so, this paper made use of a questionnaire to inquiry different enterprises (based in Portugal), in terms of size, revenues, number of employees and industry. The study demonstrated that there are certain industries that are biased towards specific ERP systems and that the number of years with an integrated system has a correlation with user satisfaction.

Keywords: ERP systems, Integrated information systems, Benchmarking, Effectiveness.

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1. Introduction

1.1 Enterprise Resource Planning. What is it?

ERP is an acronym that stands for Enterprise Resource Planning and it can be regarded as the "backbone of information systems in organizations" (Zaim, Kilic and Delen 2015).

The purpose of such system is to address firms needs by integrating the various functions the organization. These functions are often grouped into three domains: Financial Management, Human Resources Management and Manufacturing Resources Planning. This integration ensures that data made available to any of the functional modules, is made accessible to any other module that needs the information (Malindzakova and Puskas, 2018). The objective of this system is to strengthen productivity and to make daily tasks that are common to all industry segments such as: purchase order, shipping, invoicing, production planning, accounting, order fulfillment etc. as simple as they can possibly be (Maditinos, Chatzoudes and Tsairidis, 2011). This leads to a much more efficient time management in the business due to the improved consistency and data accuracy.

Nowadays, we can be sure that global business environment and all that it implies – products and services delivered on a 24x7 basis to satisfy individual needs – would have been much more difficult without an enterprise software capable of organizing information. (Malindzakova and Puskas, 2018). However, the implementation of such systems is not always effective. Some enterprises are not able to fully justify their investment in ERP software or they may misunderstand the true potential of the system, due to the complexity of the system or because some benefits may remain hidden (Maditinos, Chatzoudes and Tsairidis, 2011).

1.2 Results and benefits brought

ERP systems face serious challenges in today's society. On one hand, globalization requires that successful corporations follow best business practices and to bring innovative solutions.

On the other hand, we are facing shortened life cycles which calls for a superior management of the entire supply chain and to operate with a high level of integration (Malindzakova and Puskas, 2018).

Nonetheless, this task automation brings undeniable benefits. With the use of ERP systems information in different parts of the organization is combined and stored in a database which facilitates communication and all business functions inside the organization and manages connections outside the organization (Wang and Wang, 2014). Having information centralized makes it easier to eliminate multiple data entries - offering a single version, to improve access to accurate and timely information, to enhance work flow, to reduce the reliance on paper and consequently to support better decision making. Various studies have mentioned that ERP systems can increase competitive advantage in the information technology era. Moreover, ERP systems are able to reduce costs by reducing the necessary machinery and servers needed for each department and at the same time, reduce the number of workers per department. Enhance productivity giving employees the ability to access interaction with certain clients based on the information they get from the ERP program, leading to a quicker executed service and higher costumer's satisfaction. Increase security by improving data restrictions and to keep data customer information and company data safe (Almutairi, 2016). These benefits and the increased complexity of the processes in the organizations are clear evidence why multinational organizations with larger amount of data are attracted to ERP systems (Ullah, Baharun, Nor, Siddique and Bhatti, 2017).

1.3 Stages of ERP implementation

ERP life cycle consists of three phases which are selection, implementation and use. The selection phase is considered to be the most challenging and time consuming one due to the necessity to identify the problem and execute a detailed analysis of the business system. Thereafter, the explicit constraints in which the ERP has to function should be identified.

Finally, all the options should be evaluated and one of them should be chosen (Zaim, Kilic and Delen, 2015). According to Third Stage Consulting group, the third stage of ERP life cycle can be compared to a rocket launch, where a full digital transformation is complete, business processes are optimized and technical capabilities are realized. (Third Stage Consulting Group, 2018).

2. Literature Review

The developments in information and communication technologies have facilitated the gradual improvement of computer-based systems for operations planning and control (Olhager, 2017).

2.1 ERP overview

The roots of ERP go way back to Materials Requirements Planning (MRP) in the seventies and Manufacturing Resources Planning (MRP II) in the eighties. MRP is a system that was used to determine what material should be ordered and when the order should be made, providing the information about manufacturing needs as well as inventory level. MPR extended to MRP II and it was designed to improve the management control of manufacturing and support function, this extension worked as a way to capture all manufacturing requirement including material, human resources, scheduling and other features. The distinction between ERP and MRP II is based on technical requirements such as graphical user interface, relational databases, computer support for product design, server architecture and the portability of the system (Malindzakova and Puskas, 2018).

2.2 The path to today's society

ERP systems started in the middle of the last century due to the explosion in technology growth and global competition. To respond to the higher demands, corporations had to move towards agile production, processes improvement and reengineering. The motivation for ERP implementations focused on integration, creation of enterprise standards, process

improvements, and increased competitive advantage. ERP systems came to facilitate information sharing between company stakeholders and enhancement of business processes (Jacobs, Christe-Zeyse and Van, 2013). Throughout the years' significant upgrades have been made in ERP systems starting by including supply chain management, customer relationship management, and financial reporting standards (Grabski, Leech and Schmidt, 2011). Nonetheless the definition and applicability's of enterprise systems continues to evolve (Arthur, 2017).

2.3 Theoretical reasoning

Literature review showed that the most commonly used ERP selection criteria are customization, ease of use/user friendliness, flexibility, functionality, implementation time, integration, reliability, technical support and the trade-off price-business requirements.

Gable, Sedera and Taizan, 2008 used **customization and reliability** as system-quality key performance indicators and stated that the transition from in-house, custom-made, stand-alone applications to integrated and customizable packages has changed the way organizations manage information. Peçin, 2008 gives a good insight into the use of a multi-criteria decision making process, called analytical network process (ANP), in selecting and benchmarking ERP systems. In his study a decision making team was formed and major criteria were selected. The members of the decision-making team include an IT manager, quality system manager and logistics manager who are technically competent and experienced engineers. The three managers pointed out that employees cannot afford to spend a lot of time to learn the new ERP system software. Therefore, they defined **user friendliness** as one of the key performance indicators (KPI) in the selection process of an ERP and pointed out the importance of having experts and qualified employees during the implementation process. Managers also emphasized that installing and running a new ERP system may take several years and that the IT is affected to a great extent by the number of modules implemented and by the degree of customization.

Therefore, they considered **implementation time** a fundamental system factor. Sabau, Muntean, Bologa, Bologa and Surcel, 2009 studied the application of an ERP system in Romanian universities and defined **flexibility** as one of the fundamental attributes of an ERP system in order to match the continuous evolution of the organization. Another attribute to which they gave major importance was **integration**, considering it to be a necessary condition for the creation of quality services measured in terms of ease of access, complete coverage of all needs and availability of information. Urbach, Smolnik and Riempp, 2010 measured system quality considering performance characteristics such as navigation, search ability, structure, usability, **functionality** and accessibility and argued that system quality can be regarded as the degree to which the system is easy to use to accomplish tasks. Finally, Malidzakova and Puskas, 2018 had the purpose to analyze the criteria for selecting the information system into a production company using the AHP method. Two of the chosen criteria were the **trade-off business requirements-price** and **technical support**. Price is seen as an essential factor in the choice of an information system, whether is a small or a medium size company. Nowadays, there are lots of different information systems available in the market and given the substantial cost of the investment, a conscious decision should be made having in consideration the trade-off price-business requirements. Besides the basic purchase price, the cost of the extra services and system upgrades should be considered. According to the authors it is also important to have in mind the price of additional services, for example, the services suppliers offer to help ease the transition to a new system.

3. Methodology

The methodology that was used for this study seeks the validation or rejection of the hypothesis that will follow in this next section. For this matter, indirect and direct data sources of information were used. The indirect source consisted on research on the topic considering all

information between the years of 2008 – 2018, available on publishing companies as Elsevier, Emerald Insight, ScienceDirect, EBSCO, etc.

3.1 Research questions related to ERP effectiveness

To give answer to the objectives defined for this study an explanation should be given to the following questions:

- Does the number of years with a certain ERP system affect user satisfaction?
- What reasons could lead a company to change ERP system?
- Are there industries "biased" towards the use of a certain ERP system brand?
- In the user perspective what are the benefits that come from ERP investment?
- Do larger companies spend more on ERP systems than smaller ones (as a % of their revenues)?

With this research questions, we aim to shed light on the factors that affect effectiveness in the use of ERP systems, to understand what makes ERP systems such a cutting-edge solution that makes them absolute vital in the contemporary business society as well as, to gain insight on how firms prioritize systems based on their specific attributes. A similar methodology was used by Wang and Wang, 2014 where the authors also selected five criteria identified in the literature, namely: readiness for cloud computing as a Web-based system, completeness of commonly required ERP functionalities, ease of configuration on any operating system, existence of an active and large social network for users' community support and the presence of other non-functional requirements. Using these five assessment criteria, the authors examined six well recognized open source ERP systems available on the market.

3.2 Questionnaire

The direct and quantitative source of information was obtained through both a face-to-face and an online delivered questionnaires. The chosen data collector was distributed in person on the

Q-Day 2018, which is an annual conference promoted by Quidgest where topics such as entrepreneurship, innovation, strategy, decision modules and internationalization are debated. The final questionnaire and a cover letter including all necessary clarifications was also sent by e-mail to leader companies such as Corticeira Amorim, EDP, Novartis, Galp, Sonae, E&Y, Navigator, Mota-Engil, Universities, Public Administration, etc. aiming to cover responses from various industries.

The full script of the questionnaire can be found in Appendix 29. Answers were accepted from the 19th of September to 15th of October. In total, 160 ERP system users completed the questionnaire out of 1053 questionnaires sent, having a 15% response rate. From those, only fully completed questionnaires were considered for further analysis, obtaining a total number of 158. The survey was as many times as possible sent to IT Managers, CEOs or other collaborators with a specific background to answer, for this reason the portion of incomplete questionnaires was rather low. The data was then exported, treated and analyzed using MS Excel.

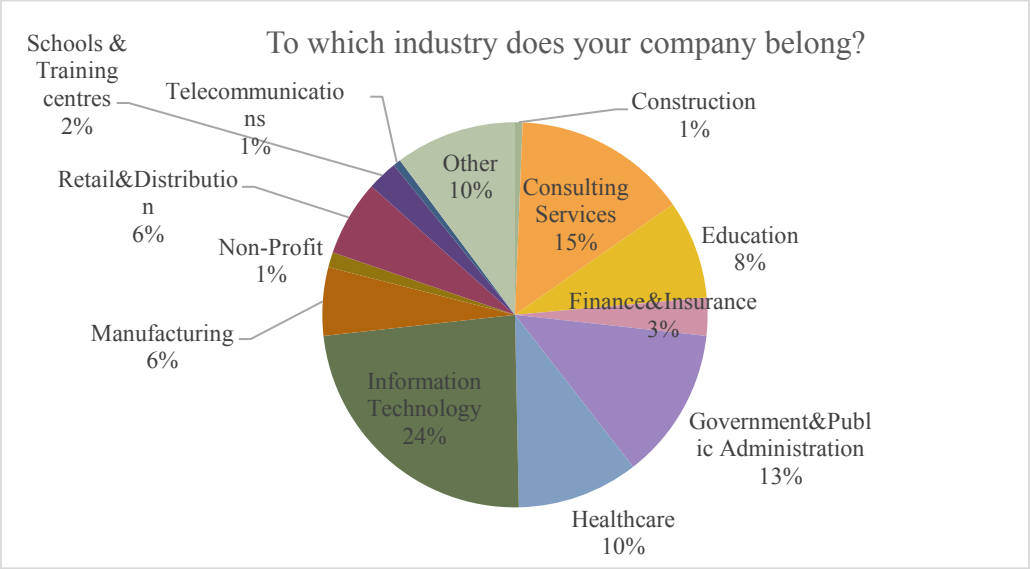
All the learnings gathered from these two main sources of information were then applied so as to obtain the main findings, which then will be used as a basis for recommendations. Overall, the main findings will add to the existing knowledge about ERP systems effectiveness and selection process with the added value of being a neutral study constructed based on the opinions of software real users.

4. Results

In this section of the paper we will analyze the results obtained with the survey in demographical terms, user's pattern and their perceptions.

4.1 Sample Characterization

Overall, the results comprise all industries with a considerable percentage in the information technology sector 24%, followed by the consulting services 15%, government and public administration 13% and healthcare 10%. The sum of the percentages obtained with these industries gives us a total of 62%, the remaining 38% include responses from finance and insurance industry, education, manufacturing, retail and distribution, telecommunications, etc.



Regarding the dimension of the companies in the sample: 54% of companies had less than 20M euros of revenues in 2017, followed by 19% with revenues between 20M and 100M, 15% between 100M and 500M and 11% with revenues superior to 500M euros (Appendix 2). In terms of the number of employees that work for the regarding company: 39% have less than 100 employees, 37% are in between 100 and 500 employees, 11% in the range of 500 until 2500 and 13% are large multinationals with more than 2500 employees (Appendix 3).

More than 2/3 of the people who were questioned are part of the Management team with 40% in top management positions and 37% in middle management, making only 23% part of the staff team. These percentages explain the very satisfactory 1.25% rate of incomplete questionnaires (Appendix 4).

Ultimately, 27% of the respondents only started having experience with an ERP less than 5 years ago while only 9% has experience for more than 25 years. The remaining 64% is splitted between the remaining ranges of 5 to 10 years, 10 to 15 years, 15 to 20 years and 20 to 25 years (Appendix 5).

4.2 ERP users pattern

Half of respondents work for companies with an ERP for more than 10 years, the remaining 50% are distributed in the intervals of less than 2 years, 2 to 5 years and 4 to 10 years (Appendix 6). In spite of this fact, a significant percentage of 34% maintain the actual ERP only for 2 years. 21% of the companies have the actual ERP for 2 to 5 years and the same percentage happens for those who have the actual ERP from 5 to 10 years. Finally, 24% is used to work with the actual ERP for more than 10 years.

To what concerns what respondents reported they spent on the ERP as a percentage of last year revenues (Appendix 8), we have 44% stating they had an expected or actual spend on the ERP of less than 1% of last year's annual revenue. Most of the companies spent less than 1% of the company's revenue on the ERP. Two out of three people are in the lower bound of the established intervals. However, 11% state that the company to which they work for, spent more than 6% of last year's revenue on the ERP. Our data shows most of the companies spent less than 1% independently of their size, in terms of number of employees (Appendix 18). When budgeting for an ERP implementation all costs should be considered, not just the licenses and services. Companies should include internal costs, such as the time spent by internal employees learning how to interact with an entirely new ERP. This task can be long, arduous and exhausting.

SAP, Microsoft and Quidgest represent some of the most frequently selected ERP vendors among our respondents. These three brands together totalize 62% of the answers (Appendix 9).

When we analyze if any industry as some kind of bias towards any particular vendor, we observe that SAP mostly sells to the healthcare industry, IT and government & public administration. Microsoft has a higher expression in the consulting services industry and Quidgest stands out in the government & public administration (Appendix 19).

ERP vendors are continuously building out their service platform and infrastructure to host solutions at the enterprise level. With options to digitize the customer experience, workforce engagement, supplier management and the movement to support the internet of things (IoT) enablement, more and more companies are entrusting software providers and leveraging services which would typically be utilized in-house. An ERP system can be either stored on cloud, on –premises or it can be a software as a service (SaaS). Cloud stored systems can either be one of three versions: private cloud 43%, public cloud 8% or hybrid cloud 2% (Appendix 10). They have the advantage of being faster implemented since the effort is towards moving the data from legacy systems to the cloud-based and they give access to more features. Updates on cloud are easier when compared to upgrading an on-premises ERP system. However, very few providers are offering a single suite of products that meet most user requirements. This implies integrating existing on-premises applications with newer cloud products which can potentially lead to additional costs, more complex process flows or lost functionality.

13% of the respondents have SaaS ERP systems, this solution has pros such as its immediacy, usually you can subscribe to most of these software packages online and start using them straight away. Low upfront costs, because the company will be paying for a service which makes it considerably cheaper initially. Minimal infrastructure needed because the software is hosted on someone else's server. However, it requires internet connection and it has lack of transparency because it is not owned by the company - it is just leased, so the company has a reduced control of the system. On-premises storage solution has a representation of 35% in our

study, it has the advantage of being owned by the company which implies that there are no subscription fees, the hardware can be shared with other internal systems and its safer because the data is stored in the organization. However, it requires more maintenance which makes it a solution with higher fixed costs.

Given the high costs to implement an ERP there are many questions that have to be evaluated. What motivates the organization to implement an ERP system? Does the perceived return on investment plays a major role in the decision to implement? The most compelling reason why our respondents implemented new ERP systems was to improve business performance (Appendix 11). Many were also interested to ensure reporting and regulatory compliance, in making employees tasks easier and having better customer service.

Concerning the privileged attributes when making a decision we have functionality, customization, ease of use/user friendliness and flexibility as the main ones (Appendix 12). The less valued attributes are the implementation time and the trade off price-business requirements. What this translates into, is the improved integration between the different functional areas to ultimately optimize an organization's business processes and ensure cross functional alignment of business processes. Companies and individuals are more concerned with the actual effectiveness and quality of the software than the price or the time it takes to have it working.

As stated before, an ERP has the purpose of facilitating the connection between the various dimensions and departments of a company. However, when making the decision to actually buy one, some companies may only make the purchase of a customer relations management, human resources management, supply chain management, finance and accounting etc. In this study's sample, human resources, operations, services and marketing & sales management are the privileged functions. Logistics and technology management are the functions that have less expression (Appendix 13).

In users' opinion the major benefits and advantages that ERP brings are easier reporting and regulatory compliance, the improvement in the business performance and the homogenization of the business operations. No respondent sees the increased productivity due to the ease in employees tasks as a benefit brought by the ERP. The increased company growth and the lower costs due to a reduction in the human resources are also not that important when compared to factors such as better systems integration across multiple locations and the increased client satisfaction (Appendix 14).

Overall most of the respondents' state to be very satisfied, 49%, or little satisfied. 32%, meaning that 81% of respondents are in the upper bound when considering user satisfaction. A number that should be highlighted is the negligible percentage of very dissatisfied and little dissatisfied users when considering the costs of change of 1% and 3% respectively. The remaining 16% corresponds to the respondents that are neutral towards the cost of change.

The ERP market is fast evolving with new functionalities coming up that can be integrated to other business solutions and are scalable to growing business needs. With the advancements in technology, the market in the next decade will see a paradigm shift driven by wide changes such as: more intuitive and user friendly solutions, customized - tailored to the specific business needs, different cloud deployment models such as software as a service (SaaS), IoT, mobile ERP application, etc.

When asked about the trends that users consider reflected in the ERP the most well-known were data privacy, responsiveness and the importance of being cloud-stored (Appendix 16). An interface is responsive if it adapts perfectly on different devices without resizing, panning and scrolling the page. Responsiveness became a hot topic in 2013 with the use of internet on smartphones, tablets or smartwatches. The benefit of responsive web design is said so because a website which can adapt its layout to browser's size should be able to adapt the size of fonts,

pictures, and other components so that the user can read the whole content without doing any horizontal scrolling to see hidden parts of website (Alnawaj'ha and Abutaha, 2018). On the opposite side, gamification was considered the less relevant trend nowadays. It consists of introducing play into the workplace with the purpose of enhancing creativity and focus. This technique can be adopted during the implementation process in order to "spice it up" and make employees learn as much as they can about the ERP. Many Fortune 500 companies have already adopted such techniques into their routine. Microsoft created "Ribbon Hero" to teach employees how to use the software and the ribbon interface, they even integrated it with Facebook allowing users to compare scores with their friends and to post achievements on their wall.

Finally, when users were questioned about what could lead them to change ERP they state that the most probable reasons to change would be an outgrowing of the system capability, the lack of support and the obsolete technology (Appendix 17). Some people do not see reason to change because they have in-house custom made software, others consider price to be the crucial factor, the lack of flexibility was also pointed out by some users.

4.3 ERP user's perceptions

When analyzing the reasons behind the decision to purchase a certain ERP brand over another it is possible to understand that respondents, except Primavera users, have pretty much uniform opinions – they all consider the improvement in business performance the most important reason (Appendix 20). The ones who interact with Primavera give more importance to the possibility of making employees tasks easier, whereas SAGE users see both reporting/regulatory compliance and improved business performance with equal importance. The reduction in the human resources is seen as the less important factor.

Regarding the ERP investment cost as a percentage of revenues it is possible to argument that most of Primavera's users spend less than 1% of the company's 2017 revenues on the ERP (Appendix 21). Oracle's users are the one who spend more on the ERP as a percentage of the company's revenues. Research says that on average company's overall information technology spending is typically 3–5% of their revenue (Gartner, 2017). The brands that have more representation in this values range are SAGE and PHC.

To what concerns the most valued attributes in each ERP, data can be discussed in four clusters. The one who privilege user friendliness as the most valued attributes: Quidgest and Sage users, the ones who prefer functionality: SAP and Microsoft, then flexibility is the most important characteristic for PHC and Oracle users and finally the respondents who use Odoo and Primavera prefer the possibility to customize (Appendix 22).

All ERP's, regardless of their brand, serve the purpose of organizing information and make daily tasks as easier as possible. However, when users were asked about the increased benefits with the use of a certain ERP, each of them has its very own perspective. For instance, Microsoft customers see the overall improved business performance as the key factor, Quidgest's considered that it exists a shared importance between the easier reporting and the better systems integration across multiple locations. Finally, SAP users share thoughts with Quidgest's and see easier reporting as the determinant factor (Appendix 24).

When we look into users' satisfaction, interesting inferences can be made. First of all, Quidgest has the higher percentage of satisfied users, followed by Microsoft and PHC. Secondly, even though it is a small percentage, the only brand who has very dissatisfied users is SAP. Moreover, and it comes as a very positive result, most of the brands such as Odoo, PHC, Primavera, Quidgest and SAGE, only have clients which are on the upper side of user satisfaction (Appendix 25). Most satisfied users are the ones who have the actual ERP for less

than two years. Curiously, very dissatisfied users either have the ERP for less than two years or for more than ten (Appendix 27).

Despite being software systems which serve the same purpose, they all have their very own particularities that help an enterprise to make a decision and opt for one or another. For instance, Quidgest's users consider trends such as interface responsiveness the most important one, whilst both SAP and Microsoft end users give a major importance to data privacy. Overall, they all see gamification, multi-language currency and alphabet as the ones which their software still does not include. (Appendix 26).

5. Main Findings

In this section we will seek the validation and rejection of the proposed hypothesis in this work and analyze possible patterns regarding ERP users. We are also going to discuss the limitations present in this work so that in the future they can be controlled.

5.1 Research Hypothesis Discussion

- Does the number of years with a certain ERP system affect user satisfaction?

Even though we would expect most consumers to respond they were neutral regarding the current ERP used by the company to which they work for, this was not the case. Surprisingly, and it comes as a very positive result, most ERP users seem to be very satisfied with their current ERP (Appendix 27). As one would expect, the highest percentage of very satisfied users has the software for less than 2 years, this comes as a no surprise given that these recent solutions will naturally be more modern, versatile and user friendly. Though, what comes as unanticipated, is the fact that the second group with the higher percentage of satisfied users are the ones who have the system for 10 years or more.

Another important aspect is the low percentage of very dissatisfied users that is only present for those who have the ERP for less than 2 or more than 10 years.

- What reasons could lead a company to change ERP system?

Companies rely on ERP systems to keep their business operations running smoothly. Without ERP implementations to manage purchases, customer orders, financial transactions, modern business society would take a significant step back in terms of efficiency. The integrated nature of ERP systems makes them tricky to maintain and update, and this explains why some of these systems are out of date or in need of major improvements. In addition to this, many organizations looking for cost savings and business flexibility, are considering migrating their ERP to the cloud or SaaS. According to our 158 responses, the most common reason to make companies seek other ERP solutions happens to be when the business needs outgrow the system capability, when it exists lack of support given by the consulting company or if the technology starts to be obsolete. All of these factors can lead ERP selling companies to disaster if they do not "run faster" that the overall society and their specific needs.

- Are there industries "biased" towards the use of a certain ERP system brand?

As previously stated the industries that have more representation in this study are IT, Government & Public Administration, Healthcare and Consulting Services. These four industries seem to be the ones who have some type of "bias" towards a specific ERP brand (Appendix 19). For instance, 6% of the IT respondents use Microsoft, the same thing happens concerning Consulting Services. Healthcare industry also suggests to have a natural preference towards SAP ERP, with 8% of respondents used to interact with this system. The last but not the least, Government & Public Administration divides its share between SAP and Quidgest ERP.

- In the user perspective what are the benefits that come from ERP investment?

When asked about what are the company motivations and problems that may lead to an ERP system purchase, improvement of the overall business performance, compliance with the reporting and simplification of employees daily tasks play a major role (Appendix 11). After ERP system purchase companies are able to evaluate what were the real differentiating factors. Most individuals considered easier reporting and regulatory compliance the differentiating factor, followed by the improvement of the business performance. These results show that, overall, observed ERP benefits meet the clients' expectations and needs.

- Do larger companies spend more on ERP systems than smaller ones (as a % of their revenues)?

To evaluate if this is the case or not, we considered the company size relative to the number of employees the company has. This question made us able to prove what was already expected. Larger enterprises (in terms of number of employees and also in terms of revenues) are the ones who spend less in percentual terms when compared to smaller ones. Naturally, in absolute terms they are probably the ones who spend higher amounts. This would happen so, because companies with higher volume of sales and higher flows of information need more complex and complete systems, that are capable to integrate all business processes (Appendix 18). Despite of that, the four groups of companies in terms of number of employees, have higher representation in the lower bound in terms of cost.

5.2 Limitations

Concerning the quantitative analysis – the survey – it is limited by the fact that IT, Consulting Services, Government & Public Administration and Healthcare totalize 62% of the represented industries, with very few representation of Finance & Insurance, Telecommunications, Non-Profit, Construction and Schools & Training Centers. Another limitation was the fact of having very few representation of large companies justified by the fact of 50% of respondents working

for companies with revenues inferior to 20M€ and only 11% of respondents working for companies with revenues superior to 500M€. Naturally, the same thing happens in terms of number of employees: we have greater expression in the lower bound that in the upper bound. There is one more limitation that is worth mentioning which is the fact of having 62% of respondents using SAP, Microsoft or Quidgest ERP and much lower presence of other systems. A larger number of respondents could have diminished these issues and allowed for a more normalized distribution sample.

As for the qualitative analysis, the obtained scores are at risk of being subjective to individual interpretation. In the future, this problem could be bypassed by increasing the number of respondents. Notwithstanding, having much higher number of top and middle management respondents than staff respondents ends up controlling, even if not entirely, for this problem.

6. Recommendations

When recovering from a failed ERP implementation, organizations struggle to answer the question: "Who is to blame?". However, the project usually involves many stakeholders, from the project team, to the ERP consultant to the ERP vendor. A better question to ask is: "What were the roots that caused failure in the overall project execution?". ERP failure can be avoided by interpreting warning signs and by developing a strategic and realistic implementation plan.

First of all, both the company that implements the ERP and the consulting company should have realistic expectations regarding costs and duration of the project. For instance, before taking decisions key questions should be evaluated. What has worked for similar companies and competitors? What were the challenges faced by these competitors? What are the real company's needs? What attributes does the company privilege in the software? The recent SAP failure at Lidl where the retailer spent 500M euros and seven years demonstrates how important it is to define strategic goals and the roots to achieve these goals (LikedIn, 2018).

Secondly, companies should not standardize and adapt their business to the software. Industry best practices may be appropriate for some areas of the organization, but they can also end up erasing the company's competitive advantage in other areas. Firms that fall into fallacy end up automating their existing processes, rather than optimizing them for efficiency and competitive advantage.

There may also exist lack of business process reengineering, for instance, insufficient employee communication and training. These practices ensure that employees effectively use the new ERP software and follow the new processes and procedures. Of course, no one can force employees to embrace change, it is each ones' choice and some people try to resist it, but this may end up affecting the overall ERP implementation.

Finally, it is key to hire experienced resources. An ERP consultant with industry specific experience understands the challenges and can ensure access to the right expertise. National Grid, a British multinational electricity and gas utility company, experienced a SAP failure due to the inexperience of its systems integrator (Panorama Consulting Solutions 2018).

7. Conclusions

Information systems are important drivers of competition in a highly globalized world. It is widely known that ERP is not just a software application, it also changes the manner how the tasks are conducted. Quoting the Senior Vice President of Citibank back in 2002 "We are a software company masquerading like a bank" (Humphrey, 2001). However, and as described throughout this paper, multiple challenges can be faced when the decision to change ERP comes. Starting with the factor of having multiple suppliers and packages available in the market, or continuous improvements and upgradings in IT. Eventually, there may also exist incompatibilities between the old and the new hardware and software systems, the complexity and the dynamics of the business environment or the lack of knowledge of the decision makers to make a system selection. Finally, financial or time constraints can also be faced.

According to Panorama's Consulting Solutions predictions for 2020, there are certain trends that can be expected about ERP industry. First of all, **consumerization**: as the millennials start integrating the workforce, we will increasingly see pressure to shift to more user friendly and intuitive software solutions that more closely resemble nowadays consumer technologies. Hence, ERP vendors should take great deal of attention to continue updated about the industry's needs and to offer innovative solutions. Secondly, **mobility** will likely continue to be the primary technological reality in 2020. Part of this trend will be due to the fact that more employees regularly use their mobile devices in their personal lives and will probably do so to access ERP software. This creates the need to offer responsive ERP's that can adapt to different interfaces and complete tasks with the same efficiency and smoothness as before. Other hot topic of the moment is the increasing focus on **business intelligence** and data. After years of capturing information from different transactions and strategic data throughout ERP software, organizations will have to put effort on understanding how to make use of this data and turn it into a strategic advantage. For this matter simple reporting will not hack it, enterprises will demand more robust and intelligent ways to make use of the information. ERP vendors such as SAP, Oracle and Infor are already investing heavily in their business intelligence capabilities. Finally, we are observing an increasing trend on the fragmentation of ERP software, clients are looking for the low-hanging fruit associated with smaller solutions such as customer relationships management systems or human capital management systems, rather than the full ERP system. Part of this is due to a natural tendency for the organizational pendulum to naturally swing back and forth between single ERP software systems and multiple point solutions. (Panorama Consulting Solutions 2014).

To sum up, certain outputs can be taken out of this research paper and are worth mentioning so they can add to the existing literature and become public knowledge available to companies that may face doubts regarding ERP efficiency. First of all, most enterprises are used to spend less than 1% of their revenues on the ERP regardless of the brand they choose to adopt. In this study

SAP has the higher percentage of respondents, which is no surprise given that it is also the market leader in terms of ERP systems. However, there are controversial opinions concerning SAP ERP system. Some consulting companies say that SAP can fit any size business, from the smallest company to a Fortune 500 company, so it distinguishes from a flexibility point of view. Other positive aspect that is pointed out is its objectivity - it does not offer unnecessary functionalities. Finally, it is usually said that although it is the second most expensive ERP, Oracle comes first, it provides the shortest payback period - of around nine months, when compared to other ERP systems (Panorama Consulting Solutions 2018). On the opposite side Brightwork Research & Analysis consulting, state that the most prominent ERP packages defenders on LinkedIn are never customers, they are consultants who say a lot of unscientific things to defend their source of income and that these consultants enjoy billing hours. Moreover, Brightwork defends that these companies who sell ERP packages succeed, due to the aggressive giveaway of its consulting to other consulting companies. These consulting companies in turn recommend their products, not because they are the correct fit, but because it allows them to make money (Brightwork Research & Analysis, 2018). Regardless of all the comments on the web, it is undeniable that SAP, Oracle or even Microsoft are the market leaders in the ERP systems arena for the last three decades. Nonetheless, the competition is fierce with a lot of new entrants in the market, from large to small vendors.

With reference to user satisfaction, we obtained very positive and unexpected results, having 81% of users saying they are very or little satisfied with their current ERP. Quidgest stood out from the remaining ERPs having the higher percentage of very satisfied users, followed by Microsoft and PHC.

Overall, companies that consider to adopt an integrated software system should bear in mind that standardize to what software packaged companies state to be “industry best practices” is not a solution because there is no “one size fits all good solution”, this is just the lazy recipe

that has disseminated throughout the years that “companies should spend on management so that they do not change the software”. Moreover, communication is essential in order to match the clients expectations with the reality and to understand how long would an implementation process run. This implementation cannot last 7 years, as happened for Lidl (Consultancy.uk 2018), because the pace of change has accelerated and ERP systems have to cope with industry dynamics and challenges. Moreover, the world is facing mutations such as digital transformation, IoT, artificial intelligence, etc. This changes are happening at a cruise speed and those who refuse to evolve can end up “swallowed” by innovative organizations. ERP software industry revenue continues to steadily grow, evolving from 24 U.S billion dollars in 2012 and achieving 34 U.S billion dollars in 2017, according to Statista (Appendix 28).

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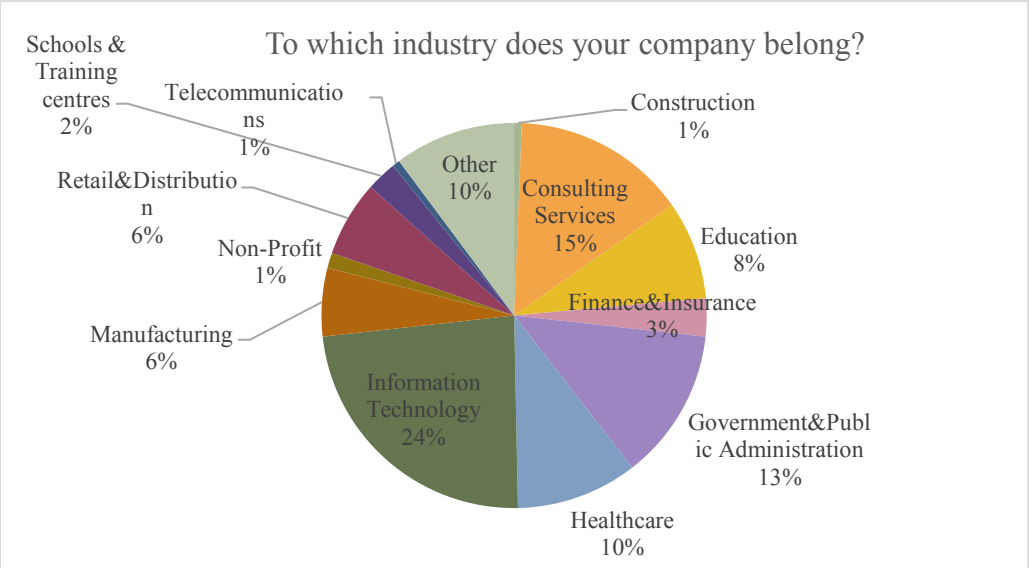
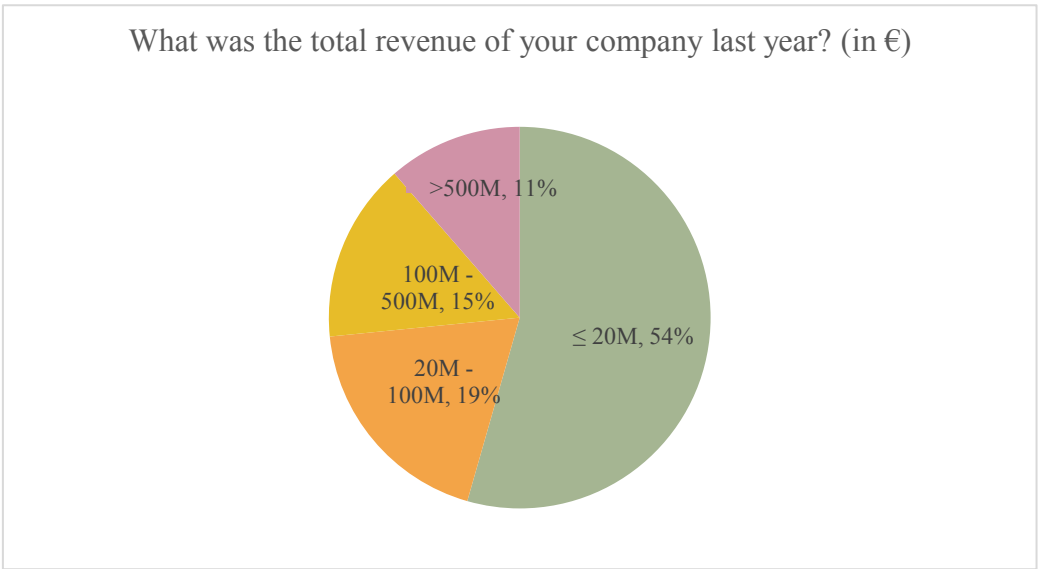
9. Appendices

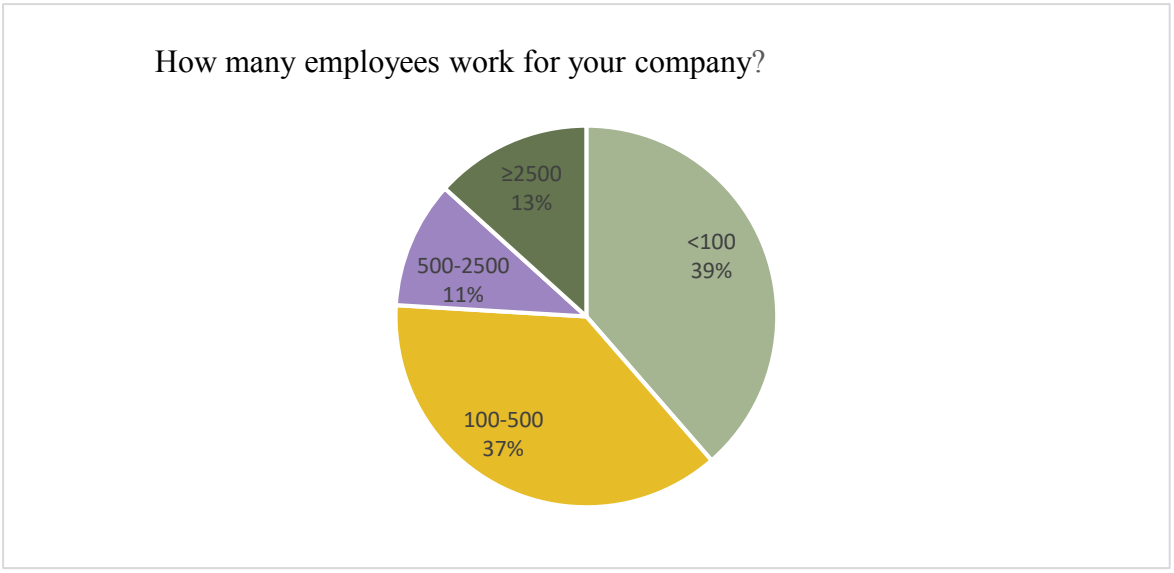
8.1 Appendix 1: Industries in the sample



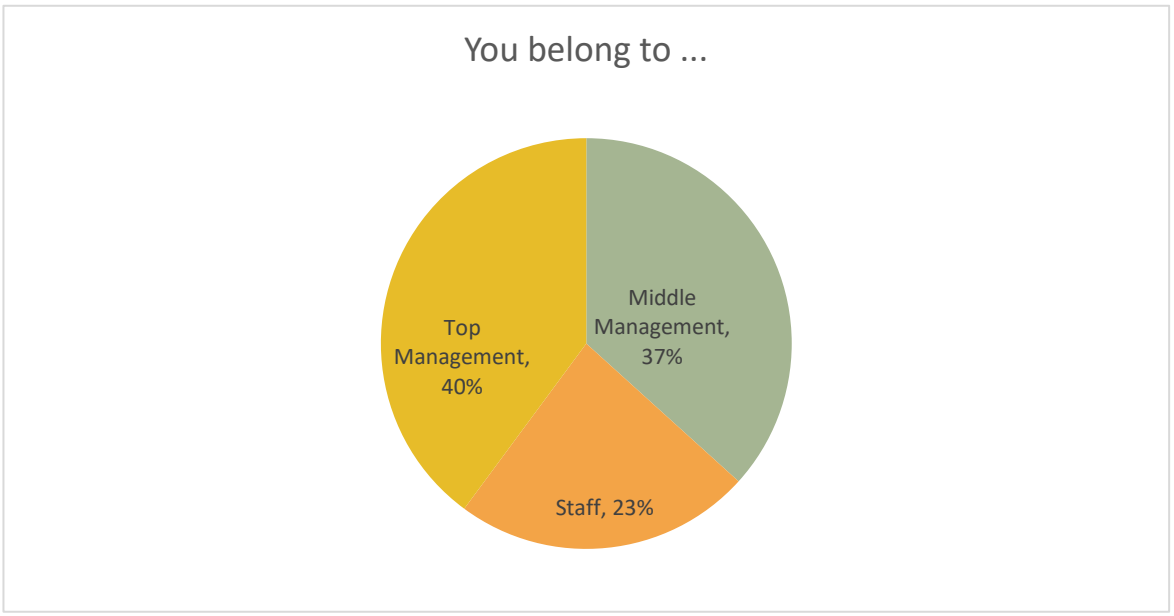
8.2 Appendix 2: Size of the company by revenues



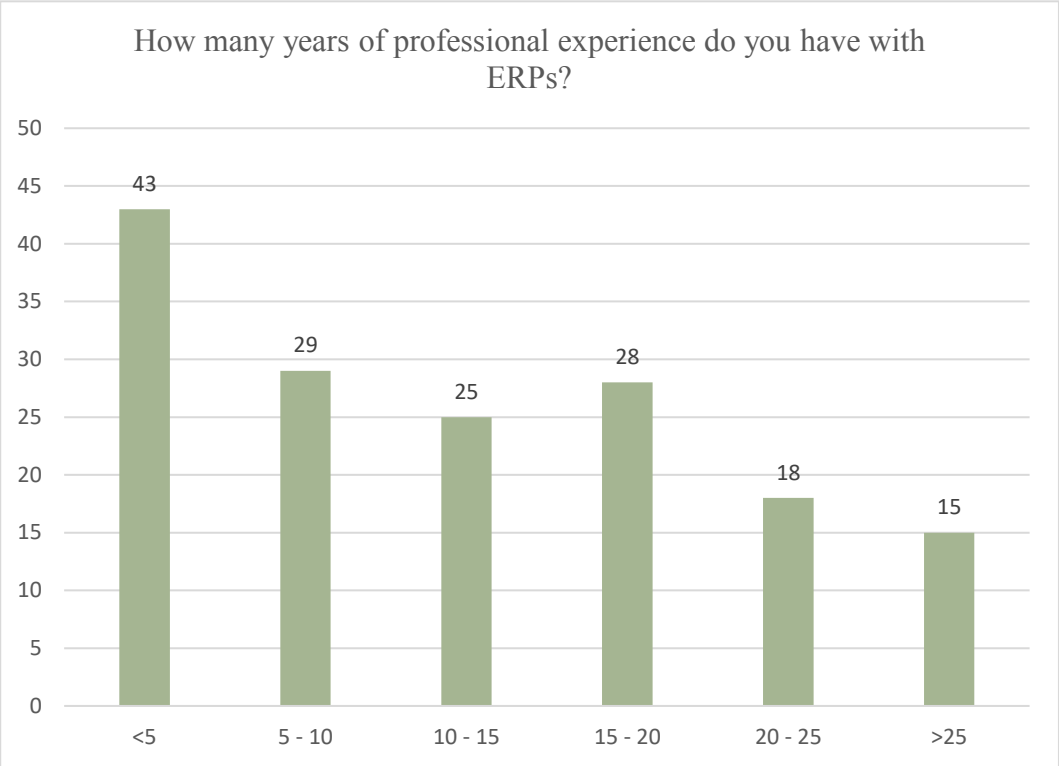
8.3 Appendix 3: Size of the company by number of employees



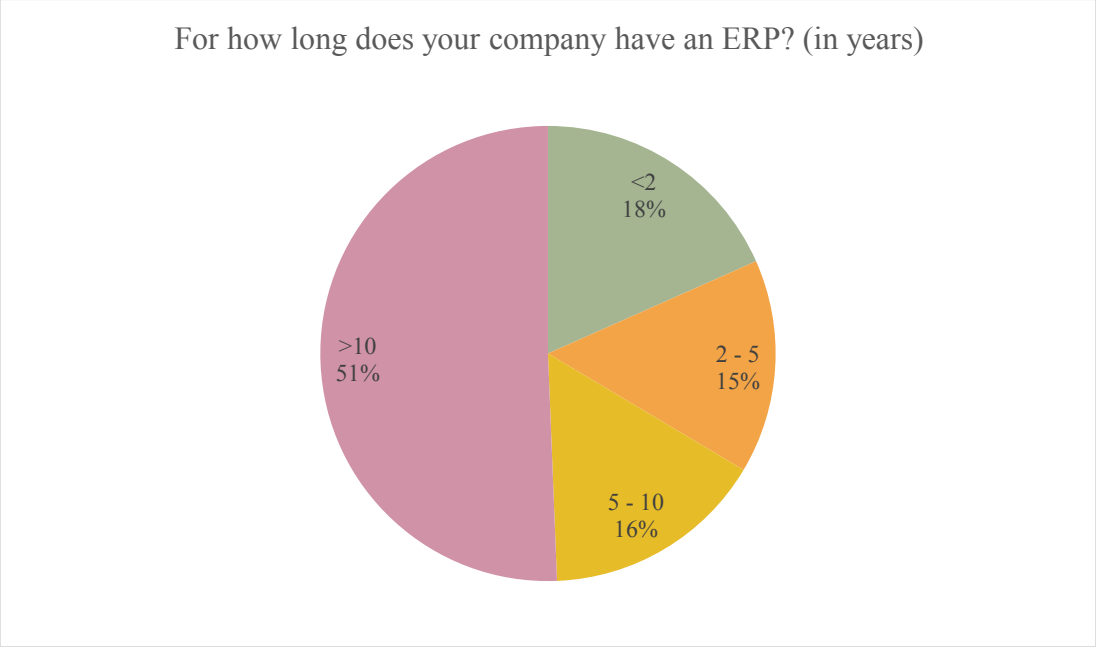
8.4. Appendix 4: Current role in the company of the questioned



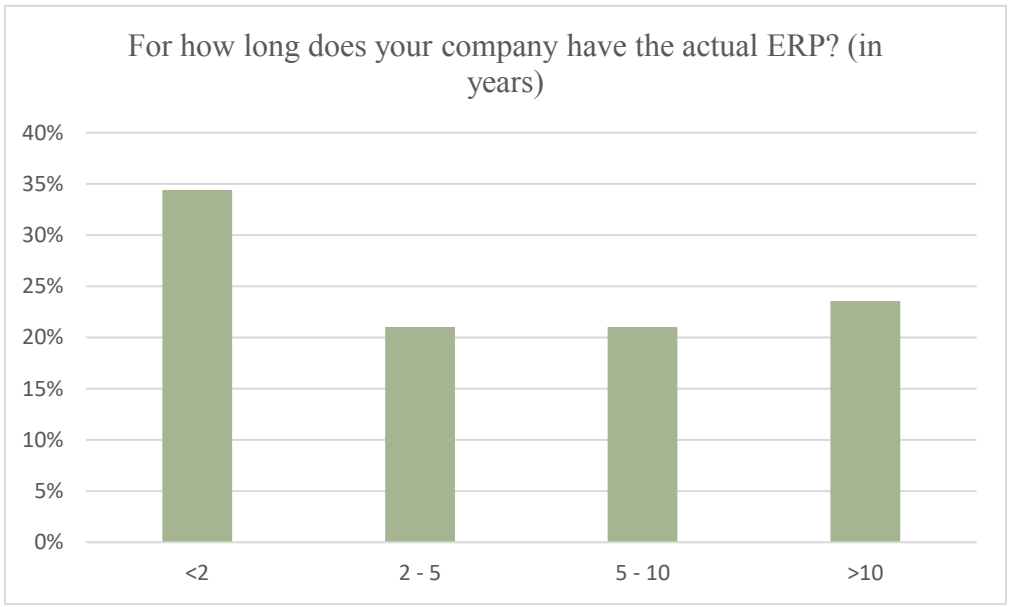
8.5 Appendix 5: Personal experience with ERPs (in years)



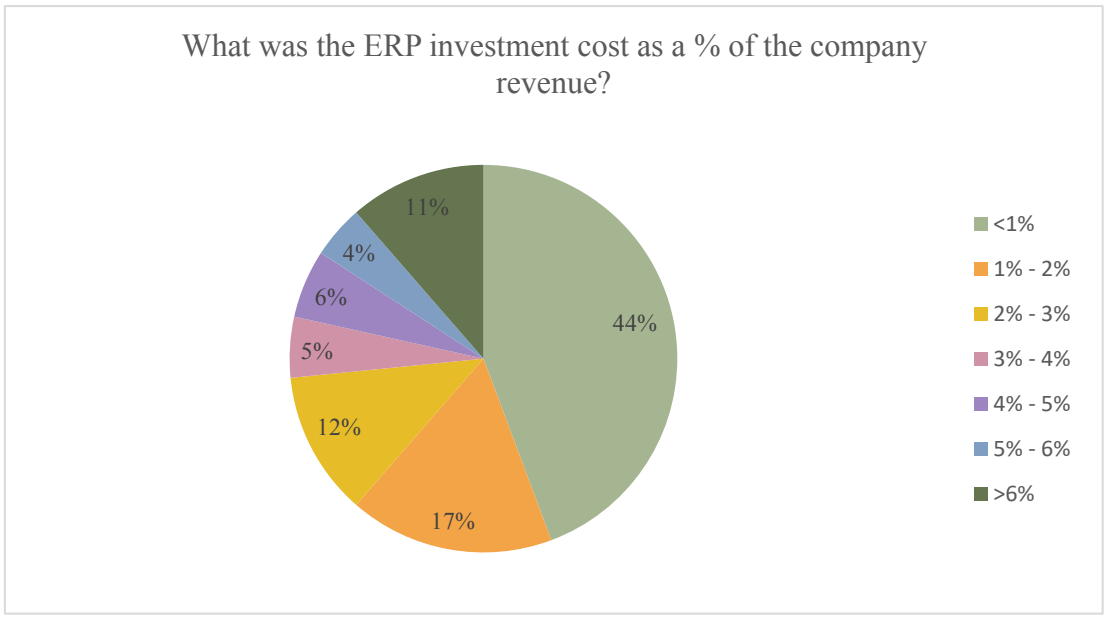
8.6 Appendix 6: Company experience with ERPs (in years)



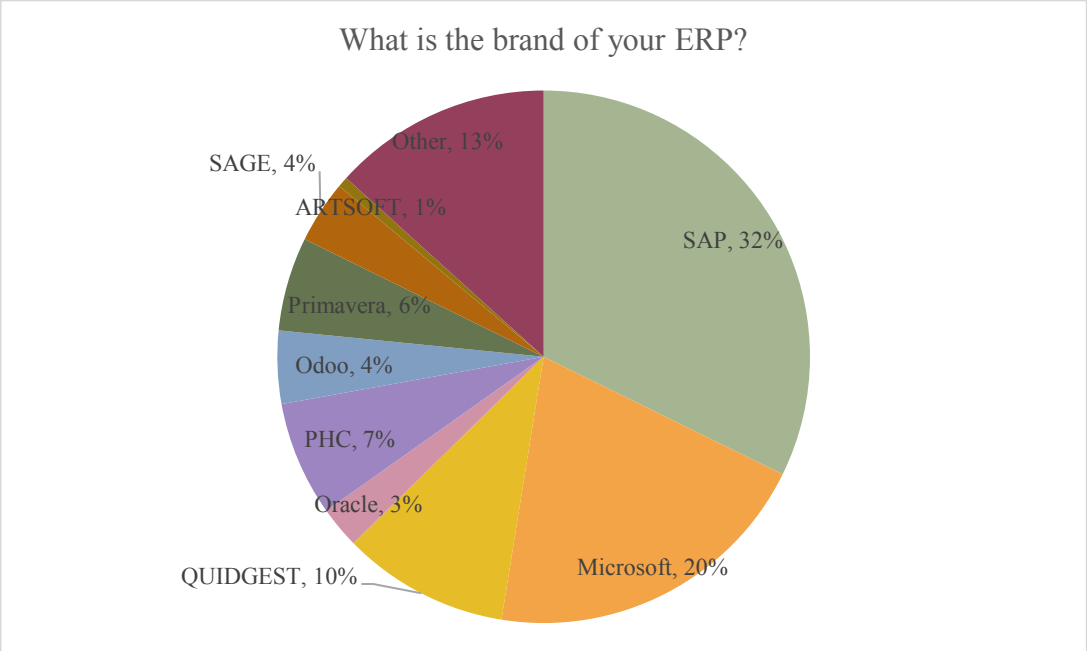
8.7 Appendix 7: Company experience with the actual ERP (in years)



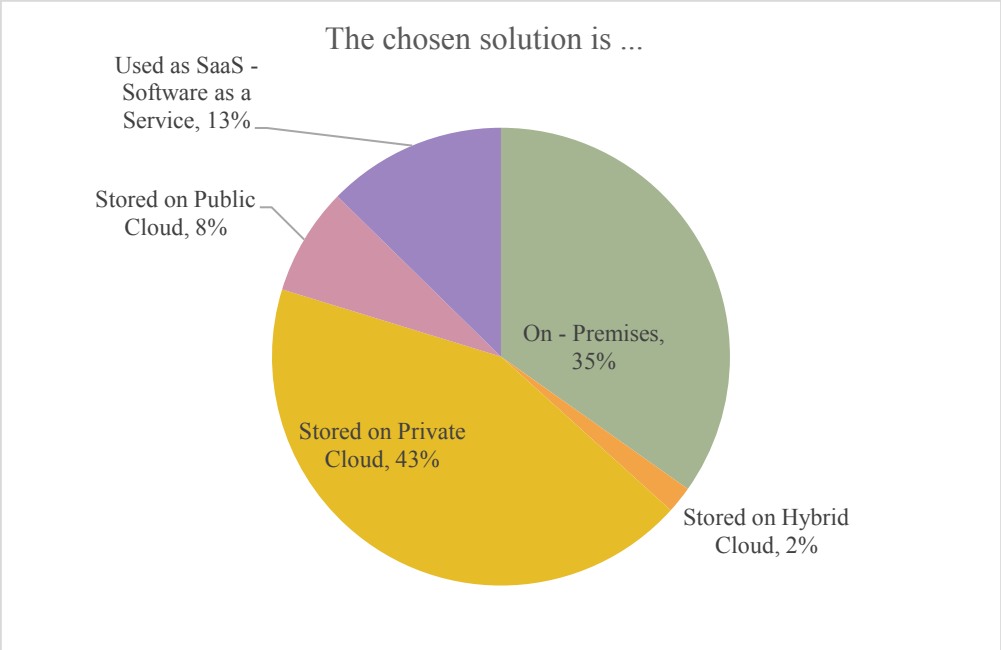
8.8. Appendix 8: Investment cost on the ERP as a % of company's revenues



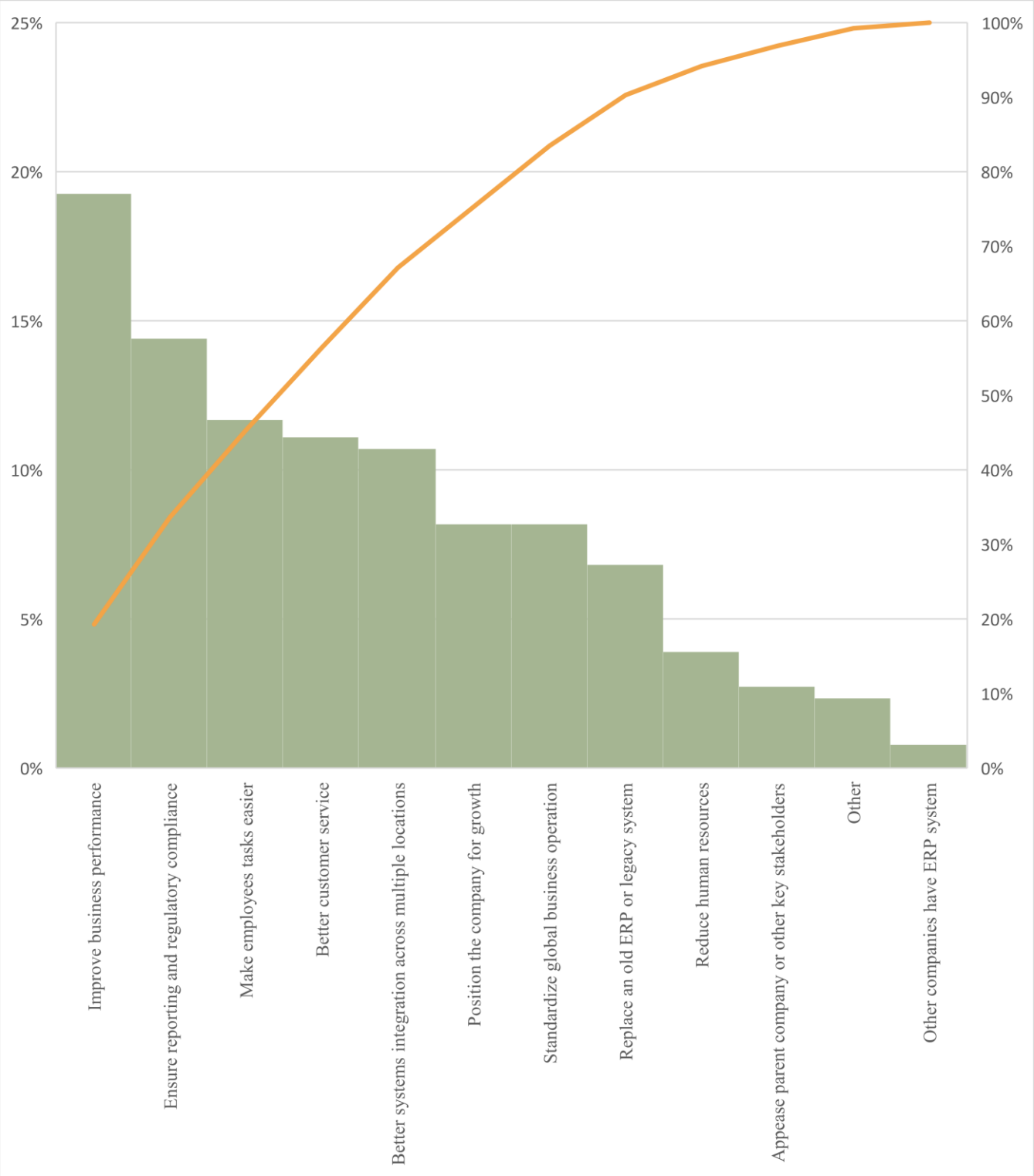
8.9. Appendix 9: ERP brands



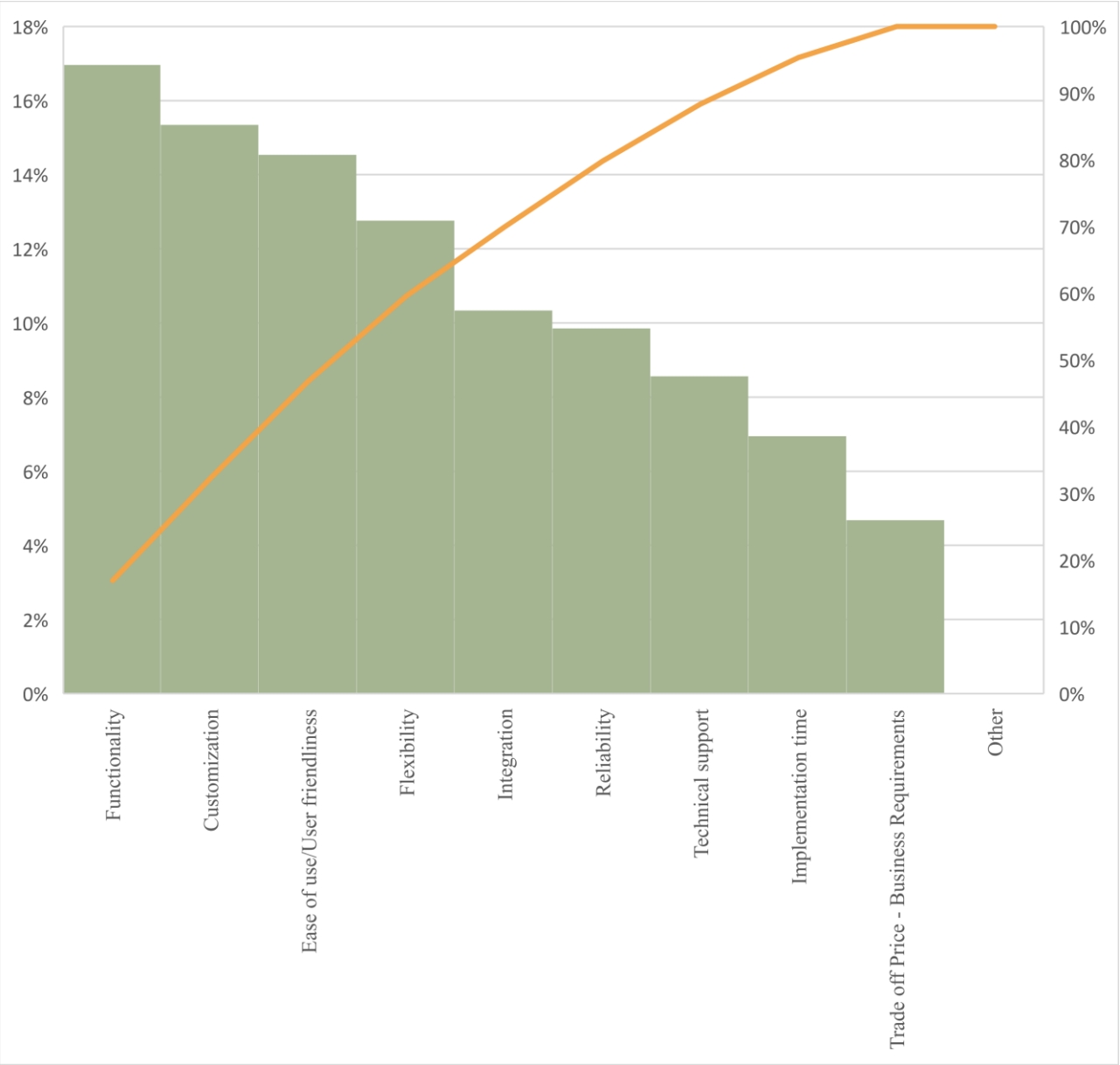
8.10. Appendix 10: ERP storage



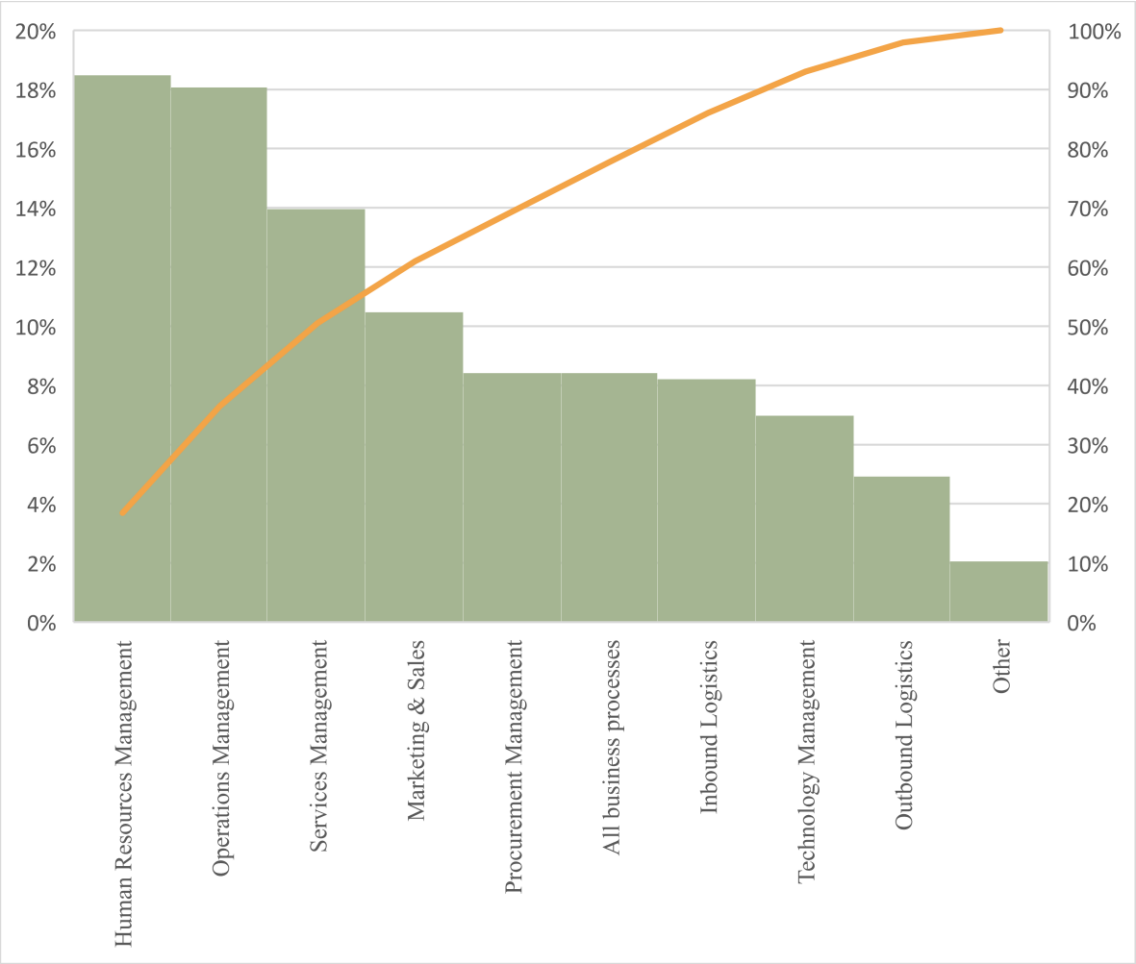
8.11. Appendix 11: Reasons that motivate the purchase of an ERP system



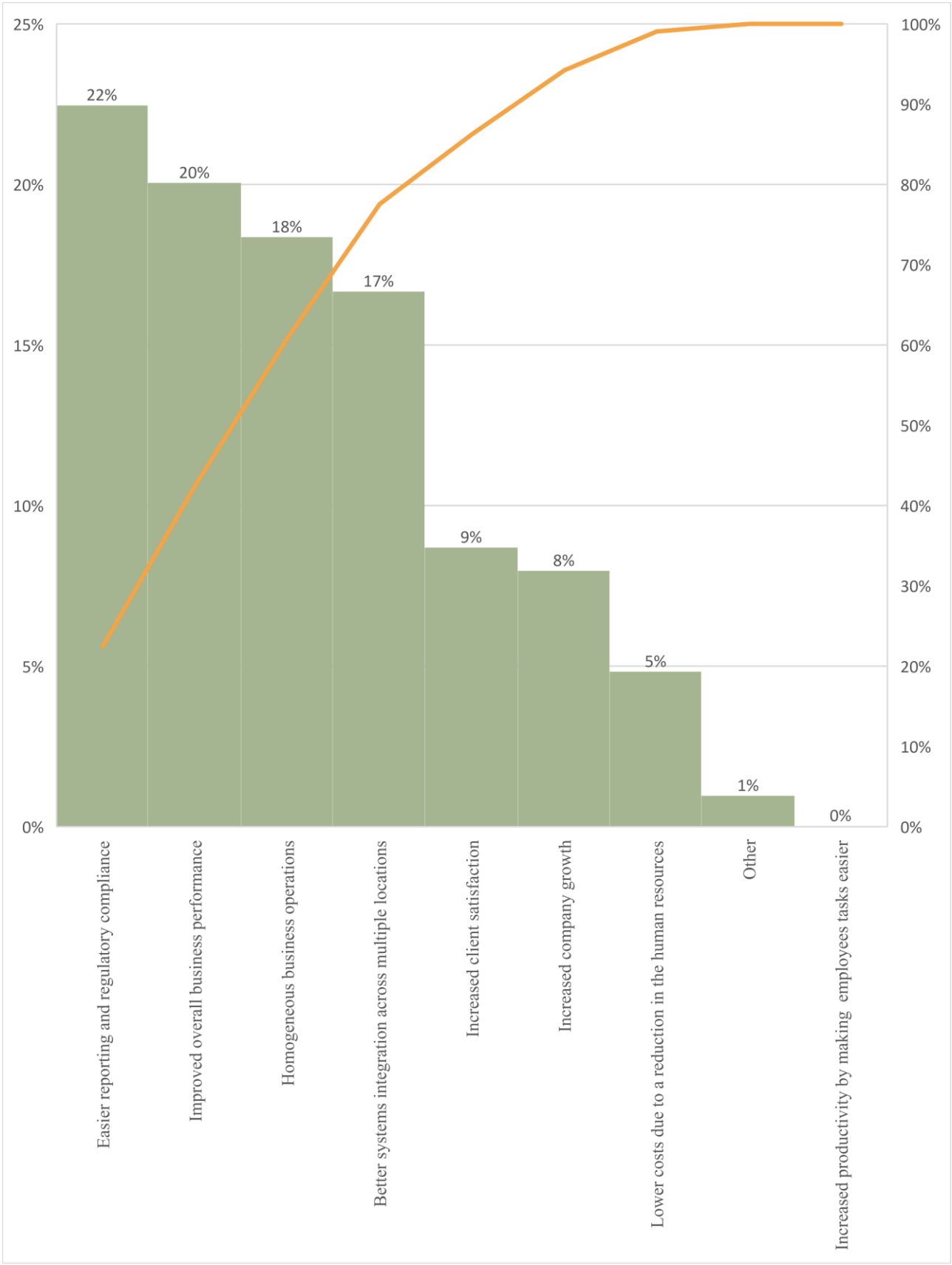
8.12. Appendix 12: Valuable attributes when purchasing an ERP system



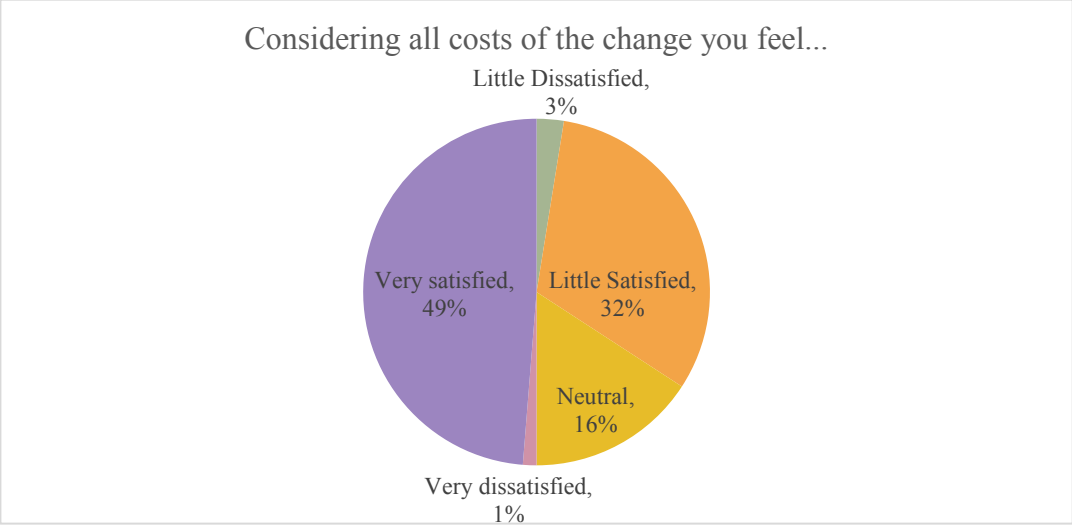
8.13. Appendix 13: Business processes included in the ERP



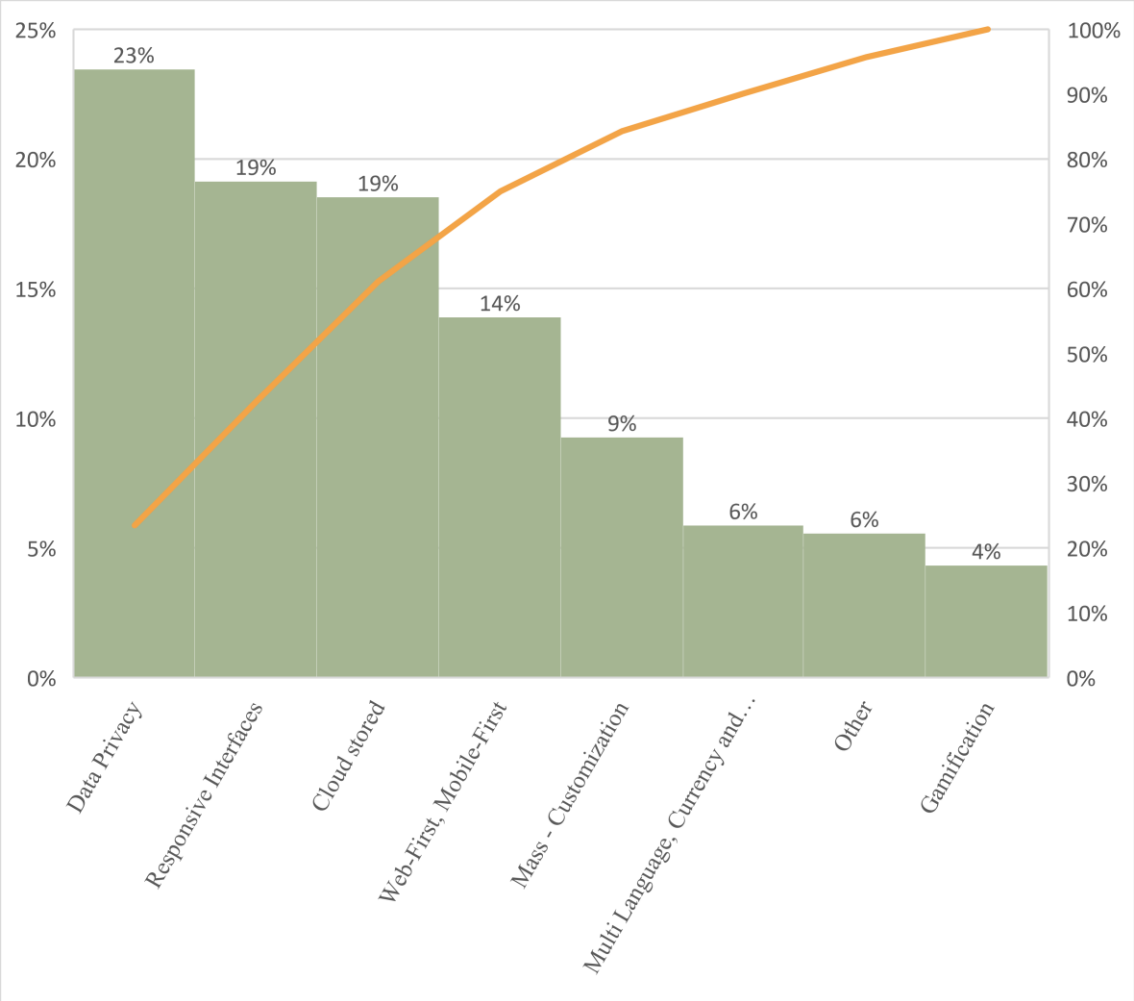
8.14. Appendix 14: Benefits noticed by the company after ERP adoption



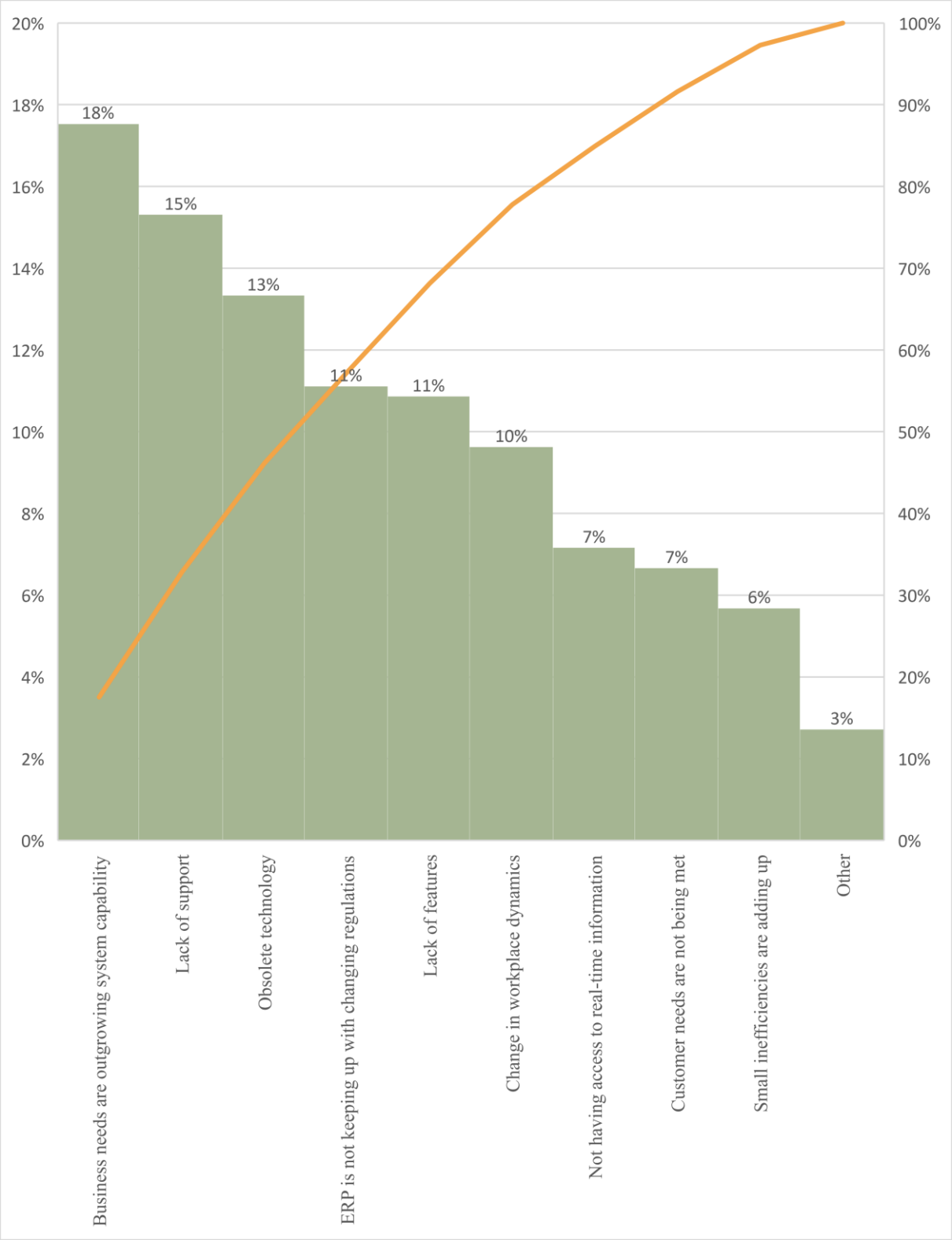
8.15. Appendix 15: User satisfaction



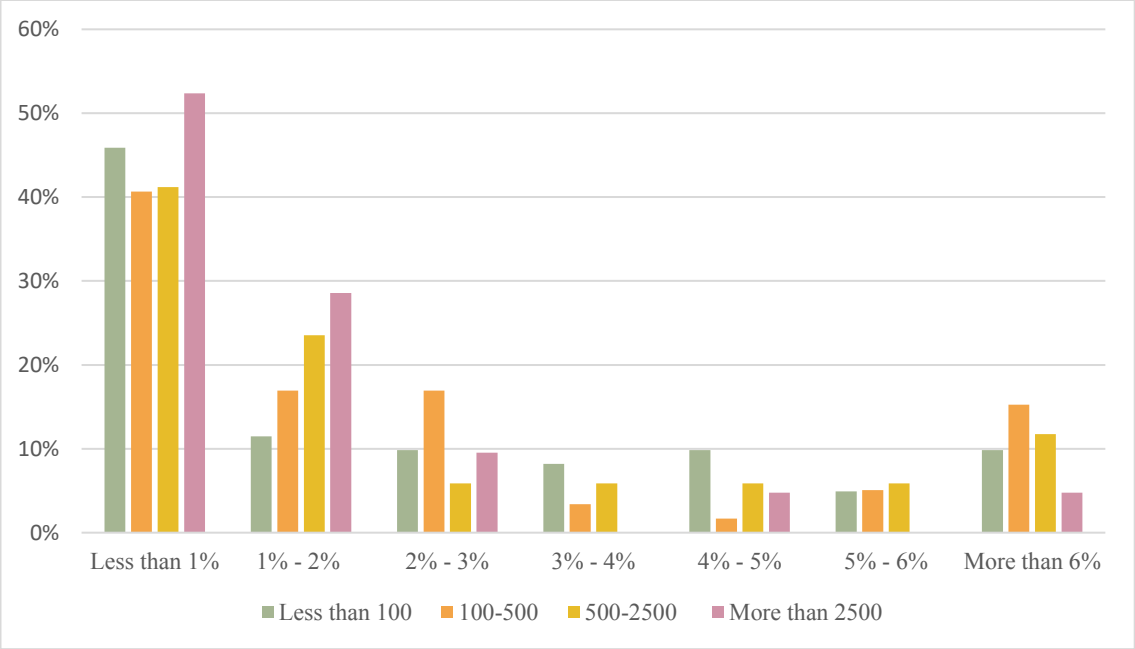
8.16. Appendix 16: New trends included in the company ERP system



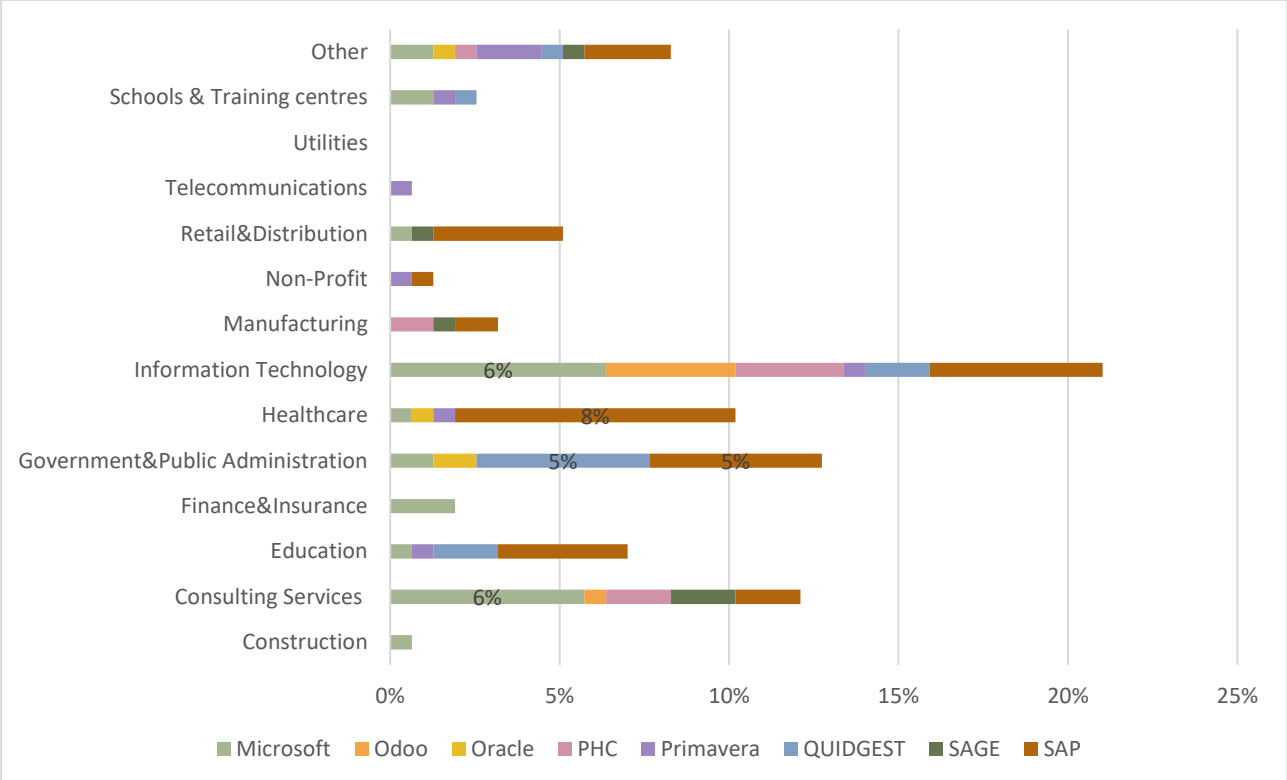
8.17. Appendix 17: Reasons to change ERP



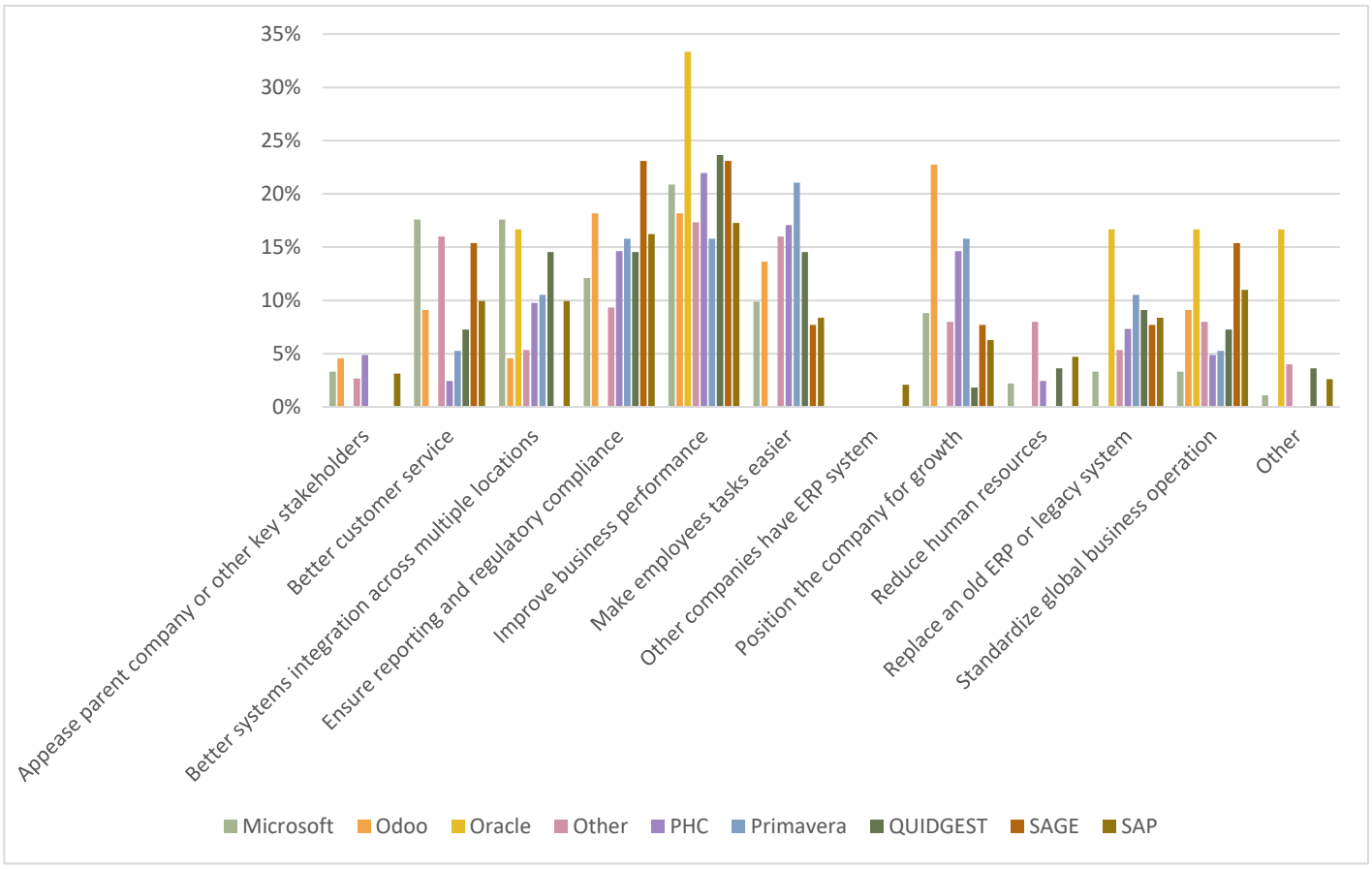
8.18. Appendix 18: Company size (# employees) relative to the cost with the ERP



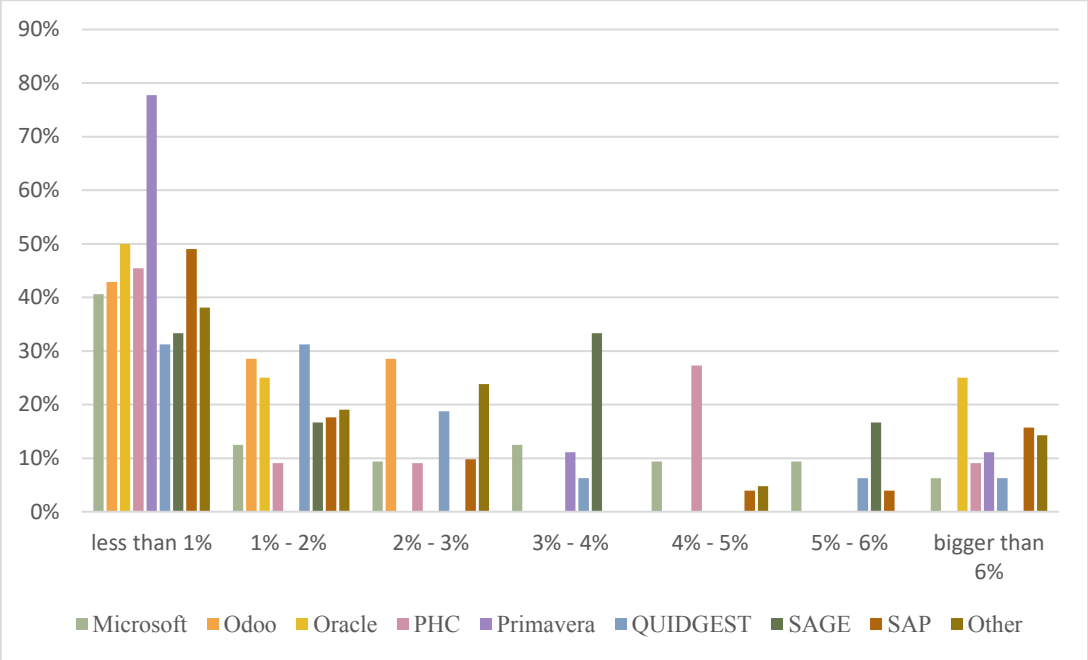
8.19. Appendix 19: Company industry per chosen ERP brand



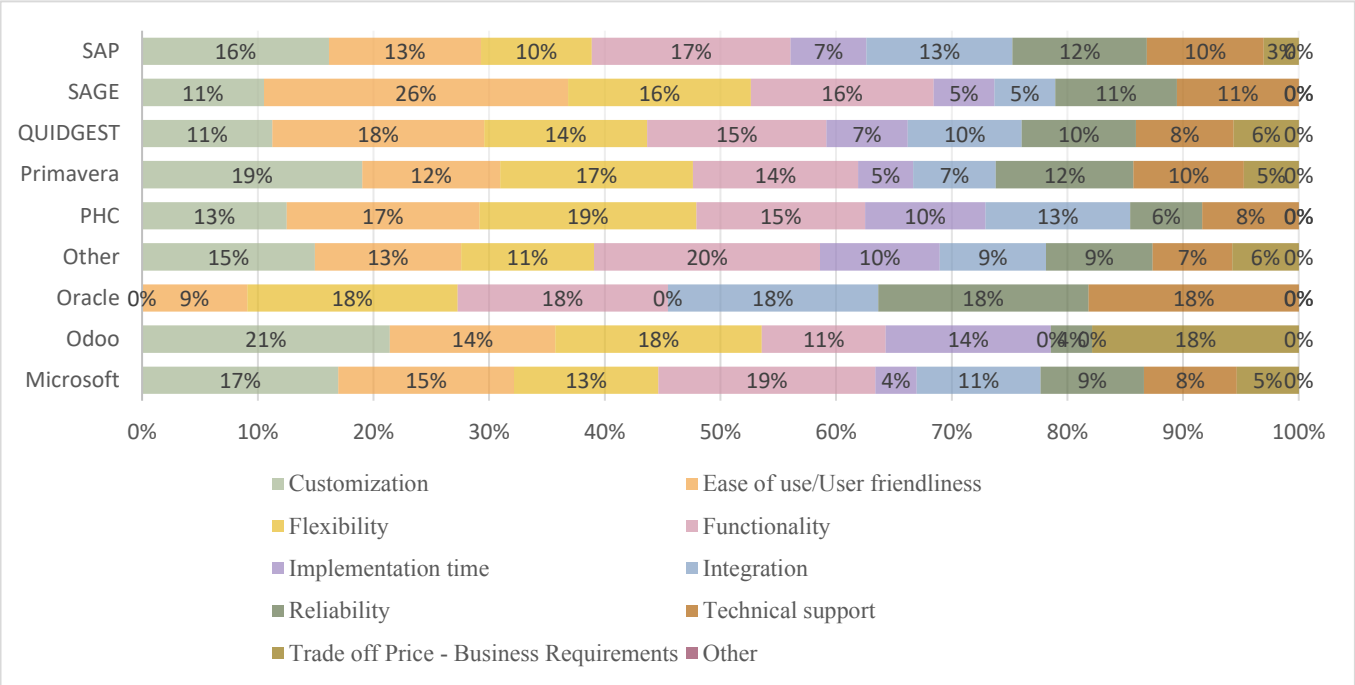
8.20 Appendix 20: Motivations to buy ERP per brand



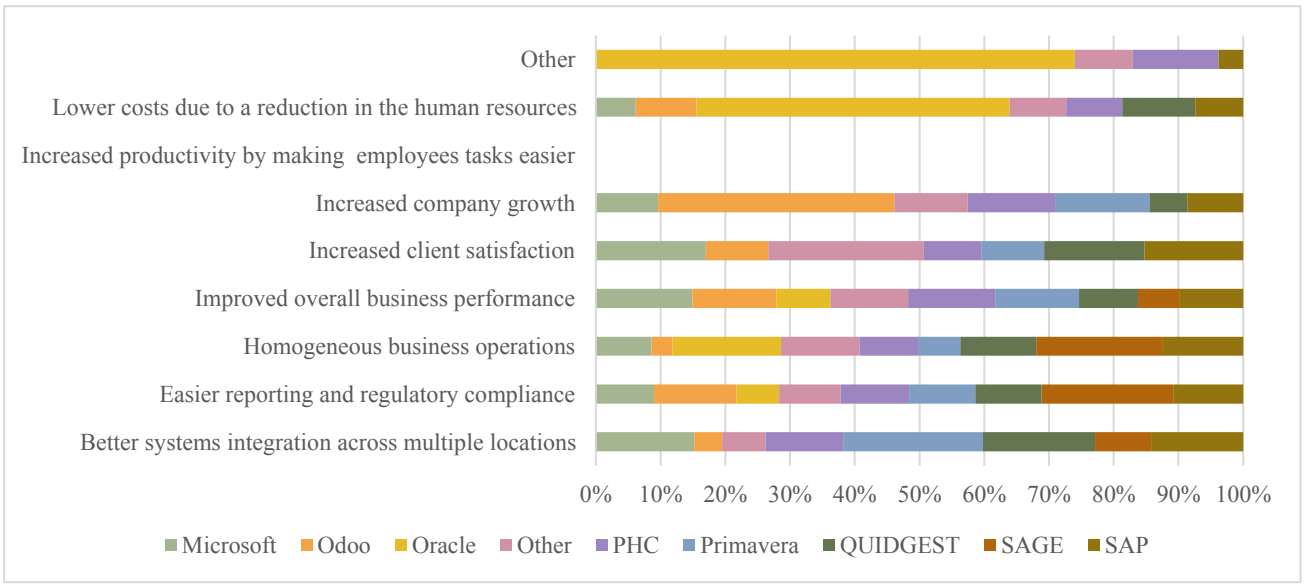
8.21. Appendix 21: ERP investment as a % of revenue cost per brand



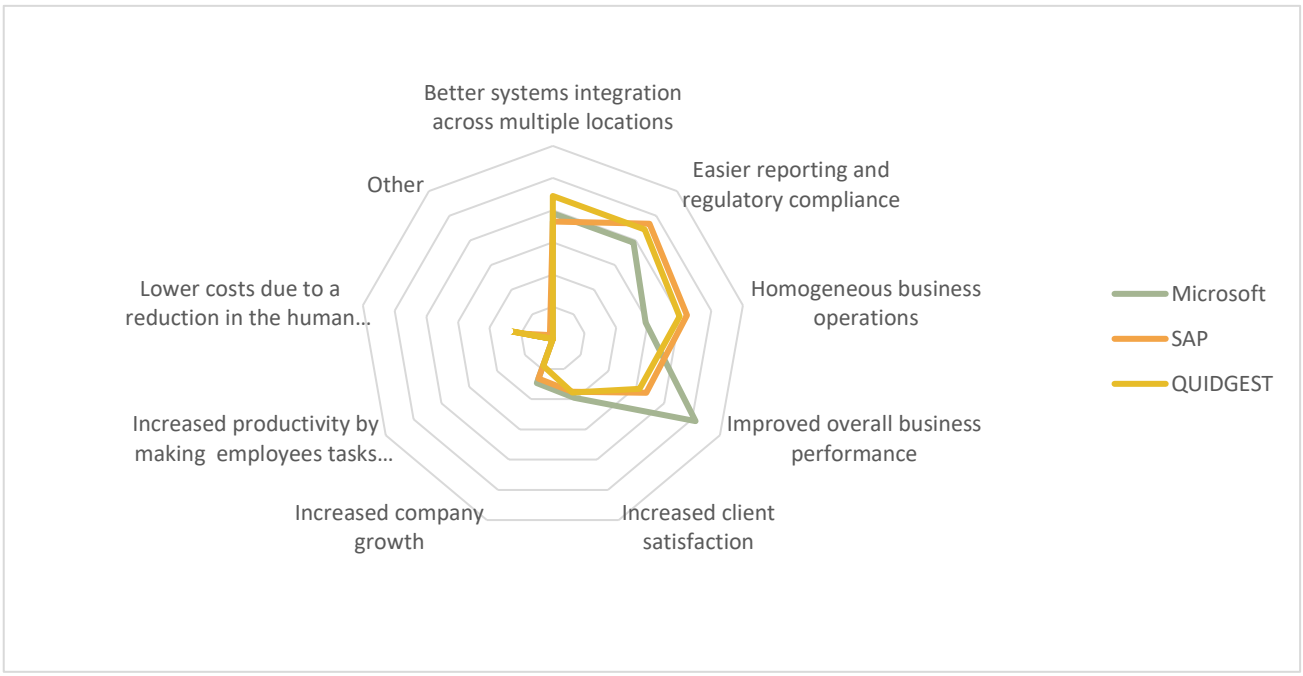
8.22. Appendix 22: Most valued attributes by ERP brand chosen



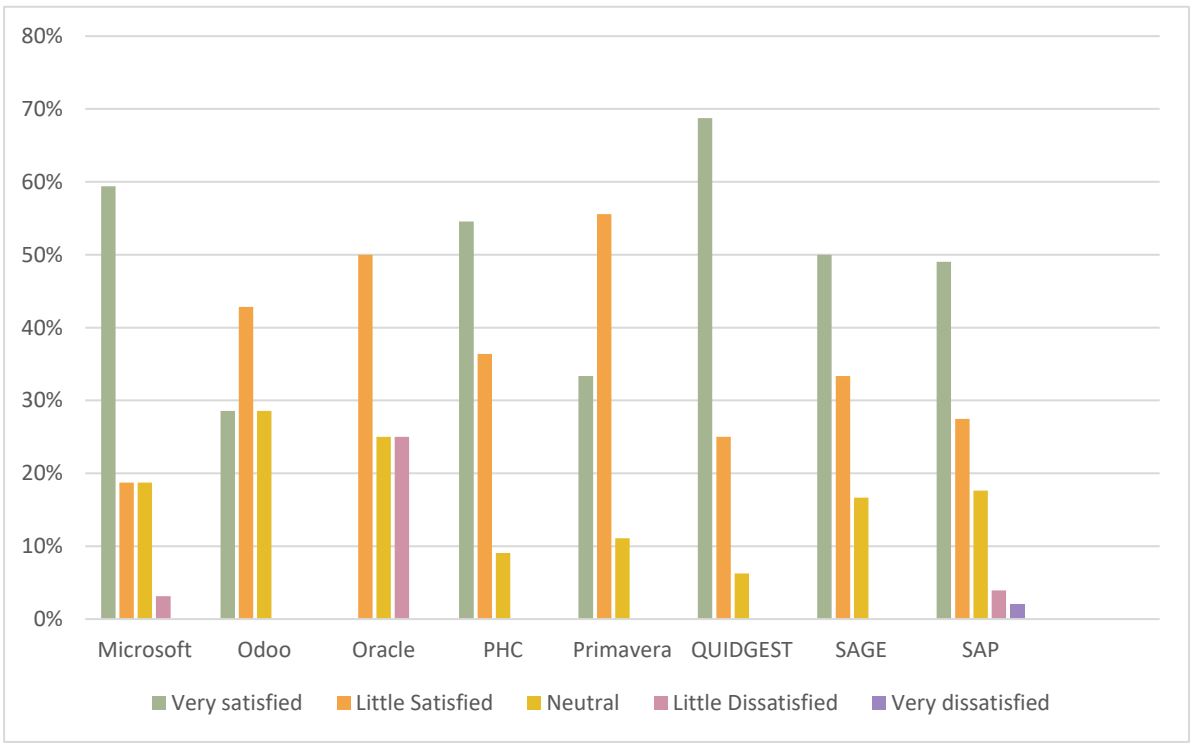
8.23. Appendix 23: Benefits realized with each ERP



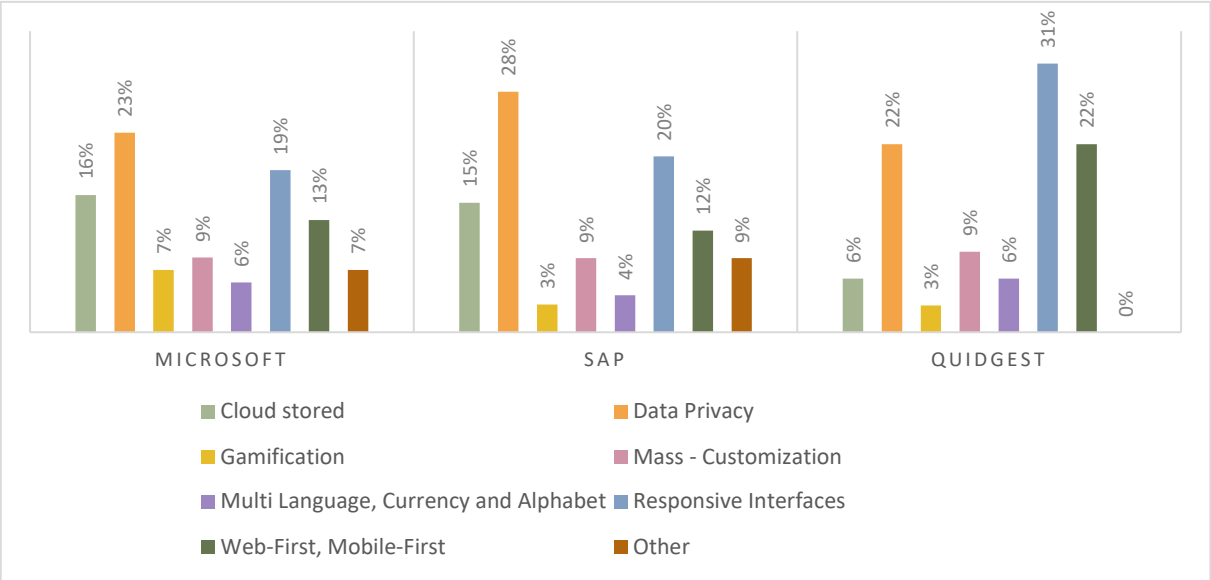
8.24. Appendix 24: Benefits realized with the three ERPs with most expression



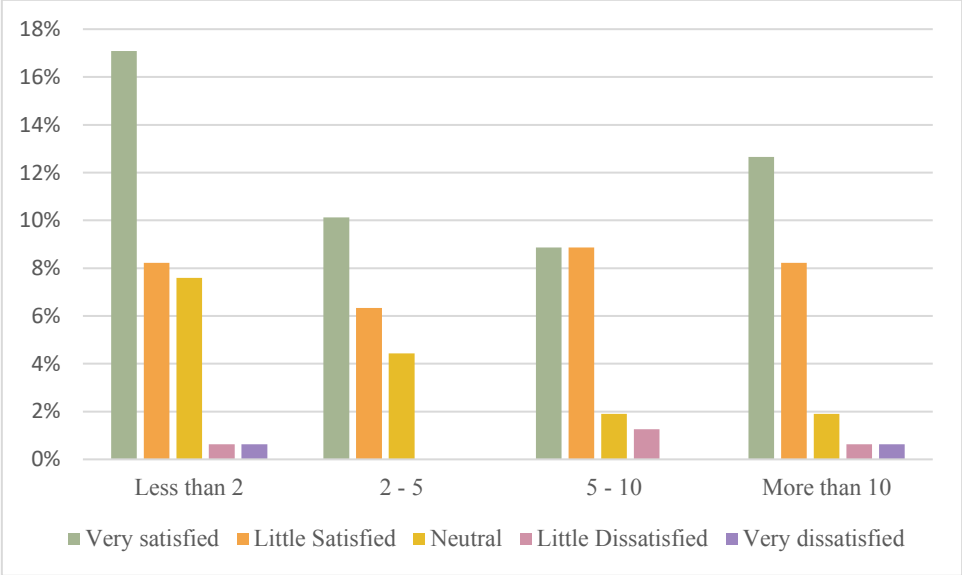
8.25. Appendix 25: User satisfaction by brand



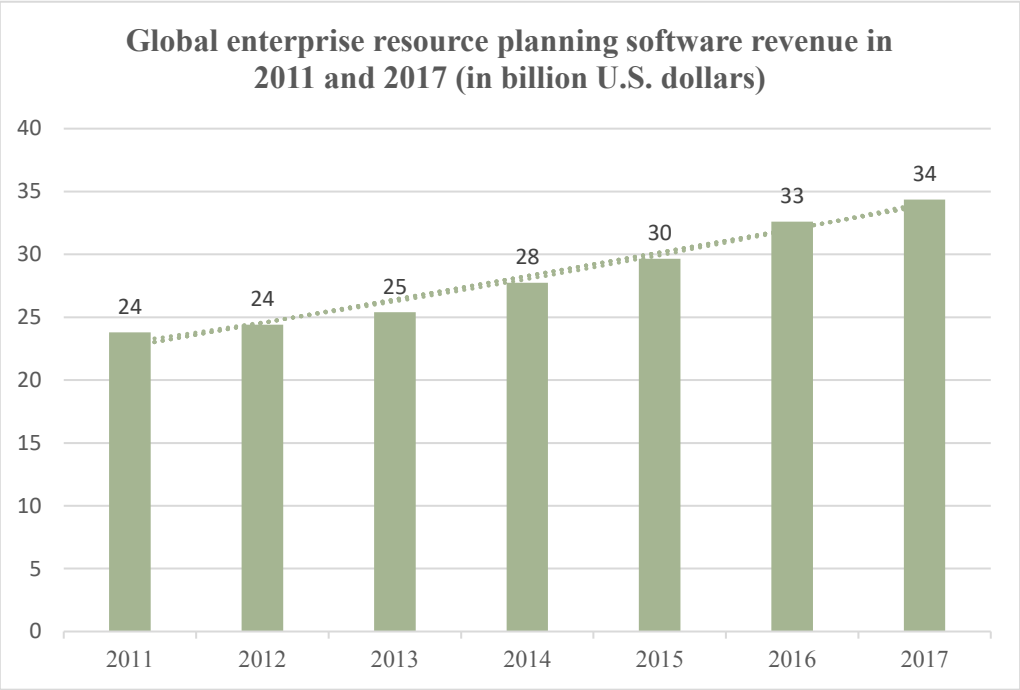
8.26. Appendix 26: Most valued trends in the three brands with higher expression



8.27. Appendix 27: User satisfaction by number of years with the current ERP



8.28. Appendix 28: Global ERP software revenue from 2011-2017



Source: Statista

8.29. Appendix 29: Questionnaire

This questionnaire aims to study which factors affect effectiveness in the use of Enterprise Resource Planning Systems.

All the requested data will remain anonymous.

The results obtained with the questionnaire will be used and treated with the purpose to obtain a Maters' degree in Finance at Nova School of Business and Economics.

Joana Cerejo Monteiro

1.To which industry does your company belong?

- Construction
- Consulting Services

- Education
- Finance&Insurance
- Government & Public Administration
- Healthcare
- Information Technology
- Manufacturing
- Non-Profit
- Retail&Distribution
- Telecommunications
- Utilities
- Schools & Training centres
- Other (open answer)

2.What was the total revenue of your company last year? (in Euros)

- ≤ 20M
- 20M - 100M
- 100M - 500M
- >500M

3.How many employees work for your company?

- <100
- 100 – 500
- 500 – 2500
- ≥2500

4.You belong to ...

- Top Management
- Middle Management
- Staff

5.How many years of professional experience do you have with ERPs?

- <5
- 5 – 10
- 10 – 15
- 15 – 20
- 20-25
- >25

6.For how long does your company have an ERP? (in years)

- <2
- 2 – 5
- 5 – 10
- >10

7.For how long does your company have the actual ERP? (in years)

- <2
- 2 – 5
- 5 – 10
- >10

8.What was the ERP investment cost as a % of the company revenue?

- <1%

- 1% - 2%
- 2% - 3%
- 3% - 4%
- 4% - 5%
- 5% - 6%
- >6%

9.What is the brand of your ERP?

- ARTSOFT
- Microsoft
- Odoo
- Oracle
- PHC
- Primavera
- QUIDGEST
- SAGE
- SAP
- Other (open answer)

10.The chosen solution is ...

- Stored on Public Cloud
- Stored on Private Cloud
- On – Premises
- Stored on Hybrid Cloud
- Used as SaaS - Software as a Service

11.Which reason (s) motivated your company to buy an ERP?

**Mark all that apply*

- Appease parent company or other key stakeholders
- Better customer service
- Better systems integration across multiple locations
- Ensure reporting and regulatory compliance
- Improve business performance
- Make employees tasks easier
- Other companies have ERP system
- Position the company for growth
- Reduce human resources
- Replace an old ERP or legacy system
- Standardize global business operation
- Other (open answer)

12.Which attribute (s) does your company value the most when acquiring an ERP?

**Mark all that apply*

- Customization
- Ease of use/User friendliness
- Flexibility
- Functionality
- Implementation time
- Integration
- Reliability
- Technical support
- Trade off Price - Business Requirements

- Other

13.Which business processes does your company ERP include?

**Mark all that apply*

- Human Resources Management
- Inbound Logistics
- Marketing & Sales
- Operations Management
- Outbound Logistics
- Procurement Management
- Services Management
- Technology Management
- All business processes
- Other

14.After the completion of the implementation process, what were the real benefits your company noticed?

**Mark all that apply*

- Better systems integration across multiple locations
- Easier reporting and regulatory compliance
- Homogeneous business operations
- Improved overall business performance
- Increased client satisfaction
- Increased company growth
- Increased productivity by making employees tasks easier
- Lower costs due to a reduction in the human resources
- Other

15.Considering all costs of the change you feel...

- Very Satisfied
- Little Satisfied
- Neutral
- Little Dissatisfied
- Very Dissatisfied

16.Which trend (s) you consider reflected in your ERP?

**Mark all that apply*

- Cloud stored
- Data Privacy
- Gamification
- Mass – Customization
- Multi Language, Currency and Alphabet
- Responsive Interfaces
- Web-First, Mobile-First
- Other

17.What reason (s) could lead you to change the company's current software?

**Mark all that apply*

- Business needs are outgrowing system capability
- Change in workplace dynamics
- Customer needs are not being met
- ERP is not keeping up with changing regulations
- Lack of features
- Lack of support
- Not having access to real-time information

- Obsolete technology
- Small inefficiencies are adding up
- Other