NOVA IMS Information Management School

MGI

Mestrado em Gestão de Informação
Master Program in Information Management

The role of users in a continuous development ERP strategy

An analysis on the impact of end-users in the creation of an ERP continuous development strategy

Diogo Ribeiro de Carvalho Pinto da Rocha

Dissertation report presented as partial requirement for obtaining the Master's degree in Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

THE ROLE OF USERS IN A CONTINUOUS DEVELOPMENT ERP STRATEGY: AN ANALYSIS ON THE IMPACT OF END-USERS IN THE CREATION OF AN ERP CONTINUOUS DEVELOPMENT STRATEGY

by

Diogo Ribeiro de Carvalho Pinto da Rocha

Dissertation report presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Marketing Intelligence

Advisor: Professor Doutor Rui Alexandre Henriques Gonçalves

August 2021

DEDICATION

To my family.

ACKNOWLEDGEMENTS

I would like to express my gratitude to my supervisor doctor professor Rui Gonçalves for all the commitment and support. His availability, expertise, and guidance were determining factors for the completion and success of this project.

I would like to thank all the participants in both the surveys and the interviews. This research was only possible because of their valuable contributions in all stages of the project.

I also would like to thank all the professors at NOVA IMS for their commitment and dedication to the students and their work as positive agents for the development and promotion of higher education in Portugal.

Last, but not least, I want to thank my family and friends for all the support throughout this adventure.

ABSTRACT

ERP are organizations best allies and, potentially, their worst enemies. There are fine margins between a successful implementation that enables and fosters technological innovation and an ineffective implementation that delays organizational progress and has a detrimental financial impact. To enhance the likelihood for a successful implementation, organizations must establish a long-term continuous development plan that creates a technological environment that prioritizes users as positive agents of change. There is a paradox between the length and importance of an ERP project phase and the time and resources most organizations allocate for each of them. Pre-implementation and implementation phases gather key stakeholders and system experts while the post-implementation phase is traditionally neglected in an ERP project framework, which leads to inefficient long-term strategies. System users are key pieces when defining an ERP long-term strategic plan. This research was focused on understanding the role that end-users must play in the continuous development of an ERP project. The study identified and tested the relationship between end-user dimensions and ERP critical success factors and their impact on the promotion of ERP efficiency.

KEYWORDS

Continuous development; Enterprise resource planning; Role; Strategy; Users

INDEX

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

AVE	Average Variance Extracted
BPR	Business Process Reengineering
CDS	Continuous Development Strategy
CSF	Critical Success Factors
CDS	Continuous Development Strategy
CRM	Customer Relationship Management
ERP	Enterprise Resource Planning
H	Hypotheses
HTMT	Heterotrait-Monotrait Ratio
IBM	International Business Machines
IS	Information Systems
IT	Information Technology
KPI	Key Performance Indicators
MRP	Material Requirement Planning
N/A	Not Applicable
PLS	Partial Least Squares
ROI	Return on Investment
SAP	Systems, Applications and Products in Data Processing
SEM	Structural Equation Modeling
SRM	Supplier Relationship Management
TA	Thematic Analysis
TAM	Technology Acceptance Model
TOE	Technology Organizational Environment
UTAUT	Unified Theory of Acceptance and Use of Technology
VIF	Variance Inflation Indicator

1. INTRODUCTION

In an environment where the ability to transform innovative technologies into enhanced business processes is a fundamental requirement for success, organizations are increasingly relying on information systems (IS), such as enterprise resourcing planning (ERP), to support business operations and competitive strategies (Shao et al., 2017). These systems are complex and the ability to customize them to improve business processes will enable organizations to increase operational efficiency as well as align IT and corporate strategies (Queiroz et al., 2020). Although there are multiple frameworks and methodologies used in ERP projects, the definition of a successful implementation is a broad concept since, from a business perspective, a project does not end when the system is in production. Post-implementation strategies are critical for an organization to benefit from the technological and operational innovation that an ERP enables. There are multiple factors that play a role in the post-implementation stage of an ERP project, however, several studies have emphasized the key importance that end-users have in the system's stabilization, business benefits and overall efficiency (Matende & Ogao, 2013).

Information system projects, and more specifically ERP implementations, are considered high-risk investments due to organizational complexity, extensive process coverage and procedural impacts. Research shows that in the early 2000's, ERP failure rate in the USA was around 51%, while in China such number rose to about 90% (Xue et al., 2005). Other concerning factors regarding ERP implementations are the unpredictable project length and the significant budget deviations that most projects confront. Adding these factors to an already demanding organizational and financial investment, creates the need for a structured long-term plan. There are fine margins between investing in new technology and receiving the expected returns, therefore maximizing the chances for success is becoming a priority for organizations, technology providers and vendors.

An ERP project involves multiple stakeholders and impacts many functional units within an organization from higher management to lower-level users. There is a paradox between user involvement in the different project stages. Higher management and solution leaders are usually more involved in the preparation and deployment phases, while end-users are only involved in a later project phase (Shao et al., 2017). In addition to this paradox, external consultancy companies and system experts are typically involved in the initial stages of an ERP project and their support tends to decrease in the post-implementation phase. Such project structure concentrates experts and solution leaders in the design and deployment phase, neglecting the system's actual users. Ultimately, an organization must define a strategy and an environment that balances the different stakeholder's needs and enhance their chances to benefit from the system over time in an autonomous way.

Over the years, ERP research was heavily focused on the implementation phases of a project (Hietala, 2020). More recently, researchers have given more attention to post-implementation strategies concluding that success is not exclusively tied to proper system configuration, but also to efficient long-term usage, update and correct maintenance (Ju et al., 2016). This research will define ERP success as the long-term ability for the system to benefit its stakeholders and help an organization achieve competitive and technological advantage in its business and operation processes. By analyzing project phases not only as support tasks, but mainly as a continuous development strategy where users would be continuously challenged to rethink the system and help IT redesign internal processes, this project

aims to understand the relationship and role of end-users when promoting a sustainable long-term ERP continuous development strategy.

Due to its significant impact, scholars have analyzed ERP project with different lenses when attempting to define its critical success factors (CSF). Considering Matende et al. (2013) research describing user relevance in promoting ERP success, this research will utilize three CSF consensually considered by scholars when addressing end-user in ERP projects. To help structure and organize the research, this thesis will confront the three user CSF with three key questions regarding the user role in ERP post-implementation strategies. The paper will first examine the individual impacts that ERP implementations have on end-users. To address this question, this research aims to understand the overall end-user experience ion ERP projects. The objective is to ultimately highlight key areas when addressing ERP success. This will lead to the second research question that will explore the characteristics of an organizational environment that enables end-users to be facilitating agents in this process. The third, and last, research question will encompass the previous two as it will look to understand the different roles that users may have in different post-implementation strategies. The objective to analyze their willingness to be a key stakeholder in a continuous development strategy.

The objective to compare the research questions and the user CSF to contribute to the scientific knowledge and provide applicable recommendations to improve the key performance indicators (KPI) identified above. This research aims to be a foundation that will potentially serve as a baseline for future ERP long-term strategic frameworks. The application of the recommendation will need a pilot project, ideally in a controlled environment, where some of the conclusions, relationships and recommendations could be tested.

This paper will follow the standard thesis structure with seven sections. The first section is the introduction, where the problem and the importance of this thesis are explained. The second section will present a literature review and theoretical background on the research topic. The objective is to fully understand the research that has been done on the user's involvement in different ERP project phases. The following two sections will explain the research model and methodologies used to perform the exploratory research. The fourth and fifth sections will provide a thorough examination and discussion on the research results and provide applicable findings and educated suggestions. The last section presents the thesis conclusion and will provide an overview of all sections as a summary of the presented research.

2. LITERATURE REVIEW

For the past decades, ERP's have been a fundamental tool for organizations. These systems have been around since the 1960's when IBM, Oracle and SAP first introduced their MRP and later ERP prototypes. Ever since, organizations have been adopting the most recent updates from integrated on-premise software to new cloud solutions (Costa et al., 2020). Even though these systems have been on the market for over 50 years, technological improvements require constant upgrades to the literature on this topic as the industry is expected to grow by 7% in 2022 reaching a revenue around 47 billion dollars (Ruivo et al., 2020). Therefore, this thesis will provide a refreshed outlook on the topic's literature by examining the core subjects regarding the presented research objectives.

The following section will investigate the user perspective in several topics. Although subjects such as ERP lifecycle or continuous development traditionally incorporate multiple dimensional layers, this review will be heavily focused on the user and on its full cycle experience in an ERP long-term strategy. The objective is to lay a foundation on the research that has been previously done on to prepare a strong research model and hypotheses.

As an introductory note on the upcoming sections, users, in the context of this study, are referred to end-users or system users. This considers the individuals in which their daily work and tasks are performed using an ERP software. Throughout the research, every time a different type of user is referenced, the appropriate prefix will be used. As an example, key-user, development-users, and others, are, for the purpose of this research, in a different user category and will be identified as such.

2.1. ERP USER LIFECYCLE

An ERP implementation requires extensive preparation from both the organization and its workforce. The literature is not consensual about the ideal framework for ERP implementations, but from a user perspective, three main phases can be considered: pre-implementation, implementation, and post-implementation phases (Saxena & Mcdonagh, 2019). There are a multitude of tasks in each of these stages and a debate between the long-term importance of each-other. The pre-implementation phase emphasizes preparation and planning tasks, while the implementation phase is focused on the operational side of a project. The post-implementation is the last, and lengthier, phase and includes the deployment and utilization of the new system (Supriyono & Sutiah, 2020). All the phases previously mentioned affect users differently regarding their role in the process. Key-users are integrated earlier in the process and are frequently an active part of the first and second phases, as they are responsible for requirement analysis and business process design (J.-H. Wu & Wang, 2007). These users are also seen as key for a smooth transition between the implementation and post-implementation as they are usually responsible for end-user training, system monitoring and control.

Contrasting to key-users, end-users have low influence in phases one and two of the implementation as their work is focused on specific daily operational system tasks. These groups gain an additional responsibility in the post-implementation phase as they will be the ones using the system on a day-to-day basis (J.-H. Wu & Wang, 2007). Research from Wu et al. (2011) identifies the relationship between these two sets of users and especially the key-user level of involvement and satisfaction throughout the project, as a defining factor in the perception of success from a user's standpoint. In general, the

user ERP lifecycle follows the traditional trend where key-users are involved in all project phases with determinant relevance in pre-implementation and implementation and end-users are only involved later in the process in the post-implementation phase (Saxena & Mcdonagh, 2019).

Other research contrarily claims that the involvement of end-users only in the last phase of an implementation will diminish the chances for a smooth and efficient system adoption (Law & Ngai, 2007). This means that a segmented end-user involvement will hinder their chance to positively impact the implementation and expedited the adoption process. This gains relevance when the timeline of the implementation phases is considered. The timings for each phase will heavily depend on the system characteristics, but the expectation is that the post-implementation phase will be longer, which causes, in simple terms, that the system will be used longer than the time it took to be implemented. Therefore all-around involvement becomes a contributing factor for a smooth ERP phase-to-phase transition (Law & Ngai, 2007).

2.2. POST-IMPLEMENTATION ERP STRATEGY

Due to their significant financial and organizational impacts, ERP implementations are long-term strategic investments for organizations. Research shows that most implementations take, on average, two years before companies can fully benefit from the system (Kallunki et al., 2011). Therefore, the post-implementation gains a special relevance when discussing ERPs as strategic investments. Although many researchers argue that a successful post-implementation is dependent on the success of the first two phases, the reality is that phase three tasks such as usage and support, are the determining factors for systems quality and extended lifespan (Hietala, 2020). Including this phase early in the ERP project's strategic roadmap will allow for a more structured and efficient approach to a success defining project phase.

Some implementation failures are directly related to poorly structured, and at times non-existent, post-implementation strategies. Research suggests that project management is frequently pressured to stay on-budget and on-time, which causes an increase in the resources in phases one and two, leaving minimal efforts to phase three (Saxena & Mcdonagh, 2019). A structured and strategic approach is recommended when considering post-implementation strategies as it is the phase that includes the highest number of new users. Project managers, key-user, end-user, and key stakeholders should be all consulted when the plan is being prepared.

Post-implementation strategies are a multi-factor process. Traditionally, the team responsible for the system's configuration will provide a hyper-care period where they will facilitate the system's usage by helping users and correcting errors. After such period the organization must try to gain independence from external consultants (Lombardi et al., 2014). Therefore, an organization must perform an early analysis, during the pre-implementation phase, to determine which will be the key factors to consider on phase three of the strategic plan.

2.3. ERP INDIVIDUAL IMPACT ON USERS

ERP implementations are large-scale projects and the ability to interconnect and relate all its stakeholders is a common challenge. Traditionally, academic research analyzes ERP utilizing qualitative measures such as system quality or processual enhancements (Costa et al., 2020). As mentioned, studies on ERP implementations tend to include users at the variable level in an extended, and distinct, research focus. Despite that, recent studies already include users, and its characteristics, as a critical success factor in an ERP plan (Ağaoğlu et al., 2015). The ability to understand the human-side and impacts that ERP projects have on its end-users is a research focus started by Bokhari that discusses two main routes for users when approaching an ERP software. It is within their human nature that users will accept the new system if it enhances their day-to-day tasks and performance. If the system does not fulfill this variable, users tend to either avoid its usage or only use it through their management's imposition (Bokhari, 2005). Later in the research, the user characteristics and factors will be discussed at length, but to prioritize users and the impact that these systems have on their daily work is an important first step when attempting to create a trustworthy relationship between the user, management, and the software.

One of the pillars of this research is the study conducted by Rajan et al. (2015) where the individual impacts that ERP systems have on end-users are thoroughly examined. Rajan et al. (2015) identifies internal and external components related to the impact the ERP's have on its daily users. They identified two key components when addressing individual user impacts. A known ERP characteristic is the ability to connect and record actions providing the ability for users to have their work be visible and monitored in real time (Dechow & Mouritsen, 2005). Rajan et al. (2015) describes this concept as the panoptic empowerment of users in which it connects empowerment with visibility (Rajan & Baral, 2015). Another key characteristic is the individual performance that each user achieves from an ERP. Older studies tie individual performance exclusively with system usage. Rajan et al. (2015) addresses the unique complexity that this relationship enjoys concluding that system usage is a critical factor but other variables must be included in future research (Rajan & Baral, 2015).

This research will be enhancing the individual user impact definition provided Rajan et al. (2015) to expand the knowledge on how these impacts are related to long-term successful strategies. Therefore, the research model and hypotheses will include the individual impact as a research variable. The objective is to identify patterns between the key impact factors and the longevity and success of an ERP strategic plan. The ability to relate those factors with an ERP continuance strategy will integrate user needs as part of implementation requirements and therefore create an extended relationship between them and the system.

2.4. TECHNOLOGY ORGANIZATION ENVIRONMENT

There are fine margins between technological advancements and organizational stability. The ability for business to expand its technological portfolio while maintaining a stable and well-rounded organization is a complex challenge (Shao et al., 2017). As a central part of today's organizations, an ERP is a software that encompasses an extensive variety of internal and external factors. Having an organizational environment that enables technological innovation while addressing those factors will

maximize the success chances for an all-around integration (Bradford et al., 2014). A framework[1] to analyze the relationship between external tasks, organization and technology was introduced by Baker as a way for organizations to evaluate the adoption and feasibility of new technologies (Baker, 2011).

In the context of this research, the deployment of structural technology will have a significant impact on the diverse operational processes and ultimately the system users. Hence, it becomes relevant to discuss an evaluation method for new technologies to have a prepared and ready infrastructure to accept and benefit from such innovation (Baker, 2011). The technology organization environment (TOE) framework can be used in the analysis of the organization environment and readiness for an ERP implementation (Ruivo et al., 2016). Ruivo et al. (2016), identifies the relationship between the TOE framework with ERP value and use, suggesting that going through this analysis early in the decision-making process will allow for in-depth understanding of an organization's readiness for such project (Ruivo et al., 2016). As discussed before, ERP implementations are heavily affected by external variables, therefore having a balanced framework that combines the three TOE factors with ERP use and value is beneficial in the evaluation and decision-making process.

In addition to the previously mentioned relationship between TOE and ERP, there are two additional factors that are relevant to study. The ability for ERP systems to be constantly updated through customization, software update and in-house development allows for the opportunity to, within the same system, integrate enhanced technology and processes through user participation (Matende & Ogao, 2013). Including new technology, within the ERP network, using a TOE framework will only be possible through a planned coordination between all relevant factors to ensure a positive and beneficial user acceptance (Bradford et al., 2014).

The organizational environment must be technologically focused on understanding the benefits and work together with the tools to maximize its benefits and overall efficiency. This research study will utilize Baker's and Ruivo's et al. (2016) research to add the user variable and identify the relationship between their model and user variables considered critical for long-term ERP success. Organizational, technological, and environmental characteristics will be analyzed against user factors with the objective of understanding a relationship between those factor's characteristics and continuous development ERP user efficiency.

2.5. USER ROLE IN AN ERP CONTINUOUS DEVELOPMENT STRATEGY

The role of system users in ERP implementations is a controversial topic among academics and ERP professionals. Most frameworks delivered from ERP providers include end-users in specific project stages such as final preparation for user training and later when the system is in production (Supriyono & Sutiah, 2020). This approach limits the user ability to be knowledgeable about the process as only the final product is being delivered for its usage. Newer technologies and frameworks, such as SAP Activate or NetSuite vertical cloud, already empathize user trials and extended onboarding plans but is not still a frequent practice.

The frameworks utilized by organizations, with the endorsement of ERP vendors, provide users with specific operational knowledge that would solely allow them to perform operational daily tasks.

[1] Technology Organization Environment framework can be found in Annex 1.

Therefore, the knowledge about the actual process is kept with specific key-users or project owners, limiting end-users ability to be involved in post-implementation system upgrades and enhancements (Candra, 2012). Research by Candra (2012) identifies knowledge capability has a driver for system assimilation, application and understanding. Additionally, such component is tied to ERP success through individual impact which combines different dimensions utilized in this research.

This research will combine the research from Ju et al. (2016) and Rezavani et al. (2016) when addressing the extended role that users must have in an ERP implementation. The relationship between a user role that starts in the pre-implementation stage is discussed by Wu et al. (2011), concluding that early user interactions would allow for an easier and positive system acceptance (J.-H. Wu & Wang, 2007). Rezvani et al. (2017) identifies top managers as they key stakeholder when promoting the inclusion of users in different project stages, but their research lacks the practical view on its application (Rezvani et al., 2017). Ju et al. (2016) finds a positive relationship between early hand-on activities and clear communication with system success concluding that knowledge users are likely to be more satisfied with the final implementation (Ju et al., 2016).

The conceptual model and research hypotheses, analyzed in the following sections, will identify user role as the long-term system usage from the end-users and the relationship with extended ERP success. This includes not only tasks, but overall decision-making capability and involvement that a user enjoys during an ERP project. An in-depth research on different users, models, and frameworks will be conducted with the objective of understanding potential relationships with the research goals.

2.6. CRITICAL SUCCESS FACTORS FOR AN ERP CONTINUOUS DEVELOPMENT STRATEGY

The academic representation of ERP implementation is heavily focused on phase one and two. Post-implementation and implementation phases were argued, by most scholars, as the success defining stages in an ERP project. Recent research from Hietala, identifies an ERP implementation as a continuous project where the post-implementation stage gains an additional relevance as it is the longest and most impactful phase (Hietala, 2020). Activities such as system maintenance and upgrades are conducted with minimal expert support and are more impactful since the system is already in production (Oseni et al., 2017). Additionally, these tasks will have a direct impact on the system lifespan and overall quality. A well-planned post-implementation phase allows for an ERP to offer a competitive advantage for organizations (Hietala, 2020).

The inclusion of ERP users in the different project stages often neglects their participation in the pre-implementation and implementation phases. Therefore, there is a paradox between their lack of opportunity to participate in phases one and two and their high exposure and long term usage in phase three (Shao et al., 2017). Recent studies emphasize the importance of including users in all ERP project stages with the objective of making them part and accountable for the process. This will provide them with tools and knowledge to improve processes and play a pro-active role in system maintenance (Candra, 2012).

This study will integrate three critical success factors when addressing users in ERP implementations. One of the most common CSF attributed to users in ERP project is user satisfaction. Having satisfied users is tied with positive system acceptance and motivation which enhances the chances for system

efficient longevity (Ju et al., 2016). The second CSF used in this study is user participation and involvement. Matende et al. (2013) concludes that user participation throughout an ERP implementation will lead to better prepared and successful implementations (Matende & Ogao, 2013). Lastly, system usage is the final user CSF included in this research. As described by Bueno in his research, user acceptance is positively tied to system usage therefore it becomes a critical success factor (Bueno & Salmeron, 2008). The following section will expand on the CSF identified before and provide an in-depth analysis on previous academic research done on each of them.

2.6.1. User satisfaction

Research studies argue that many ERP implementations fail to maximize their predicted outcomes because of non-supportive users in the post-implementation phase (Kerr & Houghton, 2014). Factors such as structural process changes, mistrust in the new system and a feeling that previous IS were more efficient can create a general environment of doubt about the new ERP (Rezvani et al., 2017). To prevent user frustration and disbelief in new ERP implementation, a new framework was introduced by Rezvani et al. (2017) that ties user motivation, a complex human-behavior discussed at length in motivation theory papers, to user involvement and usefulness throughout post-implementation strategies. It is argued that users involvement and overall satisfaction are key drivers to enable a mindset that meets users psychological needs (Rezvani et al., 2017).

This research from Rezvani et al. (2016) links to previous studies performed by Ju (et al.) that concluded that user satisfaction is tied to hands-on activities and efficient communication. The study suggests that post-implementation efforts start in the implementation phases and that organization should be including users throughout all stages of the project. This would familiarize users to the system's complexity as well as give them the opportunity to be involved and become part of the process (Ju et al., 2016). The common conclusions from recent studies suggest that user motivation and satisfaction are key drivers for user long-term ERP acceptance and that all is connected to the degree of involvement that users have in early implementation phases.

2.6.2. User participation and involvement

There are vast benefits of user participation and involvement in succeseful ERP implementations. This stakeholder tends to play a critical role in stabilizing and adapting the system to the organization's needs as well as ensure an innovative mindset when interacting with the support teams (Matende & Ogao, 2013). Barki et al. (1994) defines user participation as the assignments, activities, and behaviors that users or their representatives perform during the system's development process (Barki & Hartwick, 1994). Empirical research on user participation, in all stages, is a growing trend in the ERP field emphasizing the importance of having users as a highlight in long-term successful strategies.

In their research, Ju et al. (2016) identifies that user participation will enhance the possibilities for short and long-term system efficiency and user satisfaction. The research suggests an analogy between user participation having a roller-coaster effect in an organization as user acceptance will be determined by the number of participative users. The higher the number of participative users the greater the chances for overall adaptation. On the contrary, the least number of participative users, the smaller the chance

for a smooth system adaptation. Considering a direct relationship between these two factors, it become critical to recognize users as most effective agents of an ERP implementation within an organization (Ju et al., 2016).

The same research identified two key components for user participation and a successful implementation. Communication and early hands-on system presence will play a critical role on how users will involve themselves, their teams, and their peers as positive ERP agents. The bottom-line of this concept ties with a research from Shao et al. (2017) on how management involvement can lead to an effective implementation. Management styles that prioritize communication and allows different users to be part of the process will determine the level of engagement and accountability that these people will have in the system (Shao et al., 2017). Accountability and responsibility are closely related to understanding the purpose and being an active player in the different stages of the implementation.

Lastly, users gain an additional role in post-implementation phases as they are the ultimate system users. Their preparedness and knowledge of the system will be determined by the factors a described before. Haddara et al. (2017) in his research on user resistance suggested that users that are disengaged with the process will often feel threatened by the overwhelming technology that an ERP system delivers as well as the organization impacts, including job relevance, that such implementation may have within the organization (Haddara & Moen, 2017). Satisfied users are those who are involved and responsible from the first day and that will naturally lead to a better, faster, and more efficient system acceptance and overall user satisfaction.

2.6.3. User system usage

The ability to use the system to its full capability is often identified in the IS field as a critical challenge for organizations. Training is one of the most used user variables when addressing the success of system usage in an ERP system (Rajan & Baral, 2015). System usage and its importance in the IS field was first introduced by Davis et al. (1989) with the technology acceptance model[2](TAM). In their research, Davis (et al.) identify perceived usefulness and perceived ease as the key drivers for a positive system usage (Davis et al., 1989). This research and model have been applied across the IS field and more recent studies from Rajan et al. (2015) and Bueno et al. (2008) have applied the TAM to ERP implementations.

The relationship between TAM and ERP indicate that involving potential users in all stages have a positive relationship with system success and initial acceptance (Bueno & Salmeron, 2008). Additionally, due to the complexity that a software brings to the organization, user training must be included early in the project schedule. Bueno et al. (2008) also concluded that management must be visible and transparent with users about the system and delegate some tasks and decisions directly to users (Bueno & Salmeron, 2008). This relates to Shao's et al. (2017) research identifying that management communication and inclusion are top priorities for system assimilation. One of the arguments is that management must include users early in the process and emphasize the importance of accountability throughout an implementation (Shao et al., 2017).

[2] Technology Acceptance Model framework can be found in Annex 2.

Despite the importance of studies from Bueno et al. (2008), Rajan et al. (2015), Shao et al. (2017), among multiple others, research lacks the longevity component associated with ERP implementations. As mentioned in the previous sections, ERP are not stagnant projects and, in some form, will be part of an organization's activities for a long period of time. Therefore, preparing users to continuously benefit and improve the system becomes critical and, in this study, the analysis of their impact in the longevity and success of an ERP project will be thoroughly analyzed.

The relationship between the three CSF and the three ERP dimensions are the basis for this research with the objective of understanding these variables relationship with ERP long-term efficiency. In the following section, there is an analysis of the research that has been done on success and continuance models for IS and their relationship and applicability when measuring ERP long-term success.

2.7. ERP LONG-TERM EFFICIENCY

There are several factors that should be considered when addressing the continuance of an ERP system. The literature reviewed in the previous sections empathized user CSF when promoting a successful and efficient long-term ERP usage. Those factors must play a critical role when addressing a higher-level IS continuance strategies. Factors such as complexity, security, scalability, efficiency, etc. are all tied, in different degrees, to the user's acceptance and promotion of the implemented system (Jia et al., 2017). Recent research has been done on the promotion and analysis of success and continuance models. The following sections will analyze both conventional and innovative research on long-term IS success. The basis for this analysis will be DeLone and McLean IS success model that was later adapted by Mardiana et al. (2015) to be applied in an ERP context. Additionally, research Rezavani will be discussed as their study highlight important characteristics for long-term ERP user intention and a positive organizational environment.

2.7.1. Information system success model

In 2003, DeLone and McLean introduced an enhanced version of the IS success model that provides a framework to measure different components of a system's success within an organization. Their research variables focused on the impact that quality capabilities such as information, system and service have on the system's usage (DeLone & McLean, 2003). According to their study, higher quality is translated in a successful IS usage. They consider user satisfaction and overall system utilization as two barometers of net benefits, which means that is critical to include those factors when addressing a long-term ERP strategy.

The challenge for organizations is to maintain a process where all the independent variables mentioned by DeLone and McLean are being revised and updated. Research from Mardiana et al. (2015), expands on the IS success model with the introduction of the human, or user, factor into the research. Perceived usefulness and ease, user attitudes and behaviors are factors includes in Mardiana et al. (2015) enhanced IS successful model that combines DeLone and McLean (2003) with the technology acceptance model described by Barki et al. (2007) as one of the most influential models in recent IS theories (Barki & Benbasat, 2007). Therefore, there is a common understanding and agreement among scholars that the quality of the technology is driven by a combination of internal, or

technological, factors, which includes technological enablement and system quality, and the overall benefits that users get from the implemented system.

2.7.2. ERP continuance strategy

Another factor to consider when addressing the long-term success of an ERP system is the adaptability that an organization must have when addressing technological advancements. The ability for a business to have a system that allows for fast and efficient technological enhancements will decrease the operational impacts by allowing a more organic and friendly usability (Jia et al., 2017). The overall technological trust in both the system and in the enabling processes will facilitate users to follow the continuance models that a company must implement. Therefore, it becomes key for an organization to create an environment where all factors mentioned before are considered and where users are an integral part of the process.

Motivation and satisfaction are two components that will keep users engaged with the system and accept it for its daily tasks. Research from Rezavani et al. (2016) concluded that those user components are positively related to a management style that promotes an organizational environment that support user satisfaction and the perception of competence among users (Rezvani et al., 2016). Having supportive but autonomous users and encouraging them to be part of the maintenance team are some of the consensual conclusions from their study. Therefore, this research will go further into detailing those relationships by providing practical recommendations on how those dimensions relate to a success model.

As a conclusion, this research will utilize the literature review section as a foundation for the development of a competent conceptual model and research hypotheses. The literature reviewed ensures the need for this research as it will combine critical topics. The academic research, frameworks and models described in the review attributed an enhanced relevance into the factors identified in table 1 that will be carried on into the next sections of this research thesis.

ERP dimensions	**ERP CDS user CSF**
ERP Individual User Impact	Satisfaction
Technology Organization Environment	Participation & Involvement
ERP User Role	Usage

Table 1. Research parameters table (Source: author)

3. RESEARCH MODEL

It requires a well-defined structured approach to understand the depth of the identified problem and explore paths to solve it. This study aims to analyze and research three ERP user dimensions and identify their relationship with the deployment of a successful continuous development strategy. As previously described, user impact, user role and organizational environment are the three dimensions covered in this study. The objective is to create an in-depth understanding, according to the relationship between the dimensions and the user CSF, of their lifecycle in all project stages. The research model is designed for participants that have been previously exposed to an ERP system as their expectations, feedback and experiences will be analyzed and compared.

3.1. CONCEPTUAL MODEL

Prior to the identification of the conceptual model, it is relevant to address some key definitions used in specific ways for the context of this research. For this study, the impact on users refers to the ability that an ERP deployment has in order meet users previous expectations as well as the direct impact on their daily tasks (W.-W. Wu, 2011). The user role refers to the participation and tasks that users will be responsible for in the different project stages. This study uses Matende's et al. (2013) concept, which highlights user participation, involvement, and acceptance in the deployment stages. Additionally, this research enhances the definition by including the continuity aspect of user such role in post-implementation phases leading to the user role in an ERP continuous development strategy (Matende & Ogao, 2013). Lastly, ERP efficiency is the consensual acknowledgement of success by the different project stakeholders. In his research Candra, identifies an analytical approach to ERP success including factors such as system quality, information quality, individual impact and organizational impact to measure ERP efficiency over time (Candra, 2012). Additional definitions are provided table 2 in the following sections of this research.

To address all the dimensions described before, the conceptual model presented in figure 1 identifies the three dimensions and their impacts in specific ERP continuous development user factors. As described in the literature review, three key factors for a succeseful deployment of an ERP continuous development strategy will be included in the conceptual model and individualized in the research hypothesis. User satisfaction, participation and involvement, and overall system usage are, in this research study, the three key factors analyzed for the deployment of a successful continuous development strategy. For each dimension one research hypothesis is presented and analyzed. To conclude, after analyzing the collected data, the study will provide specific recommendations that can extend the knowledge on the promotion of an ERP long-term strategic plan.

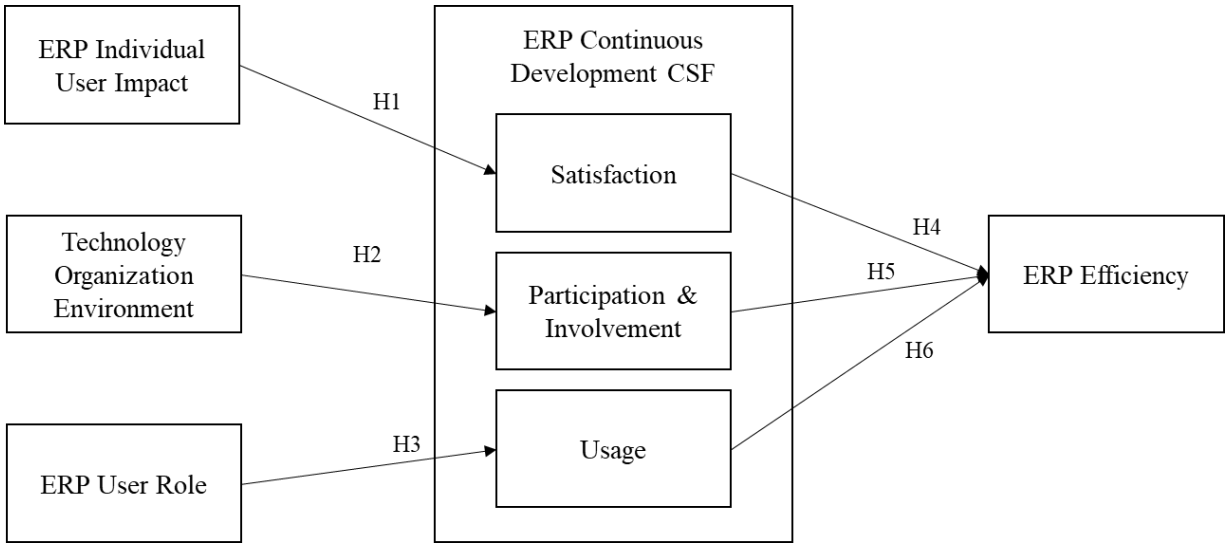


Figure 1. Research thesis conceptual model (Source: author)

Table 2 identifies and describes the variables used in this research study conceptual model. The following section provides an analysis on the described variables and the formulated research hypotheses to be tested.

Variable	Operational definition	Reference
ERP Individual User Impact	ERP system correlation with individual performance and panoptic empowerment.	Adapted from: (Rajan & Baral, 2015)
Technology Organization Environment	Influencing factors for organizational readiness and preparedness for technological adoption.	Adapted from: (Baker, 2011)
ERP User Role	The long-term relevance and actions of a user participation and involvement.	Adapted from: (Ju et al., 2016) (Rezvani et al., 2017)
Satisfaction	User perception of system success and acceptance.	Adapted from: (J.-H. Wu & Wang, 2007)
Participation & Involvement	Involvement in the system development and implementation process by representatives of the target user groups.	Adapted from: (Matende & Ogao, 2013)
Usage	User ability to utilize the system for its individual benefit.	Adapted from: (Jia et al., 2017)
ERP Efficiency	Long-term ERP organizational and individual success.	-

Table 2. Research variables table (Source: author)

3.2. RESEARCH HYPOTHESES

The research model presented in the previous section was created by considering the important dimensions and drivers identified throughout the literature review on the topic. Although the foundation of the model is sustained by previous academic research, its applicability needs to be tested and validated. To test the conceptual model, it is useful to develop research hypotheses based on the previously identified variables. These hypotheses must be testable to enhance the validity and applicability of the study with the objective of providing meaningful recommendations that can be applied in future ERP projects and frameworks.

The developed hypotheses will account for the impact that the different dimensions, identified in the literature, have in the three key ERP user success drivers. Each of the dimensions will be tested against a specific key CSF driver to understand the correlation between them and a long-term ERP user strategy. This will allow to test for a positive correlation between the dimension and the key drivers. After testing the user dimensions against the user CSF, the study will also add an additional layer to the research by testing the collected data to validate their impact on overall ERP efficiency. In the following section the created hypotheses will be described with an additional analysis on its connection to the literature review and conceptual model.

3.2.1. Individual impact users and continuous development strategy

The first dimension analyzes the impact that ERP implementations have on the system's end-users. In traditional implementations, users are mostly impacted in the post-implementation stage when the system is already customized and their role is to accept what key stakeholders and ERP vendors have decided (Saxena & Mcdonagh, 2019). In implementations where users are not part of the decision making, their reaction to the final product, in this case the system, is solely susceptible to the changes and impacts to their daily tasks. Some academic research suggests that an enhanced user training strategy should be in place to enable users to rapidly adapt to the new system (Shao et al., 2017). However, this research will analyze a wider spectrum and different sets of user experiences.

Despite the strategy that an organization follows, an ERP implementation will have an organizational impact and user acceptance will be a determinant factor for ERP efficiency. Therefore, this research will analyze the relationship between the perceived ERP impacts and user satisfaction. According to the literature review, user satisfaction is a key driver for user acceptance and long-term usage success. Therefore, it becomes crucial to understand the different impacts that users face and the relationship with their levels of motivation and satisfaction. The objective is to understand, from the user perspective, what characterizes a positive impact and if such impact will lead to a positive continuous development strategy.

H1: *A beneficial impact on users is positively associated to highly satisfied users.*

3.2.2. TOE and continuous development strategy

The organizational environment is a field of study that is in constant adaptation. Each generation of employees will have its personal vision and values and it is becoming more relevant that those views are well aligned with the organization's mission. A lot of research has been done with the focus of determining organizational strategies that will enable employees, and consequently businesses, to be ready for change. Zhang et al. (2020) describes the relationship between technological compatibility, which is the concept that an organization should deploy technology that users can benefit from, and technological readiness that shows the ability of a business to be ready for technological change (Zhang et al., 2020). This concept is well-connected with the literature review described above regarding the need of an organization to provide an enabling environment where workers, or users in the case of this study, feel like they have the tools for individual growth.

The research hypothesis aims to understand the characteristics that leads to a positive technological organizational environment, in the context of ERP projects, and their impact on user participation and involvement. With the objective of achieving ERP acceptance and efficiency, organizations need to have a pre-established organizational environment that allows for constant adaptation. That will allow for positive technology decisions that will benefit the company's performance. Therefore, it becomes relevant to understand, from an ERP user perspective, what is the appropriate environment that will lead to a continuous participation and involvement with the implemented system. The final objective is to determine specific characteristics that an organization must have, from an organizational environment standpoint, that enable a successful plan. A balance between technological infrastructure and user readiness must be continuously addressed in all project stages to ensure a successful environment where users are benefiting from the technological infrastructure.

H2: *A positive organizational environment is positively associated to highly participative and involved users.*

3.2.3. User role and continuous development strategy

The third, and last, dimension analyzed in this study focuses on the role that users have during an ERP implementation. In the literature review the paradox between project stages was described concluding that organizations tend to neglect user participation in phases one and two, including them only in phase three (Shao et al., 2017). The research consensus is that users must be included earlier in ERP projects as they are the ones who will be utilizing the system for their daily tasks. There is a large amount of research done on how to address system usage, from a managerial perspective to a communication one. The challenge is to create an enabling strategy that will make them part as well as accountable for their use of the system (Ju et al., 2016). This topic relates to a research from Kerr et al. (2014), where it is identified that many implementations fail because of non-supportive users. Therefore, having a strategy that includes and encourages users to be positive agents will be translated for a more positive environment and ultimately long-term system success (Kerr & Houghton, 2014).

These research hypotheses aim to conclude the real impacts of having users in all project stages. The objective is to understand the long-term impacts of encouraging users to assume additional responsibilities in stages one and two and the impact that that will have one the CSF identified before.

User role, as described in the review, is directly connected with their project involvement as well as satisfaction. In contrast with the previous topics where more practical research has been done, the evaluation of a long-term strategy that includes users in all stages is lacking on both theoretical and practical research. Therefore, the objective is to contribute with such study and identify specific recommendations to efficiently include users in all project stages and promote long-term efficiency.

H3: *A role that includes users in all project stages with relevant tasks is positively associated to positive system usage.*

3.2.4. Continuous development strategy and ERP efficiency

The overarching objective of this research thesis is to establish a connection between a continuous development strategy, that privileges ERP users, and overall system efficiency. The ability to determine such connection will justify the investment of including users as an active part of the overall strategic plan. For organizations this is a critical factor as research from Saxena et al. (2019) identifies poor planning as the cause for a high percentage of system failures (Saxena & Mcdonagh, 2019). In addition, according to Kerr, user acceptance is an essential factor for ERP success, which shows the importance of establishing a positive relationship (Kerr & Houghton, 2014).

Lastly, the compounded analysis will create an understanding of the characteristics that an ERP continuous development strategy needs to address and include to enable a positive balance between both user and strategic dimensions. ERP success frameworks from DeLone et al. (2003) and Candra (2012) will allow to compare the results from the previous studies and compared them with the data collected in this research. Extending that to the ability of achieving ERP efficiency and ultimately an implementation success is the objective of this thesis.

H4: *Highly satisfied users are positively associated to ERP long-term efficiency.*

H5: *Highly participative and involved users are positively associated to ERP long-term efficiency.*

H6: *High system usage is positively associated to ERP long-term efficiency.*

To address the formulated research questions and conceptual model in a detailed way, a mixed methods approach will be used by combining both quantitative and qualitative methods. Table 3 identifies the instruments that will be used to collect, measure, and analyze the collected data. In short, questionnaires and in-depth interviews will be used to collect data. Partial least squares structural equation modeling (PLS-SEM) will be the statistical model used to measure the data collected through the surveys. A thematic analysis will be the analytical method used to evaluate the data collected through the in-depth interviews. Lastly, SmartPLS and MaxQDA will be software tools considered to support the PLS-SEM and the thematic analysis, respectively. The following section will expand on the usage of these instruments for the continuation of the research.

Instrument	Description	Reference
Questionnaire	Research questionnaires will be utilized in this research. The questionnaires will target ERP users as its exclusive respondents. The questionnaire will be divided into 8 sections and have on average 4 questions per section to analyze each conceptual model variable. The Google Forms was used to create the questionnaire and collect the answers. The questions were made available online and shared exclusively with ERP users to respond.	-
In-depth interview	Six in-depth interviews were conducted. The interviews targeted key stakeholders in the creation, promotion, and deployment of an ERP strategic plan. ERP provider, vendor and project manager were interviewed to connect conceptual model to its operation and practical objective. Each interview was conducted with a pre-established script and through online collaborative platforms.	-
SEM	Second-generation multivariate data analysis method that used in research as it can test theoretically supported linear and additive causal models.	(Wong, 2013)
PLS-SEM	PLS-SEM is a causal modeling approach that aims to maximize the explained variance of the dependent latent constructs.	(Hair et al., 2011)
SmartPLS 3	Software application designed for Partial Least Squares Structural Equation Modeling.	(Wong, 2013)
Thematic analysis	Thematic analysis is a qualitative analysis method of identifying, analyzing, and reporting themes or patterns within data sets.	(Braun & Clarke, 2006)
Data coding	Coding is the concept of defining and categorizing the data by recognizing the links between the interview transcripts of all participants.	(Jayawickrama et al., 2016)
MaxQDA	Software application designed for qualitative data analysis and mix methods research.	-
Discussion analysis	For this research, discussion analysis refers to the comparison between the literature review, qualitative and quantitative research methods.	-

Table 3. Research instruments table (Source: author)

As a conclusion, the research hypotheses will address different components and dimensions that will enable an understating about the relationship that users currently have with ERP implementations. Additionally, it will allow for a more in-depth knowledge on what is their perspective of a successful implementation and the key drivers in each of the dimensions. The following section will address the research methodology designed to collect and analyze data. The results will be used to support specific and practical recommendations that can be used in ERP implementation and future frameworks.

4. METHODOLOGY

The objective of this research thesis is to describe the characteristics of an ERP continuous development strategy that will successfully lead to an efficient ERP performance and recommend practical strategic tasks that can be implemented to achieve the described characteristics. In short, the goal is to understand, from the user perspective, what are the characteristics of a successful ERP implementation and how can those characteristics be achieved with specific tasks or project approaches.

This study will use both quantitative and qualitative methods because ERP implementations require the involvement of multiple stakeholders with different expectations and priorities for the project. The quantitative research will utilize questionnaires targeted to ERP users as they are the key piece being analyzed in this study. The following section will discuss the questionnaire design and analysis. The qualitative research will utilize in-depth interviews with ERP vendors, providers, and organizational decision makers such as project manager or sponsors. The objective is to integrate their analysis and expectations in the design of recommendations for a continuous development strategy. Additionally, these interviews will provide a future overview in solutions and frameworks that decision makers are considering for upcoming implementations.

In addition to the mixed method approach that combines both quantitative and qualitative methods, this research will add an additional vector by including the literature review presented above and integrate it in the research's discussion analysis. The objective is to understand, evaluate and compared a complete range of ERP stakeholders to conclude the willingness and feasibility to implement this study's conclusions. Figure 2 provides a visual framework of the research methods that will be considered for this research. The following sections explain, in detail, the data collection and measurement tools that will be considered in the research.

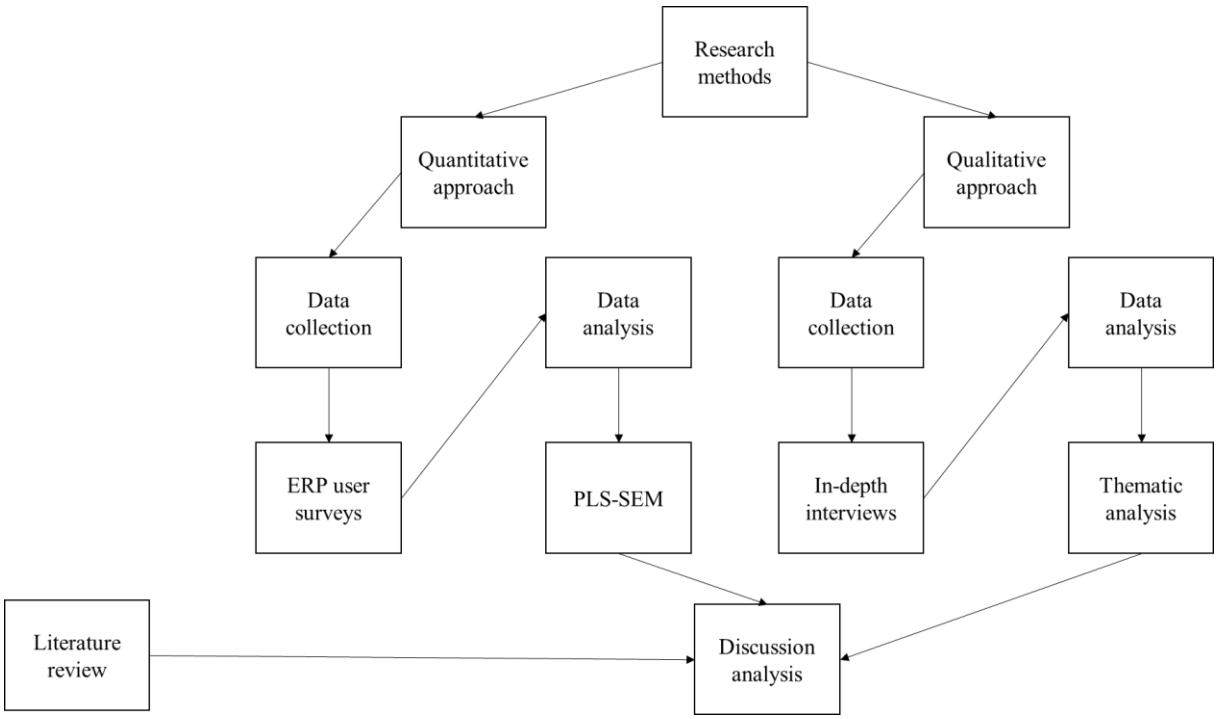


Figure 2. Research thesis research method (Source: author)

4.1. DATA COLLECTION

To collect data, this research study will combine two data collection methods: expert surveys and in-depth interviews. The expert surveys will be targeted to ERP users and online questionnaires will be distributed for the purpose. The in-depth interviews will target six ERP stakeholders each with their unique experience in the ERP field of study.

4.1.1. Quantitative method

For the quantitative data collection process, questionnaires were distributed to ERP users. The questionnaire was designed to address all factors included in the conceptual model identified in figure 1. In short, the questionnaire will have eight sections in which the seven factors and a background assessment will be addressed. All the sections, but the last, will have a matrix response table in which respondents will select their level of agreement with each of the sentences that are included. The responses can range from zero (totally disagree) to four (totally agree). All questions will require an answer to ensure the validity of the response and the efficacy of the measurement.

Before the questionnaire starts, each user will have to agree to its participation and indicate that is, or was, an ERP system end-user. After, section one will elaborate on the individual impact that an ERP has on users, highlighting on performance, motivation, and satisfaction topics. Section two will address the environmental aspects that users prefer in an ERP implementation. Section three aims to understand the preferential roles users may assume in an ERP implementation and the direct impact on them and the project. These three initial dimensions will lay a foundation on understanding both the internal and external drivers that affect users while utilizing an ERP system.

Sections four, five and six will investigate the three user critical success factors identified before in this research. User satisfaction, participation and system usage will have a dedicated block of questions with the objective to understand the relationship between those specific factors and the ERP dimensions. The seventh section addresses the ERP conceptual model designed for this study and will aim to analyze the ERP long-term efficiency from the user perspective. That will enable the connection with the previous questions and allow for specific recommendations. The last questionnaire section will ask for some background information about the user. The ability to create a demographic table will enable a cross-industry or cross-role analysis, which will enrich the applicability of the recommendations.

For the collection of responses and measurement, the questionnaire will follow the standard rating system identified above. Additionally, the questionnaire was created using Google Forms and shared online to specific respondents. As mentioned, the questionnaires were only delivered to ERP end-users. All other ERP roles or individuals with no previous ERP experience were not included in the respondent sample.

The questionnaire follows the standard data collection method for a research thesis. The first version was developed and distributed to a smaller respondent target of about thirty respondents. The objective was to ensure that both the questions and the responses would allow the study to progress. After the feedback, the questionnaire was adjusted to ensure all the questions were targeting the specific audience and correct data. Some of the adjustments included the addition of a question

regarding the respondent's experience and participation in an ERP implementation to be qualified to contribute to section five of the survey. Lastly, to some questions, an introductory note was added to ensure the correct understanding of the section. For example, an explanation of the research's definition for project phases was added before section five. Other minor adjustments were added to ensure grammatical consistency. After the necessary adjustments, the final version was delivered to about two-hundred ERP users with the objective of having a sample size around one-hundred responses.

The questionnaires questions can be found in Annex 1. Table 4, below, identifies the references used in the construction of the question for each survey section.

Section	Reference
Section 1. Individual User Impact	Adapted from: (Rajan & Baral, 2015)
Section 2. Technology Organization Environment	Adapted from: (Rajan & Baral, 2015)
Section 3. ERP User Role	Adapted from: (Rezvani et al., 2017)
Section 4. Satisfaction	Adapted from: (Batada & Rahman, 2012)
Section 5. Participation & Involvement	Adapted from: (Barki & Hartwick, 1994)
Section 6. Usage	Adapted from: (Jia et al., 2017)
Section 7. ERP long-term Efficiency	-
Section 8. Background Assessment	Adapted from: (Ferreira, 2015)

Table 4. Research questionnaire reference table (Source: author)

4.1.2. Qualitative method

The second data collection method are semi-structured in-depth interviews. These specialized interviews will be conducted with three relevant participant groups that have a direct impact on the design and application of an ERP strategy. System providers are the software companies that create the ERP services as well as the implementation methodologies. Understanding what their view of the user role is throughout the design stages becomes relevant as they are the ones researching specific frameworks. Vendors are frequently the ones responsible for deploying the system and enabling organizations to fully benefit from it. As they are the ones, together with organizations, to lay out the strategic plan, it will be critical to understand their perspective on the user's involvement. Lastly, project managers or project sponsors are stakeholders within the organization that are responsible to ensure project quality and delivery. Since they are the decision makers and they have experience with ERP implementation, understanding their view will enable the applicability of the recommendations.

The scripts used for the interviews can be found in Annex 2. The same framework and logic were used in the development of all three scripts with the necessary adjustments to adapt the conversation to each one of the interviewees. The script is divided into two main sections. The first section is an overview on thoughts and experience of the respondents about the analyzed topic. Such section will

have the same five questions for the three participants involved in the study. In the second section, individual questions were created for each respondent depending on their role within the ERP industry.

Collecting quality data will be a determining factor for the quality and effectiveness of this study and therefore only qualified participants will integrate the sample size. That may add an additional challenge to collect many samples. The following section will describe how the collected data will be measured to produce simple and structured outcomes.

4.2. MEASUREMENTS

To measure the collected data, this research will be utilizing two different analysis methods. To measure the questionnaire data, the partial least squares structural equation modeling will be used to test conceptual model and validate its causality. For the in-depth interview measurement, a thematic analysis will be conducted mixing a deductive approach with an analytical coding to analyze the interview transcripts. The following section will detail how these measurements will relate to the data collection methods and be applied to measure such data and provide practical conclusions to this research.

4.2.1. Quantitative measurements

For the research model to be accepted and validated, the collected data needs to be measured and analyzed. To perform this research analysis, the structural equation modelling (SEM) with partial least squares was selected (PLS). This statistical model is often to test conceptual model and validate its causality. PLS minimizes the residual variance of the constructs as it requires a smaller sample size (Hair et al., 2011). The SmartPLS software will be used to analyze the data. The analysis and results interpretation will follow a two-step approach. First, the measurement model reliability and validity will be evaluated. Secondly, the structural model will be assessed and validated. The process follows a standard SEM-PLS approach introduced by Hair, et al. (2011). The objective is to ensure the validation and consistency of the model and the hypothesis significance.

To elaborate this analysis, table 5 identifies the constructs table. Each construct is used as a survey question and table 4 identifies the research used as the foundation to create and validate the construct parameters.

Construct	Items	Question items
ERP Individual User Impact (IMP)	IMP1	Using an ERP system improves my performance.
	IMP2	Using an ERP system increases my productivity.
	IMP3	ERP and its components are an important and a valuable help in the execution of my daily work.
	IMP4	The ERP system provides accurate information about how well, or poorly, I am executing my job.
	IMP5	The ERP system provides reliable information about how well, or poorly, I am executing my job.
	TOE1	I know what to do when I need any assistance with our ERP system.

Technology Organization Environment (TOE)	TOE2	In my organization, we get an efficient technical support for our ERP system.
	TOE3	The company ERP environment has positive impact in my adaption to the ERP system.
ERP User Role (UROL)	UROL1	I feel like I have valuable inputs in deciding how I use the ERP system in my work.
	UROL2	My feelings toward ERP system are taken into consideration.
	UROL3	I am free to express my ideas and opinions when using the ERP system.
	UROL4	I feel like additional end-user responsibilities lead to stronger and better configured systems.
	UROL5	I feel like end-users should be included in all stages of an ERP project.
Satisfaction (SAT)	SAT1	Overall, I like working with an ERP system.
	SAT2	I feel satisfied when I work in an ERP system.
Participation & Involvement (P&I)	P&I1	I wish I were more involved during the pre-implementation phase of the ERP project.
	P&I2	I wish I were more involved during the implementation phase of the ERP project.
	P&I3	I wish I were more involved during the post-implementation phase of the ERP project.
	P&I4	I would rather be involved earlier in an ERP implementation.
	P&I5	If I were included early and had more responsibilities in the implementation, my overall commitment would be higher.
Usage (USE)	USE1	I find the ERP system to be useful in my daily tasks.
	USE2	My interactions with an ERP system are clear and understandable.
	USE3	I find it easy to get the ERP system to do what I want it to do.
	USE4	I intend to use the ERP system for performing my job as often as need.
	USE5	I prefer to use an ERP system over manual tasks.
ERP Efficiency (ERPEFF)	ERPEFF1	I intend to continue to use the system in the future.
	ERPEFF2	I want to use an ERP in my future job.
	ERPEFF3	The long-term success of and ERP implementation depends heavily on the users.
	ERPEFF4	I would like to be more involved in a future implementation.

Table 5. Research constructs table (Source: author)

Additionally, for this analysis, three indirect hypotheses will be assumed to include the whole structural scope of the model used in this research. Table 6 introduces the assumed indirect hypotheses paths considered in the analysis. The structural model presented and analyzed before assumes the direct and indirect relationship in both the literature analysis and the direct hypotheses evaluation.

Indirect hypotheses	**Path**
Ha	ERP Individual User Impact -> Satisfaction -> ERP Efficiency
Hb	Technology Organization Environment -> Participation & Involvement -> ERP Efficiency
Hc	ERP User Role -> Usage -> ERP Efficiency

Table 6. Research indirect hypotheses path (Source: author)

4.2.2. Qualitative measurements

To evaluate the data collected throughout the in-depth interviews conducted for this research, a thematic analysis methodology will be used. In short, thematic analysis is a qualitative analysis method of identifying, analyzing, and reporting themes or patterns within data sets (Braun & Clarke, 2006). This approach allows for flexibility when interpreting the data transcripts allowing the research to identify patterns within the data that match the topics as well as outliers that may be relevant in future work. Research from Jayawickrama et al. (2016) on ERP implementations and its relationship with knowledge management uses a thematic methodology to analyze qualitative data collected in their research. This verifies the validity and applicability of this methodology in this field.

This research will use an approach introduced by King et al. (2010) where the analysis will use a coding framework to categorize the collected data. Coding is the concept of defining and categorizing the collected data by recognizing the links between the interview transcripts of all participants (Jayawickrama et al., 2016). Coding is frequently used when analyzing interview transcripts to provide an analytical approach to the data with the objective to extract significant relationships that are supported by statistical evidence. This thesis will follow the three stages approach introduced by King et al. (2012) and used by Jayawickrama et al. (2016) in their research. The three coding stages can be defined with the hierarchy mapped in table 7.

Coding stage	Description	Reference
Descriptive coding (first-order codes)	Select the relevant data that address the research questions and objectives by allocating descriptive codes throughout the interview transcripts.	Adapted from: (Braun & Clarke, 2006) & (King & Christine Horrocks, 2010)
Interpretative coding (second-order themes)	Grouping the descriptive codes that share some similar meaning and create an interpretative code that encompasses the information.	
Defining overarching themes (support dimensions)	Identification of the level of support for the overarching themes that characterize key concepts in the analysis.	

Table 7. Research thematic coding table (Source: author)

The research model for this thesis, detailed in figure 2, indicates a discussion analysis between both quantitative and qualitative methods. Therefore, the thematic approach used to evaluate qualitative data will be using a concept-driven coding structure. This coding structure was introduced by King et al. (1998) and explored by Ritchie et al. (2003) and emphasizes the importance to focus the qualitative data evaluation with the research's focus. By coding pre-established thematic ideas, the evaluation of an interview transcripts will aim to target specific key points and concepts that are considered relevant to the study (Ritchie et al., 2003) . Table 8 identifies the second-order coding themes that will be used in the transcript analysis.

Relating this structure with this research thesis, the concept-driven coding follows the same structure used when creating the concept model and the questionnaires constructs table. The chosen variables for this research will be used as second-order themes to map the descriptive coding data into relevant categories that can be measured and compared. This approach enhances the chances for a successful

aggregation of the topic when performing this study's discussion analysis. Despite the different roles that both survey respondents and interview participants have in the ERP field, their ability to work together is critical for project success. Therefore, it becomes relevant to incorporate a comparison with the objective of providing applicable recommendations for future frameworks.

Concept-driven coding – Second-order themes		
ERP Individual User Impact (IMP)	Technology Organization Environment (TOE)	ERP User Role (UROL)
Satisfaction (SAT)	Participation & Involvement (P&I)	Usage (USE)
	ERP Efficiency (ERPEFF)	

Table 8. Research concept-driven coding second-order codes (Source: author)

A key idea emphasized by Ritchie et al. (2003), and most reviewed scholars, is that the concept-driven approach should account for relevant outliers to the pre-established (Ritchie et al., 2003). Therefore, this research will attempt to structure the data according to the second-order coding themes but analyzing the first-order codes attempting to understand relevant outliers that can be considered for the discussion.

One of the benefits of utilizing a structured thematic methodology to analyze qualitative data is the ability to adjust and enhance the coding system according to the collected transcripts. Throughout the data collection process one of the most common and transversal factors observed were the constant practical and actionable recommendations that participants were able to provide in their statements. Having a range of roles, industries, and geographical locations it becomes relevant to analyze and compare their experiences and recommendations in an analytical and structured form. The objective is to add an additional coding layer to identify all the recommendable actions that participants shared in their interviews and utilize them in the discussion analysis and future research conclusions. Therefore, in addition to the seven codes previously identified, an extra code was included in the qualitative data analysis. The new code, mapped and described in table 9, attempts to identify all actionable items included in the interview transcripts.

Concept-driven coding – Second-order themes – Additional code	
Future Project Actions (FPA)	Actionable items with potential to be included in ERP frameworks and project strategies.

Table 9. Research extended concept-driven coding second-order codes (Source: author)

The final step considered in the thematic analysis will be a comparative data validation between the collected codes and the support evidence provided by the interviewees. The comparative analysis will be used to validate all relationships revealed throughout the analysis. The comparative process of a thematic analysis was introduced by Rihoux and Ragin and uses the frequency scale presented in table 10 (Rihoux & Ragin, 2008). The objective is to evaluate the level of evidence and support that the research conceptual model was able to obtain throughout the thematic analysis. This process is

adapted from Jayawickrama et al. (2016) when they identified the level of evidence in each of the interviews (Jayawickrama et al., 2016). This research utilizes such process to create two comparative models evidence tables that will reveal the level of support of each dimension. Model one will evaluate the relationship between the independent variables highlighted in this research. Model two will evaluate the relationship between mediator variables and understand their integrated impact in a continuous development strategy. Such process will close the gap between the quantitative and the qualitative evaluation and allow for a more direct and effective discussion analysis.

Scale	Symbol	Frequency of Occurrence
No evidence	No evidence(blank)	Zero times
Weak evidence	✓	Between 1 and 4
Medium evidence	✓✓	Between 5 and 8
Strong evidence	✓✓✓	More than or equal to 9

Table 10. Research comparative scale (Source: Rihoux and Ragin, 2008)

The MaxQDA software will be used to perform all the qualitative data analysis. The interview adapted transcripts can be found in appendix 3. Figure 3 details the process that was used to perform the thematic analysis. The same process was used for all the interviews with the exceptions to the ones that were conducted in English and therefore the translation step was not considered.

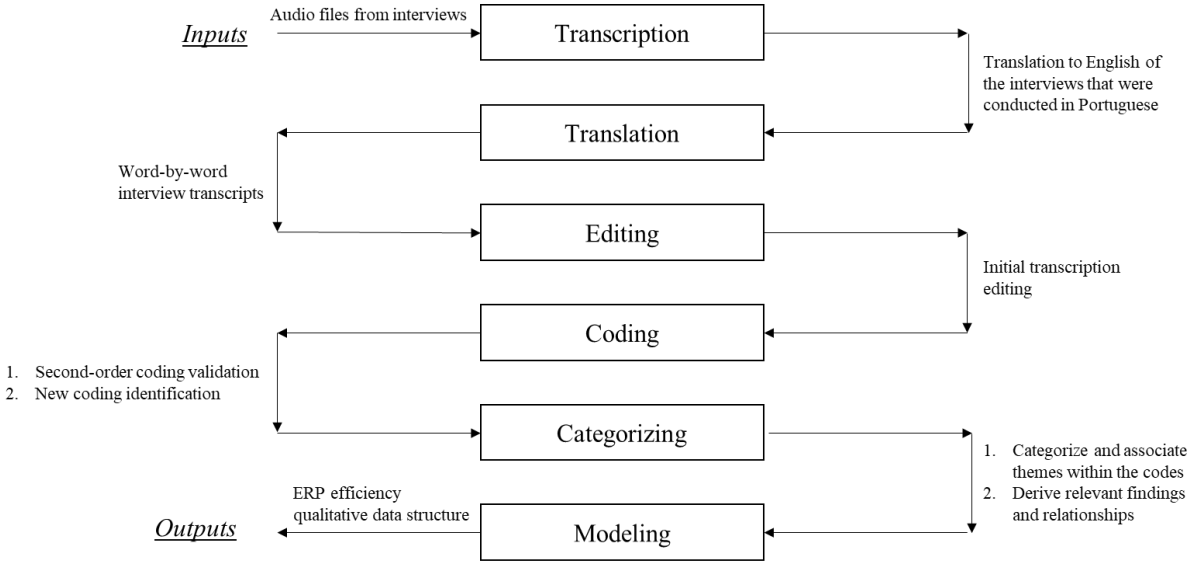


Figure 3. Research thematic analysis process flow (Source: author, adapted from Jayawickrama, et al. 2016)

Lastly, it is relevant to highlight that the data collected in the interviews was anonymous and any clients or companies mentioned in the interviews were not disclosed since they were not part of the scope of this project. The role and the relevant background information of the participants is detailed in the demographics section of the data analysis.

4.2.3. Discussion measurements

One of the objectives of this study is to incorporate the different layers around an ERP long-term strategic plan. All sections of this research aim to interpret the ERP field with their own specific lenses. From the literature review, which brought an academic and theoretical perspective, to the research methods which enhanced the research with a more practical overview of the current business environment of this field of study. It is relevant to reemphasize that an ERP strategic plan includes a large multitude of stakeholders, therefore it becomes critical to interpret and compare the different perspectives to provide practical and usable recommendations for future projects or frameworks.

To assess, analyze and compare all the above sections, a discussion analysis will be conducted. This analysis will consider this research literature review and both the quantitative and qualitative analysis. The findings and correlations between these three factors, as described in figure 2, will be considered for the discussion analysis. The objective is to find relationship and gaps between the collected data and extend the knowledge on this field. This approach will allow for a more diverse range of ERP factor which will lead to practical recommendation that can later be accepted and used in ERP project strategic frameworks. In this section is where all the findings will be included and a layout for the conclusions will be detailed.

The following sections will describe and analyze all the collected for this research. Both the quantitative questionnaires and qualitative in-depth interviews will be analyzed. The analysis will include a sample characterization for both research methods and the results provided by both models presented before. Lastly, a practical discussion of the findings will be conducted to integrate all components of this research thesis.

5. RESULTS AND DISCUSSION

One of the main objectives of this research thesis is to incorporate in the topic's analysis the different factors that affect an ERP long-term strategic plan. That will enhance the applicability and acceptance of the research since it will be consistent with the needs and wants of different stakeholders that share responsibilities in an ERP project. The results and discussion aim to maintain such approach and create a balance between the analytical results derived from the research methods identified before and a cross-methods discussion to integrate and validate the data results and lead to the conclusions.

This section's structure will start with a data sample analysis where all three components considered in the questionnaires and the interview will be analyzed. The objective is to ensure the data sample is reliable and that there are no significant outliers that may hinder the results and need to be considered in the discussion analysis. The second sub-section will analyze both quantitative and qualitative results derived from both PLS-SEM and the thematic analysis. The results will be analyzed independently to ensure a non-biased approach. The final sub-section will compare all the data collected and analyzed throughout this research. It will include a discussion analysis between the literature review, the quantitative results, and the qualitative results. The end objective is to perform a cross-comparison between all three factors and derive the most appropriate conclusions to this study.

5.1. DATA SAMPLE ANALYSIS

The data collection was a thorough process since all the participants for both the quantitative and qualitative research method require either ERP experience or specialization. The response collection process was conducted entirely online using digital surveys and collaborative platforms. Both the survey responses and the interview transcripts analysis were anonymous, and the data records were only used for the purposes of this research. The following sub-sections will analyze the participants demographic, employment, and ERP characteristics for both research methods. Since it is relevant for the results discussion each set of participants will be analyzed independently.

5.1.1. Quantitative data sample analysis

The survey's background assessment focused on three key sample characteristics. The first section analyzed the traditional demographic characteristics such as age, gender, educational level, etc. aiming to understand the general characteristics about the survey participants. The second section emphasizes employment or work-related characteristics with the objective of assessing the different industries, roles, organizations, etc. of the respondents. The third, and last, section asked about the participants ERP experience to understand their level of familiarity with the field.

As described previously in the data collection section, the survey was distributed to about 200 potential respondents with the objective of obtaining 100 valid[3] responses. The survey was available for about one and half months and throughout those 122 responses were collected which represent a

[3] Valid responses refer to respondents who agreed to participate in the survey and indicated that they are or were ERP end-users.

rate of response of 61%. Of the responses pool, 100 were valid responses and 22 were not considered since the participant indicated they were not ERP end-users. Therefore, out of the 122 survey responses, 100 were used for the analysis representing an 82% validity rate.

5.1.1.1. Demographic data sample analysis

The demographic sample analysis is presented in table 11 and identifies age group, gender, educational level, and location as the key demographical groups to be reviewed. Starting the analysis by the age group parameter, 75% of respondents reported an age between 25 and 39 years old. This is an expected result since the target of the survey were working professionals with ERP experience and that tends to be more applicable to young adults. Of the other 25% of respondents, 10% belong to the age group between 18 and 24 years old and 15% to the age group between 40 and 60 years old. The second dimension analyzed the participants gender and the results showed that 59% of respondents were male, 40% were female, and 1% preferred not to disclose. Educational level was the third demographic factor analyzed in this section and the collected sample showed that 52% of participants have a bachelor's degree, 43% a master's degree or higher, and 3% a high-school degree. This shows an expected balance between the educational level of the respondents since previous research showed similar data in this parameter. The participant's location was the fourth, and last, factor to be considered in the demographic analysis. This was the parameter that showed the highest homogeneity between the ones considered in this section. Of all respondents, 98% indicated that they are based in Portugal, with 87% in Lisbon, 8% in Porto, and 3% in other locations. The last 2% of participants were based in Italy and the United States. Since the research was conducted in Portugal, this number is not a surprise, but it will be highlighted later in the research as a potential improvement factor.

Overall, the demographic analysis was consistent with the other studies conducted in the same field by Ferreira (2015) or Rezvani et al. (2017), where the population sample and their demographic showed similar results. Such consistency is critical for this study since it ensures the validity, credibility, and reliability of the demographics of the data sample. The following section will extend the sample analysis focusing on the employment characteristics of the survey respondents.

Demographic characteristics		***(n = 100)***
Age Group	18-24	10%
	25-39	75%
	40-60	15%
Gender	Female	40%
	Male	59%
	Other	1%
Educational Level	Lower than Bachelor	3%
	Bachelor	52%
	Master or Higher	45%
Location	Lisbon, Portugal	87%
	Porto, Portugal	8%
	Other	5%

Table 11. Research demographic data sample analysis (Source: author)

5.1.1.2. Employment data sample analysis

The employment sample analysis is presented in table 12 and identifies the employment characteristics of the survey participants. The objective was to understand any outliers that needed to be considered in the results discussion. The parameters used to conduct this analysis were organization size, industry, organizational role, and hierarchical role.

The first parameter to be analyzed was the organization size and the data shows that only 7% of participants work or worked in an organization with less than 100 people. This is a consistent factor with the organizational size required to justify a long-term ERP project, therefore a low percentage in the category was expected. The other 93% were similarly divided among the rest of the categories with 29% reporting their organization has between 100 and 500 people, 26% between 500 and 1000 people, and lastly, 38% with more than 1000 people. For the same reason indicated before, the expectation is that the participant pool had experience in mid to large scale organizations. The second parameter was industry of the surveyed participants, and the responses were mixed, which created an interesting balance between industries. The technology industry, with 30%, was the one with the highest percentage of respondents followed by finance with 15%, and retail with 14%. The third parameter was the organizational role that these people assumed when using an ERP system. Technology, with 24%, and finance, with 22%, were the two highest roles followed by logistics. These categories followed the traditional ERP modules that are discussed in the following section. It is relevant to highlight the diverse range of industries and roles reported the survey respondents which will support a cross-industry and cross-role results discussion. The last parameter focuses on the hierarchical role of the survey respondents. A balance between junior and senior roles was achieved with 48% reporting they had junior positions in their organization and 46% reporting they had senior positions. The balance and mix between the results reported in this section are a good indicator for a positive result acceptance among the analyzed parameters. The following section will analyze the ERP experience of the participants.

Employment characteristics		***(n = 100)***
Organization Size	Less 100	7%
	100 - 500	29%
	500 - 1000	26%
	More 1000	38%
Industry	Entertainment	8%
	Finance	15%
	Pharmaceutical	9%
	Retail	14%
	Technology	30%
	Other	15%
Organizational Role	Finance	22%
	Technology	24%
	Logistics	13%
	Marketing	12%
	Other	28%
Hierarchical Role	Junior	48%
	Senior	46%
	Operational	6%

Table 12. Research employment data sample analysis (Source: author)

5.1.1.3. ERP experience data sample analysis

The ERP experience sample analysis is presented in table 13 and it represents a core analysis when evaluating the validity of the collected data sample. Since the research aims to interact with an ERP strategic plan, it is crucial that the collected sample highlights a mix between ERP usage, experience, and provider. Those were the three data parameters, or questions, that were used to characterize the participants ERP experience. The first factor to be evaluated were the ERP modules with the analysis reporting balanced percentages among the different modules. Finance, with 28%, and logistics, with 16%, were the two modules with the highest usage percentage which was expected since these are the most widely used ERP modules. Additionally, modules such as treasury, real estate, human resources, etc. also had a significant representation which enhances the transversal applicability of the findings. The second parameter was the survey participants ERP experience, and such factor was measured in years. With equal percentages of 41%, respondents reported that they either had less than 3 years of experience or 3 to 9 years of experience. The other 18% reported over 9 years of ERP experience. This factor shows, once again, a balance between the three categories. The third, and final, parameter was the respondent's experience with different ERP providers. Different providers will utilize different methodologies and frameworks. Therefore, it is relevant to include a range of provider in the sample to be analyzed. SAP, with 60%, was the provider with the highest participant experience followed by Microsoft, with 15% and Oracle, with 10%. These numbers are not a surprise since SAP is the ERP market leader for large corporations (Abreu, 2018).

The ERP experience reported by the survey participants shows a balance between the three categories analyzed in this research when ensures cross-module, experience, and provider applicably of the results that will be analyzed in the following sections.

ERP experience characteristics		***(n = 100)***
ERP Modules	Finance	28%
	Logistics	16%
	CRM	12%
	Human Resources	10%
	Treasury	8%
	Other	27%
ERP Experience	Less than 3 years	41%
	Between 3 – 9 years	41%
	More than 9 years	18%
ERP Provider	SAP	60%
	Microsoft	15%
	Oracle	10%
	Other	16%

Table 13. Research ERP experience data sample analysis (Source: author)

Overall, the three data sample dimensions analyzed in this section concluded presented a wide range of profiles that will allow the results analysis and discussion to provide practical and transversal recommendations. The following section will analyze the characteristics of the qualitative data participants to contextualize the interview data and collected results.

5.1.2. Qualitative data sample analysis

This research thesis utilized in-depth interviews to perform a thematic analysis. As previously indicated in the measurement section, the interviews targeted three key groups of stakeholders within the ERP field. The objective is to combine and analyze their experience and later compare it to the survey results and the literature review. Two participants, from each ERP category, were selected based on the combination of five fundamental factors. A balance between these factors was critical to enhance the interviews with different perspectives and future applications. All the interviews were conducted online, recorded, transcribed, and later analyzed. It is relevant to re-affirm that the interview results are anonymous and the collected was jointly analyzed. Table 14 maps the data analysis regarding the qualitative sample.

The first, and most relevant, factor was the ERP role that the participants play in the ERP field. This was a controlled characteristic since it was previously chosen to have two participants in each ERP category. The second characteristic to highlight is the ERP provider used by the interviewees and the results showed 2 out of the 6 participants used SAP and the others used Microsoft, Oracle, PHC and Salesforce. The third factor was the ERP experience that the interviewees reported and all of them indicated they have more than 3 years of experience, with one participant reporting over 9 years of ERP experience. The last two factors were industry and location and the results showed that 4 interviewees are from the technology or consultancy industry and the other 2 participants are from the retail or sales industry. In terms of location the results reported 4 participants from Portugal and the other 2 from the United States.

No	ERP role	ERP provider	ERP experience	Industry	Location
1	Developer/Architect	SAP	3-9 years	Technology/Consultancy	Lisbon, Portugal
2	Developer/Architect	Microsoft	3-9 years	Technology/Consultancy	Denver, CO, USA
3	Consultant/Vendor	SAP	3-9 years	Technology/Consultancy	Lisbon, Portugal
4	Consultant/Vendor	Oracle	3-9 years	Technology/Consultancy	Minneapolis, MN, USA
5	Project Manager	PHC	9+ years	Retail/Sales	Lisbon, Portugal
6	IT Manager	Salesforce	3-9 years	Retail/Sales	Lisbon, Portugal

Table 14. Research qualitative data sample analysis (Source: author)

The qualitative data sample analysis provided the expected results since the participants were selected according to specific categories to provide a balance between the factors that were considered relevant. It is important to highlight that both the quantitative and qualitative data analysis showed both consistency and diversity which are two key factors when attempting to provide transversal conclusions. The following section will examine the quantitative and qualitative data results and access the models according with the measurements previously described.

5.2. DATA RESULTS ANALYSIS

This research conceptual model was tested using a SEM with PLS. As described in the measurement analysis section, this a variance based structural equation modelling technique and the analysis will be conducted using SmartPLS3 software (Ringle & Wende, S., Will, 2015). The analysis and result interpretation followed a two-step approach. First, the measurement model reliability and validity were evaluated. The second step was the structural model assessment and validation. The process follows a standard SEM-PLS approach introduced by Hair, et al. (2011). The objective is to ensure the validation and consistency of the model and the hypotheses significance.

5.2.1. Quantitative results analysis

For the measurement model evaluation, and according to the Hair, et al. (2011) PLS-SEM approach, this research explored the individual reliability indicators, convergent validity, internal consistency reliability, and discriminant validity (Hair et al., 2011). The analysis demonstrates that the average standardized loading factors of all constructs were above 0.6, with a minimum value of 0.704, and they also demonstrated significance at $p < 0.001$. Both factors provide a strong indicator for individual indication reliability (Sarstedt et al., 2017). The internal consistency reliability was also confirmed as all construct's Cronbach alphas and composite reliability exceed the minimum value of 0.7 (Sarstedt et al., 2017). Table 15 shows an aggregate analysis on the measurement model results, including all the values previously indicated.

Construct	Item	Average outer loading	Cronbach's alpha	Composite reliability	AVE
IMP	IMP1	0.740	0.808	0.860	0.553
	IMP2				
	IMP3				
	IMP4				
	IMP5				
TOE	TOE1	0.754	0.807	0.858	0.669
	TOE2				
	TOE3				
	TOE4				
UROL	UROL1	0.704	0.746	0.833	0.502
	UROL2				
	UROL3				
	UROL4				
	UROL5				
SAT	SAT1	0.969	0.934	0.968	0.938
	SAT2				
P&I	P&I1	0.885	0.931	0.948	0.785
	P&I2				
	P&I3				
	P&I4				
	P&I5				

USE	USE1	0.790	0.850	0.894	0.631
	USE2				
	USE3				
	USE4				
	USE5				
ERPEFF	ERPEFF1	0.736	0.738	0.836	0.575
	ERPEFF2				
	ERPEFF3				
	ERPEFF4				

Table 15. Research measurement model results (Source: author, adapted from SmartPLS)

The following analysis utilized three key factors to confirm the collected data convergent validity. The first factor, as validated before, indicates that the average standardized loading factors of all constructs loaded positively and significantly as demonstrated in table 15. Second, all constructs have a composite reliably over 0.70. The third, and last, factor examines the average variance extracted (AVE) and table 15 demonstrates that for all constructs the AVE value exceeds 0.50 (Bagozzi & Yi, 1988). To assess and analyze the discriminant validity a two-step approach was used. The first step was the Fornell and Larcker criterion in which it is required that the square root of AVE, in table 16, is greater than the largest correlation with any construct. (Fornell & Larcker, 1981). By comparing table 15 and table 16, the criterion can be validated for all constructs included in this research.

	IMP	**TOE**	**UROL**	**SAT**	**P&I**	**USE**	**ERPEFF**
IMP	**0.744**						
TOE	0.592	**0.818**					
UROL	0.636	0.646	**0.709**				
SAT	0.566	0.456	0.493	**0.969**			
P&I	0.147	0.287	0.290	0.077	**0.886**		
USE	0.527	0.609	0.570	0.678	0.228	**0.794**	
ERPEFF	0.429	0.421	0.418	0.706	0.319	0.752	**0.758**

Table 16.Research inter-construct correlation and square root of AVE (Source: author, adapted from SmartPLS)

The second step was to use the Heterotrait-Monotrait Ratio (HTMT) criterion (Henseler et al., 2015; Sarstedt et al., 2017). There is no academic consensus on the ideal values to consider as a threshold for the HTMT ratio as studies from Clark and Watson (1995) and Kline, et al. (2011) propose a value of 0.85 and other studies from Gold, et al. (2001) and Teo, et al. (2014) propose a value of 0.90 (Henseler et al., 2015). This study will use the Gold, et al. (2001) and Teo, et al. (2014) HTMT threshold proposal to assess the discriminant validity. Table 17 expresses the results of the HTMT analysis and ensures the validation that all values are below the defined threshold line of 0.90 defined for this study. The two-step approach provides additional validation of discriminant validity for the analyzed items and constructs.

	IMP	TOE	UROL	SAT	P&I	USE	ERPEFF
IMP							
TOE	0.737						
UROL	0.811	0.847					
SAT	0.600	0.532	0.593				
P&I	0.197	0.337	0.375	0.081			
USE	0.551	0.819	0.706	0.694	0.284		
ERPEFF	0.488	0.559	0.593	0.789	0.449	0.858	

Table 17. Research Heterotrait-Monotrait ratio results (Source: author, adapted from SmartPLS)

The next assessment regard the evaluation of the structural model used in this research. The structural model was evaluated using the sign, magnitude, and significant path coefficients (Dias et al., 2020). The first analysis was a check for collinearity using the variance inflation indicator (VIF). According to Sarstedt, et al. (2017), the VIF values must be below 5 to ensure no collinearity (Sarstedt et al., 2017). This research's VIF values ranged from 1 to 1.66, therefore the results were validated for no collinearity. All the VIF values can be found in annex 10.5.3. To predict the model's predictive accuracy, the magnitude of R^2 was evaluated for each endogenous variable (Sarstedt et al., 2017). To predict the model's predictive relevance, the Stone-Geisser's Q^2 values were used (Sarstedt et al., 2017). For the endogenous variables of Participation & Involvement, Satisfaction, Usage, and ERP Efficiency the R2 value were 8.2%, 32.1%, 33.1%, and 67% respectively. According to Falk & Miller (1992), the rule of thumb for R^2 interpretation is that the value greater or equal to 10% (Falk & Miller, 1992). The value analysis should consider the relationship between the endogenous variables to ensure the decisive variable has a strong R^2 value. All the values, but Participation & Involvement, vastly surpass the threshold, including ERP Efficiency, with a 67% R^2 value, which is the variable that relates to all others. The Q^2, for the same endogenous variables, was 0.283, 0.051, 0.291, and 0.197, respectively. Since all variables Q^2 value was above zero that indicates predictive relevance for the structural model (Dias et al., 2020).

To assess the structural model relationships, table 18 indicates the path results for the relationship of the structural model. The following direct relationships were confirmed:

- ERP Individual User Impact has a significantly positive effect on Satisfaction (β=0.566, $p<0.001$). This provides support for H1.
- Technology Organization Environment has a significantly positive effect on Participation & Involvement (β=0.287, $p<0.001$). This provides support for H2.
- ERP User Role has a significantly positive effect on Usage (β=0.575, $p<0.001$). This provides support for H3.
- Satisfaction has a significantly positive effect on ERP Efficiency (β=0.389, $p<0.001$). This provides support for H4.

- Participation & Involvement has a significantly positive effect on ERP Efficiency (β=0.187, p<0.001). This provides support for H5.
- Usage has a significantly positive effect on ERP Efficiency (β =0.446, p<0.001). This provides support for H6.

Hypotheses	Path	Path coefficient	Standard errors	t-statistics	p-values
H1	ERP Individual User Impact -> Satisfaction	0.566	0.091	6.7076	0.000
H2	Technology Organization Environment -> Participation & Involvement	0.287	0.074	3.748	0.000
H3	ERP User Role -> Usage	0.575	0.065	8.959	0.000
H4	Satisfaction -> ERP Efficiency	0.389	0.122	3.207	0.010
H5	Participation & Involvement -> ERP Efficiency	0.187	0.073	2.583	0.001
H6	Usage -> ERP Efficiency	0.446	0.109	4.116	0.000

Table 18. Research model structural paths (Source: author, adapted from SmartPLS)

This research will use Hayes and Preacher (2008) bootstrapping procedure to evaluate the significance of the indirect effects associated with the mapped hypotheses. Table 19 indicates the path results for the indirect relationship of the structural model. The following indirect relationships were confirmed:

- The indirect effects of ERP Individual User Impact on ERP Efficiency, via the Satisfaction mediator, have a significantly positive effect on ERP Efficiency (β=0.566, p<0.001). This provides support for Ha.
- The indirect effects of Technology Organization Environment on ERP Efficiency, via the Participation & Involvement mediator, have a significantly positive effect on ERP Efficiency (β=0.287, p<0.001). This provides support for Hb.
- The indirect effects of ERP User Role on ERP Efficiency, via the Usage mediator, have a significantly positive effect on ERP Efficiency (β=0.575, p<0.001). This provides support for Hc.

Indirect Effects	Path coefficient	Standard errors	t-statistics	p-values
ERP Individual User Impact -> Satisfaction -> ERP Efficiency	0.566	0.091	6.7076	0.000
Technology Organization Environment -> Participation & Involvement -> ERP Efficiency	0.287	0.074	3.748	0.000
ERP User Role -> Usage -> ERP Efficiency	0.575	0.065	8.959	0.000

Table 19. Research bootstrap results for indirect effects (Source: author, adapted from SmartPLS)

To conclude the quantitative data results analysis, table 20 and figure 8 highlights the key relationships and its supporting evidence for both the measurement and the structural model utilized in this research. Table 20 expresses the hypothesis analysis and its results regarding the statistical tests that were conducted for the direct hypotheses. All of them were concluded to be positive and significant

with either medium or large supported effect. Figure 8 highlights the R^2, Q^2 and p values as they demonstrated positive evidence, statistical relevance and predictability on the model and hypotheses being tested.

Hypotheses	Independent variable	->	Dependent variable	Findings	Conclusions
H1	ERP Individual User Impact (IMP)	->	Satisfaction (SAT)	Positively and statistically significant (β=0.566, p<0.001)	Supported with large effect
H2	Technology Organization Environment (TOE)	->	Participatio n & Involvement (P&I)	Positively and statistically significant (β=0.287, p<0.001)	Supported with large effect
H3	ERP User Role (UROL)	->	Usage (USE)	Positively and statistically significant (β=0.575, p<0.001)	Supported with medium effect
H4	Satisfaction (SAT)	->	ERP Efficiency (ERPEFF)	Positively and statistically significant (β=0.389, p<0.001)	Supported with medium effect
H5	Participation & Involvement (P&I)	->	ERP Efficiency (ERPEFF)	Positively and statistically significant Efficiency (β=0.187, p<0.001)	Supported with medium effect
H6	Usage (USE)	->	ERP Efficiency (ERPEFF)	Positively and statistically significant (β =0.446, p<0.001)	Supported with medium effect

Table 20. Research results of hypotheses tests (Source: author, adapted from SmartPLS)

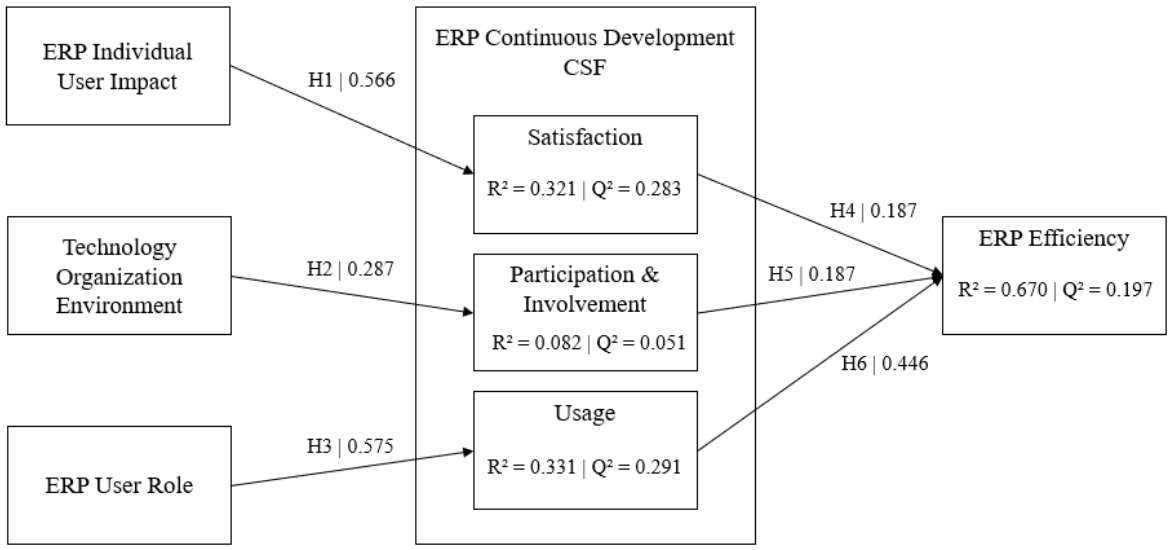


Figure 4. Research structural model results (Source: author, adapted from SmartPLS)

The following section will elaborate on the qualitative results analysis as all the interviews will be evaluated according with a method introduced by Jayawickrama, et al. (2016), and uses different coding structures to test the research hypotheses.

5.2.2. Qualitative results analysis

The qualitative analysis data results are a combination between a thematic analysis with a concept-drive coding structure and a comparative analysis to support the findings. The measurement process and the competitive scale table can be found in section 4 of this research and enhance the necessity to divide the analysis in two different comparative models evidence tables. The goal is to validate both the independent and dependent relationships revealed in the conceptual model. Therefore, the structure of the analysis will first provide an overview of the collected data be macro-analyzing the second-order codes and its relevance for the construction and validation of variables model. For each evidence model the same structured will be followed with an introduction to the relationships, an overview of the findings provided by the thematic analysis and comparative evidence table that will be used to support the findings. Lastly, an integration between both models will be discussed to provide the qualitative analysis conclusion.

5.2.2.1. Qualitative results overview

The thematic analysis structure utilized in this thesis utilizes second-order codes as aggregators to establish a connection between this analysis and the research conceptual model. The codes were collected through the thorough analysis of the interview transcripts. Six interviews were conducted, and 165 codes were initially mapped. Each interview had on average 20.6 codes with a maximum of 26 codes and a minimum of 17 codes per individual interview. The collected second-order codes followed the conceptual model construct structure with an additional code that regards future project actions. The collected codes reported similar occurrence percentage with participation and involvement as the most coded construct, with 16%, and usage as the least coded construct with 10%. These identical values showed that the responses targeted this research variables in a consistent and sustainable way. Table 21 presents a structured layout of the total number codes per construct and its respective percentage.

Code System	Number Codes	%
Future Project Actions (FPA)	21	13%
ERP Individual User Impact (IMP)	22	13%
Technology Organization Environment (TOE)	18	11%
ERP User Role (UROL)	17	10%
Participation & Involvement (P&I)	26	16%
Satisfaction (SAT)	19	12%
Usage (USE)	17	10%
ERP Efficiency (ERPEFF)	25	15%
Total Codes	**165**	**100%**

Table 21. Research code system: total codes (Source: author, adapted from MaxQDA)

After the initial the initial coding process where 165 codes were processed, an individual analysis was conducted in to validate the relevance of each collected code. For this research, relevant codes are defined as codes that specifically target one, or more, constructs. The analysis concludes that out of the 165 codes, 126 were considered relevant. In terms of occurrence percentage, the relevance results showed that ERP efficiency and participation and involvement, with 18%, were the constructs with the greatest number of relevant codes. Usage and TOE, with 10%, were the ones with the least percentage of occurrence. Comparing the total number with the relevant codes, the results presented a consistent relationship between all constructs which will allow for a comparative analysis presented in the following section. Table 22 presents a structured layout of the total number of relevant codes per construct and its respective percentage.

Code system	Number codes	%
Future Project Actions (FPA)	17	13%
ERP Individual User Impact (IMP)	14	11%
Technology Organization Environment (TOE)	12	10%
ERP User Role (UROL)	13	10%
Participation & Involvement (P&I)	22	18%
Satisfaction (SAT)	14	11%
Usage (USE)	12	10%
ERP Efficiency (ERPEFF)	22	18%
Total Codes	**126**	**100%**

Table 22. Research code system: relevant codes (Source: author, adapted from MaxQDA)

The relevance analysis concluded that all constructs have more than 17 relevant codes which sustains the comparative scale presented in table 10 and utilized in the following section. As mentioned, the continuation of the thematic results analysis will introduce the independent and dependent variable model and the coding relationships between the variables, or constructs, mapped in the conceptual model.

5.2.2.2. Qualitative results independent variables

The qualitative independent variable model aims to analyze the conceptual model relationships between the independent variables and the first level dependent variables. The analysis is organized by combining the qualitative models used by Jayawickrama, et al. (2016) in their research where they have analyzed knowledge and competence transfer in ERP implementations (Jayawickrama et al., 2016). This analysis will evaluate the relevant codes con compare them with the relationships identified in the conceptual model. Each research hypothesis will be evaluated according with the frequency of occurrence model (Jayawickrama et al., 2016). First, similarly to the evaluation process used for the quantitative analysis, the direct relationships will be individually analyzed for support code

evidence. The second step will be the indirect relationship evaluation, which will follow a similar analysis flow. The objective is to have a consistent analysis process that will enable a clear and structured aggregated analysis in the next section where all methods used in this research will be discussed.

As mentioned, the first parameter will discuss the main findings and support evidence for the indirect relationships mapped in the conceptual model. For consistency and interpretive practicality, the hypothesis aggregated findings were detailed below in a bullet format. Each hypothesis was evaluated using the relevant codes detailed before and aimed to analyze each of the code's support for each of the hypotheses.

- **H1** – ERP Individual User Impact showed medium evidence, with 7 support codes, to demonstrate qualitative correlation with Satisfaction.
- **H2** – Technology Organization Environment showed strong evidence, with 9 support codes, to demonstrate qualitative correlation with Participation & Involvement.
- **H3** – ERP User Role showed strong evidence, with 10 support codes, to demonstrate qualitative correlation with Usage.
- **H4 –** Satisfaction showed strong evidence, with 11 support codes, to demonstrate qualitative correlation with ERP Efficiency.
- **H5** – Participation & Involvement showed strong evidence, with 10 support codes, to demonstrate qualitative correlation with ERP Efficiency.
- **H6** – Usage showed medium evidence, with 6 support codes, to demonstrate qualitative correlation with ERP Efficiency.

All the considered hypotheses in this research were supported in thematic coding analysis with different levels of evidence. Four, out of the six, reported 9 or more support codes while the other two reported between 5 and 8 support codes. Therefore, four hypotheses demonstrated strong code support and two demonstrated medium, or average, code support. These numbers need to account for the analysis bias that, although an analytical process was established in this research thematic analysis, still plays a factor when evaluating and interpreting qualitative data.

Table 23 shows an aggregated analysis and interpretation between the model results and the measurements used to perform such evaluation. The conclusion is that the coding analysis for all hypotheses demonstrated support for the proposed direct relationships. The table shows two of the transcription codes used for each of the analyzed hypotheses. In Appendix 9.3 all the relevant codes used for the evaluation are mapped according with its respective second order construct.

The following section will evaluate the conceptual model indirect relationships. The same evaluation method was used for the analysis to ensure for data result consistency and minimal bias.

First-order codes	Second -order codes	Conceptual model relationship	Support evidence from interviews	Aggregate dimension
Having the flexibility to be able to make changes down the line because the role of the end-user is kind of invaluable…	IMP	IMP -> SAT	✓✓	Supported with medium evidence (7 codes)
Go through those profiles and explaining why the company is implementing this and how can the system help them…	IMP	IMP -> SAT		
The mindset and culture are very important because they will make the adoption easier and the implementation more efficient…	TOE	TOE -> P&I	✓✓✓	Supported with strong evidence (9 codes)
It is critical that the client's IT teams frequently talk to the end-users for clear examples…	TOE	TOE -> P&I		
A key stage at an implementation is a moment where end-users start feel like they will not say anything anymore because they know nothing will happen…	UROL	UROL -> USE	✓✓✓	Supported with strong evidence (10 codes)
There was a clear benefit for everyone, for us the sooner we understood their exact doubts and the sooner we could act on them…	UROL	UROL -> USE		
I always want to make sure I am aligned with the client and the users, because that will ensure we are all on the same page in terms of long-term goals…	SAT	SAT -> ERPEFF	✓✓✓	Supported with strong evidence (11 codes)
It is a long-term investment, and you must have a management view to make sure that the customer is happy with this approach…	SAT	SAT -> ERPEFF		
The more end-users are involved from the beginning, the more prepared and equipped…	P&I	P&I -> ERPEFF	✓✓✓	Supported with strong evidence (10 codes)
The main critical success factor of an implementation is exactly the involvement of the users. This is, by far, the main goal…	P&I	P&I -> ERPEFF		
It is different to show the user what a system or a process looks like and giving them the opportunity to use and test the system…	USE	USE -> ERPEFF	✓✓	Supported with medium evidence (6 codes)
I think that for any project, the goal is to deploy a solution that will continue to be used for…	USE	USE -> ERPEFF		

Table 23. Research qualitative analysis results: direct variables (Source: author, adapted from MaxQDA)

5.2.2.3. Qualitative results mediator variables

To evaluate the mediator variables and the model indirect relationships this research used the same process as the one used for the direct relationship analysis. The only difference between the two analysis is that the second-order codes had to be analyzed together as the integrated relationship required the integration and evaluation of two codes. Therefore, the analysis used a larger coding set, as integrated all the relevant codes for two variables, but evaluated the relationship of such integrating with the ERP Efficiency variable. Additionally, only codes that were considered both relevant and used to support direct relationships were used in the indirect analysis.

Following the same the same process, the initial indirect hypothesis analysis is detailed below in a bullet format for interpretive consistency.

- **Ha** – ERP Individual User Impact and Satisfaction showed strong evidence, with 12 support codes, to demonstrate qualitative correlation with ERP Efficiency.
- **Hb** – Technology Organization Environment and Participation & Involvement showed strong evidence, with 14 support codes, to demonstrate qualitative correlation with ERP Efficiency.
- **Hc** – ERP User Role and Usage showed strong evidence, with 10 support codes, to demonstrate qualitative correlation with ERP Efficiency.

All the indirect relationships demonstrated a strong support from the relevant codes considered for the analysis. For Ha 18 relevant codes were evaluated and 12 supported the relationship being tested. For Hb 19 relevant codes were evaluated and 14 supported the indirect relationship between the e variables. Lastly, for Hc 16 relevant codes were evaluated and 10 supported the relationship. These are not surprising results considering the direct relationship testing and the strong relationships identified in such analysis.

Table 24 aggregates the analysis, similarly to the mapping done for table 23, and enhances the conclusion that all indirect relationships demonstrated a solid support. Similarly, to what was mentioned before, appendix 9.3 highlights all the codes collected in the interviews. The consistent rules between the direct and indirect variable relationship will allow for a structured approach when introducing these results to the discussion where they will be compared with both the quantitative and literature analysis.

The following section will discuss the results and add the Future Project Actions code to the analysis. This code was added later to the process and aims to discuss future actions that can be used in both frameworks and methodologies for ERP long-term strategic plans.

First-order codes	Second-order codes	Conceptual model relationship	Support evidence from interviews	Aggregate dimension
Having the flexibility to be able to make changes down the line because the role of the end-user is kind of invaluable…	IMP & SAT	IMP -> SAT -> ERPEFF	✓✓	Supported with strong evidence (12 codes)
It is a long-term investment, and you must have a management view…		IMP -> SAT -> ERPEFF		
It is critical that the client's IT teams frequently talk to the end-users for clear examples…	TOE & P&I	TOE -> P&I -> ERPEFF	✓✓✓	Supported with strong evidence (14 codes)
The more end-users are involved from the beginning, the more prepared…		TOE -> P&I -> ERPEFF		
A key stage at an implementation is a moment where end-users start feel like they will not say anything anymore…	UROL & USE	UROL -> USE -> ERPEFF	✓✓✓	Supported with strong evidence (10 codes)
I think that for any project, the goal is to deploy a solution that will continue to be used for…		UROL -> USE -> ERPEFF		

Table 24.Research qualitative analysis results: mediator variables (Source: author, adapted MaxQDA)

5.2.2.4. Qualitative results discussion

The results of the qualitative analysis showed a strong positive support for both direct and indirect relationships. The hypotheses were successfully validated by analyzing the data collected in the interviews. The theoretical conclusions will be detailed in the following section, but it is relevant to highlight that for all 9 hypotheses, 6 direct and 3 indirect, 2 of them showed medium support and 7 showed strong support from the coding analysis. In short, the hypotheses tested were strongly supported by the codes collected in the expert interviews.

One of the additional parameters that was included after the interviewing process as a key code to analyze the interview transcript were the future project actions. This code was used to aggregate all suggestions or comments regarding frameworks enhancements or strategic inputs that the participants referenced throughout the interviews. The collected codes were analyzed following the

same process as the one used for the conceptual model ones. The results were aggregated based on two factor criteria which were recurrence and relevancy. These are two of the factors that are recommended by Gibbs (2012) as criteria to analyze individual codes (Gibbs, 2012). For consistency and interpretive practicality, the findings are presented below in a bullet format. The theoretical interpretation will be included in the discussion analysis where they will be analyzed together with the other results and parameters.

- Include system users in **demonstration sessions** for new implementations or solutions. The objective is that they are included when changes are introduced, and they can provide quick and efficient feedback.

- In demonstration session provide users with system **prototypes** that they can test and see the benefits from using such feature. That will enhance the adoption and account for any adjustments that may be needed in the standard solution.

- Regular **status meetings** where most users, or previously defined ones, are challenged to evaluate the system and propose improvements. This could be included in a strategic ERP framework.

- The client, and more specifically the users, should be the ones doing the **test script documents**. As they are the ones who know exactly what their daily processes are this will ensure that (the processes being tested are exactly the ones that they will be using. This applies for an implementation or any new solutions that requires testing.

There is always a level of individual biases when utilizing a qualitative analysis evaluation method. Therefore, it is recommended, for academic research purpose, that the qualitative results are integrated and compared with are data results to ensure conclusive consistency.

5.3. DISCUSSION ANALYSIS

This thesis combined three types of independent research methods each with their own discussions and conclusions. Each of the method had its specific purpose of this research. The literature review aimed to evaluate the past and current academic literature on the topic. The quantitative analysis collected data from over 100 ERP end-users to focus on the current experience that these users are having when operating the system. Lastly, for the qualitative analysis interviews to several ERP profiles were conducted to understand the experience and ideas that system developers, consultants and project managers have when approaching and ERP strategic plans. The final analysis section for this thesis will aggregate all the collected data and conclusion from each method to provide a conclusive summary on the findings.

The discussion analysis will evaluate this research in three different dimensions. The first dimension is the hypotheses analysis. All research methods utilized the same conceptual model and research hypotheses. Therefore, it is relevant to compare the findings and provide an aggregated validation to the discussed hypotheses based on all the method used. The second dimension is a theoretical analysis where the conceptual model and hypotheses conclusion will be evaluated together with the latest academic research on this topic. This differs from the literature review since this analysis will focus

specifically on this research findings and aims to evaluate them against other academic conclusions on this topic. The final dimension is a practical analysis. One of the most empathized factors throughout this research is the need for the conclusions to be practical and applicable in future research and frameworks. By comparing all research methods and the participant's feedback, this research will provide actionable recommendations that can be included and applied in future frameworks.

5.3.1. Hypotheses Analysis

This research thesis evaluated nine hypotheses where six were from direct relationships and three from indirect relationships. These hypotheses were built after the literature review and tested using quantitative and qualitative methods. In summary, all hypotheses were validated in both testing methods. Analyzing the quantitative results, 4 out of the 9 hypotheses were supported with large effect while the other 5 hypotheses were supported with medium effect. Therefore, 44% of the hypotheses demonstrated support with large effect and 56% demonstrated support with medium effect. Analyzing the qualitative results, 7 out of the 9 were supported with strong evidence while the other 2 hypotheses were supported with medium evidence. Therefore, 78% of the hypotheses demonstrated support with strong evidence and 22% demonstrated support with medium evidence.

Table 25 demonstrates the comparison between the quantitative and the qualitative results and shows that all variables were supported in this research. One key conclusion from the method results comparative analysis is that for 5 out of the 6 results for indirect relationship, which evaluates together the three paths mapped in the conceptual, demonstrate strong support which highlights the consistency of the results for such hypotheses.

Hypotheses	Quantitative results	Qualitative results
H1	Supported with large effect	Supported with medium evidence
H2	Supported with large effect	Supported with strong evidence
H3	Supported with medium effect	Supported with strong evidence
H4	Supported with medium effect	Supported with strong evidence
H5	Supported with medium effect	Supported with strong evidence
H6	Supported with medium effect	Supported with medium evidence
Ha	Supported with large effect	Supported with strong evidence
Hb	Supported with medium effect	Supported with strong evidence
Hc	Supported with large effect	Supported with strong evidence

Table 25. Research hypotheses result discussion (Source: author)

As a conclusion, the hypotheses were all consistently validate in both test methods used in this thesis and reassures the quality of the conceptual model determined through the literature review. The following section will aggregate the results presented above and the specific literature review on the topic.

5.3.2. Theoritical Analysis

The conceptual model research demonstrated that the ERP dimensions included in this study were supported by the CSF when attempting to achieve ERP efficiency. This is a difficult variable to define and research as efficiency may mean different things depending on the evaluation parameters. DeLone and McLean (2003) presented an updated version of their IS success model that has been serving as baseline for academic research on what impacts a successful, beneficial and efficiency IS (DeLone & McLean, 2003). Throughout the years, several academic papers have used this model and enhance by testing and incorporating variables that best fit their research. One example is Mardiana, et al (2015), when they include TAM and UTAUT to the IS success model to test the inclusion of external factors in this analysis (Mardiana et al., 2015).

This thesis incorporates Mardiana, et al (2015), arguments that the IS success model can be used as a model structure and theoretical concept, but other constructs can be used within such framework (Mardiana et al., 2015). This research does not use the same framework as the used in the two papers mentioned before, but it utilizes such structure and theoretical model to understand the relationship between ERP dimension and ERP CSF to ERP efficiency. Ultimately, this research concludes that such structure allows for a positive and significant relationship between different key variables.

The theoretical conclusion is that success or efficiency variables, within the ERP or IS field of study, can be used, and achieve significant relationships among the chosen variables. The argument that there should be a unified approach can be challenged by research such as this one, and others referenced in the lecture review. Additionally, the inevitable attachment between ERP and technology development will encourage a non-stagnant theoretical approach as all models will require constant testing and adjustments.

5.3.3. Practical Analysis

The last analysis dimension considered in this thesis is the practical recommendations that were collected throughout the research. These recommendations incorporate different dimensions of this thesis such as the participants feedback in both the questionnaires and the interviews, the literature review and ERP strategic framework. The recommendations will be presented below in a bullet format with the objective of being direct and applicable.

- There should be a higher involvement of end-user in ERP pre-implementation and implementation project stages.
- Users must be provided with system process training and be included in solution build and design.
- Testing must occur regularly and, when applicable, included end-users.
- The gap between consultants or internal system experts and end-users should be reduced.
- An organizational environment where management is available to listen and act upon end-user feedback.

- Regular status meeting to evaluate and collect end-user feedback must be included in all implementation stages.
- The promotion of positive end-user accountability on the processes that are being implemented.

6. CONCLUSIONS

ERP is, and will continue to be, a field in rapid development. Its attachment technological and organizational components will enhance the need for constant updates on the research that is done on the topic. Due to their organizational complexity, process coverage and financial commitment, ERPs must be addressed as part of the organization's long-term investment and strategic plans. Taking that into consideration, businesses must focus on addressing key aspects that will enhance the chances for the deployment of a successful, or efficient, ERP plan.

This research addressed the role of end-users in the development of an ERP continuous development strategy. The literature review highlighted the relationship between ERP dimensions and ERP user CSF and such relationship was used to create the conceptual model and the research hypothesis. The model tested the influence that ERP individual user impact has on user satisfaction, the influence of the TOE on participation and involvement and lastly the influence the user role has on system usage. All the CSF variables, and later the indirect relationships, were tested against the ERP efficiency variable.

This research aimed to collect data to test its hypotheses by combining both the end-user perspective and other ERP roles such as developers, consultants, and project managers. Therefore, a quantitative analysis was carried using questionnaires targeting ERP system end-users and evaluated with a PLS-SEM methodology. Additionally, a qualitative analysis was carried using expert interviews and evaluated through a thematic coding analysis. Both analyzes demonstrated support for all the hypotheses being tested. In short, the research concluded a positive impact will be translated into satisfied system end-users. An appropriate technological environment will lead to more participative and involved users. A user role that involves users in all project stages will contribute to a positive system usage. Lastly, all these variables demonstrated a positive impact on ERP efficiency, which means that they must be considered and addressed when developing a strategic ERP plan.

The ability to understand the special impact that end-users have in promoting and helping in the construction of an efficient ERP strategy, will enhance the chances for a better implemented and less costly system. Involving end-users early in process will give them the tools to better understand and utilize the system which will promote the creation of more efficient processes and a better equipped system. End-users are the most important agents for system acceptance. The more satisfied, participative, and equipped to properly use the system, the more they will promote it within the organization.

7. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORKS

Although this is a comprehensive research that highlights the relationship between literature, quantitative and qualitative research, there are some limitations that should be addressed in future studies. Traditionally, ERP have global templates and requirements, therefore it is relevant to address different markets and geographies as the data collected for this study, for both quantitative and qualitative methods, were from either Portugal or the United States.

Another enhancement that can be addressed to this study is to incorporate the conclusions in both an ERP methodology template and an implementation project. Despite the fact several ERP roles were included in the process, the different idiosyncrasies of a project may play a role in how these studies suggestions could potentially impact the overall project. Therefore, the recommendation is to segment the recommendations and, when applicable, apply them in a smaller and controlled environment to fully understand the depth of their application and potentially update some of them.

Lastly, one of the key takeaways from the qualitative analysis were the recommendations provided by the participants that enhanced the need for a refreshed outlook on some of the strategic frameworks used when approaching a long-term ERP project.

As a conclusion, the actual application of the recommendation in an IS implementation is the key next step to complement this research and provided the project validity that all academic studies and frameworks require when research this industry.

8. BIBLIOGRAPHY

Abreu, M. (2018). Adoção de ERP em Ambiente Cloud. *ISCTE Business School*.

Ağaoğlu, M., Yurtkoru, E. S., & Ekmekçi, A. K. (2015). The Effect of ERP Implementation CSFs on Business Performance: An Empirical Study on Users' Perception. *Procedia - Social and Behavioral Sciences*, *210*, 35–42. https://doi.org/10.1016/j.sbspro.2015.11.326

Bagozzi, R., & Yi, Y. (1988). *On the Evaluation of Structure Equation Models*. *January*. https://doi.org/10.1007/BF02723327

Baker, J. (2011). Informations Systems Theory: Vol.2. *Information Systems Theory*, *28*(Book), 461. https://doi.org/10.1007/978-1-4419-6108-2

Barki, H., & Benbasat, I. (2007). *Quo vadis,*. *8*(4), 211–218.

Barki, H., & Hartwick, J. (1994). *Measuring User Participation, User Involvement, and User Attitude*. *18*, 59–82.

Batada, I., & Rahman, A. (2012). Measuring System Performance & User Satisfaction after Implementation of ERP. *Proceedings of the 2012 InSITE Conference*, 603–611. https://doi.org/10.28945/1679

Bokhari, R. H. (2005). The relationship between system usage and user satisfaction: A meta-analysis. *Journal of Enterprise Information Management*, *18*(2), 211–234. https://doi.org/10.1108/17410390510579927

Bradford, M., Earp, J. B., & Grabski, S. (2014). Centralized end-to-end identity and access management and ERP systems: A multi-case analysis using the technology organization environment framework. *International Journal of Accounting Information Systems*, *15*(2), 149–165. https://doi.org/10.1016/j.accinf.2014.01.003

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Bueno, S., & Salmeron, J. L. (2008). TAM-based success modeling in ERP. *Interacting with Computers*, *20*(6), 515–523. https://doi.org/10.1016/j.intcom.2008.08.003

Candra, S. (2012). ERP Implementation Success and Knowledge Capability. *Procedia - Social and Behavioral Sciences*, *65*(ICIBSoS), 141–149. https://doi.org/10.1016/j.sbspro.2012.11.103

Costa, C. J., Aparicio, M., & Raposo, J. (2020). Determinants of the management learning performance in ERP context. *Heliyon*, *6*(4), e03689. https://doi.org/https://doi.org/10.1016/j.heliyon.2020.e03689

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, *35*(8), 982–1003. https://doi.org/10.1287/mnsc.35.8.982

Dechow, N., & Mouritsen, J. (2005). Enterprise resource planning systems, management control and the quest for integration. *Accounting, Organizations and Society*, *30*(7–8), 691–733. https://doi.org/10.1016/j.aos.2004.11.004

DeLone, W., & McLean, E. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, *19*(5), 9–20.

Dias, Á., Silva, G. M., Patuleia, M., & Rosario, M. (2020). Developing sustainable business models : local knowledge acquisition and tourism lifestyle entrepreneurship Developing sustainable business models : local knowledge. *Journal of Sustainable Tourism*, *0*(0), 1–20. https://doi.org/10.1080/09669582.2020.1835931

Falk, R. F., & Miller, N. B. (1992). *A Primer for Soft Modeling*. *April*.

Ferreira, E. (2015). *ENTERPRISE RESOURCE PLANNING ADOPTION AND SATISFACTION DETERMINANTS*.

Fornell, C., & Larcker, D. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50.

Gibbs, G. (2012). Thematic Coding and Categorizing. *Analyzing Qualitative Data*, 38–55. https://doi.org/10.4135/9781849208574.n4

Haddara, M., & Moen, H. (2017). User resistance in ERP implementations: A literature review. *Procedia Computer Science*, *121*, 859–865. https://doi.org/https://doi.org/10.1016/j.procs.2017.11.111

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). *A new criterion for assessing discriminant validity in variance-based structural equation modeling*. 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hietala, H. (2020). *Benefits Realisation in Post-Implementation Development of ERP Systems*. 83.

Jayawickrama, U., Liu, S., & Hudson Smith, M. (2016). Empirical evidence of an integrative knowledge competence framework for ERP systems implementation in UK industries. *Computers in Industry*, *82*, 205–223. https://doi.org/10.1016/j.compind.2016.07.005

Jia, Q., Guo, Y., & Barnes, S. J. (2017). Enterprise 2.0 post-adoption: Extending the information system continuance model based on the technology-Organization-environment framework. *Computers in Human Behavior*, *67*, 95–105. https://doi.org/10.1016/j.chb.2016.10.022

Ju, P.-H., Wei, H.-L., & Tsai, C.-C. (2016). Model of post-implementation user participation within ERP advice network. *Asia Pacific Management Review*, *21*(2), 92–101. https://doi.org/https://doi.org/10.1016/j.apmrv.2015.11.001

Kallunki, J. P., Laitinen, E. K., & Silvola, H. (2011). Impact of enterprise resource planning systems on management control systems and firm performance. *International Journal of Accounting Information Systems*, *12*(1), 20–39. https://doi.org/10.1016/j.accinf.2010.02.001

Kerr, D., & Houghton, L. (2014). The dark side of ERP implementations: narratives of domination, confusion and disruptive ambiguity. *Critical Studies in Innovation*, *32*(3). https://www.tandfonline.com/doi/abs/10.1080/08109028.2015.1017247

King, N., & Christine Horrocks. (2010). *Interviews in qualitative research* (6th ed.). SAGE.

Law, C. C. H., & Ngai, E. W. T. (2007). ERP systems adoption: An exploratory study of the organizational factors and impacts of ERP success. *Information and Management*, *44*(4), 418–432. https://doi.org/10.1016/j.im.2007.03.004

Lombardi, D. R., Vasarhelyi, M. A., & Verver, J. (2014). Continuous controls monitoring: A case study.

Journal of Emerging Technologies in Accounting, *11*(1), 83–95. https://doi.org/10.2308/jeta-51006

Mardiana, S., Tjakraatmadja, J. H., & Aprianingsih, A. (2015). DeLone-Mclean information system success model revisited: The separation of intention to Use - Use and the integration of technology acceptance models. *International Journal of Economics and Financial Issues*, *5*(July), 172–182.

Matende, S., & Ogao, P. (2013). Enterprise Resource Planning (ERP) System Implementation: A Case for User Participation. *Procedia Technology*, *9*, 518–526. https://doi.org/10.1016/j.protcy.2013.12.058

Oseni, T., Foster, S., Rahim, M., & Smith, S. P. (2017). A framework for ERP post-implementation amendments: A literature analysis. *Australasian Journal of Information Systems*, *21*(June), 0–21. https://doi.org/10.3127/ajis.v21i0.1268

Queiroz, M., Tallon, P. P., Coltman, T., Sharma, R., & Reynolds, P. (2020). Aligning the IT portfolio with business strategy: Evidence for complementarity of corporate and business unit alignment. *The Journal of Strategic Information Systems*, *29*(3), 101623. https://doi.org/https://doi.org/10.1016/j.jsis.2020.101623

Rajan, C. A., & Baral, R. (2015). Adoption of ERP system: An empirical study of factors influencing the usage of ERP and its impact on end user. *IIMB Management Review*, *27*(2), 105–117. https://doi.org/https://doi.org/10.1016/j.iimb.2015.04.008

Rezvani, A., Chang, A., Wiewiora, A., Ashkanasy, N. M., Jordan, P. J., & Zolin, R. (2016). Manager emotional intelligence and project success: The mediating role of job satisfaction and trust. *International Journal of Project Management*, *34*(7), 1112–1122. https://doi.org/10.1016/j.ijproman.2016.05.012

Rezvani, A., Khosravi, P., & Dong, L. (2017). Motivating users toward continued usage of information systems: Self-determination theory perspective. *Computers in Human Behavior*, *76*, 263–275. https://doi.org/10.1016/j.chb.2017.07.032

Rihoux, B., & Ragin, C. (2008). *Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques*. SAGE Publications.

Ringle, C. M., & Wende, S., Will, A. (2015). *SmartPLS3.0.* www.smartpls.de.

Ritchie, J., Lewis, J., McNaughton Nicholls, C., & Ormston, R. (2003). *Qualitative Research Practice: A Guide for Social Science Students and Researchers*.

Ruivo, P., Johansson, B., Sarker, S., & Oliveira, T. (2020). The relationship between ERP capabilities, use, and value. *Computers in Industry*, *117*, 103209. https://doi.org/https://doi.org/10.1016/j.compind.2020.103209

Ruivo, P., Rodrigues, J., Johansson, B., Oliveira, T., & Rebelo, J. (2016). Using TOE and RBV Theories to Define a Theoretical Model to Assess ERP Value Across Iberian MANUFACTURING and Services SMEs. *Procedia Computer Science*, *100*, 474–479. https://doi.org/10.1016/j.procs.2016.09.184

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). *Partial Least Squares Structural Equation Modeling* (Issue September). https://doi.org/10.1007/978-3-319-05542-8

Saxena, D., & Mcdonagh, J. (2019). Evaluating ERP Implementations: The Case for a Lifecycle-based Interpretive Approach. *The Electronic Journal Information Systems Evaluation*, *22*(1), 29–37.

Shao, Z., Feng, Y., & Hu, Q. (2017). Impact of top management leadership styles on ERP assimilation and the role of organizational learning. *Information & Management*, *54*(7), 902–919. https://doi.org/https://doi.org/10.1016/j.im.2017.01.005

Supriyono, S., & Sutiah, S. (2020). *Improvement of Project Management Using Accelerated SAP Method in the Odoo ERP*. 1–9. https://doi.org/10.4108/eai.3-8-2019.2290729

Wong, K. K. K.-K. (2013). 28/05 - Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin*, *24*(1), 1–32. http://marketing-bulletin.massey.ac.nz/v24/mb_v24_t1_wong.pdf%5Cnhttp://www.researchgate.net/profile/Ken_Wong10/publication/268449353_Partial_Least_Squares_Structural_Equation_Modeling_(PLS-SEM)_Techniques_Using_SmartPLS/links/54773b1b0cf293e2da25e3f3.pdf

Wu, J.-H., & Wang, Y.-M. (2007). Measuring ERP success: The key-users' viewpoint of the ERP to produce a viable IS in the organization. *Computers in Human Behavior*, *23*(3), 1582–1596. https://doi.org/https://doi.org/10.1016/j.chb.2005.07.005

Wu, W.-W. (2011). Segmenting and mining the ERP users' perceived benefits using the rough set approach. *Expert Systems with Applications*, *38*(6), 6940–6948. https://doi.org/https://doi.org/10.1016/j.eswa.2010.12.030

Xue, Y., Liang, H., Boulton, W. R., & Snyder, C. A. (2005). ERP implementation failures in China: Case studies with implications for ERP vendors. *International Journal of Production Economics*, *97*(3), 279–295. https://doi.org/10.1016/j.ijpe.2004.07.008

Zhang, Y., Sun, J., Yang, Z., & Wang, Y. (2020). Critical success factors of green innovation: Technology, organization and environment readiness. *Journal of Cleaner Production*, *264*, 121701. https://doi.org/10.1016/j.jclepro.2020.121701

9. APPENDIX

9.1. QUESTIONNAIRE QUESTIONS

9.1.1. Questionnaire Consent and ERP Experience Validation

Dear participant,

The present survey aims to understand the perceptions and motivations about your ERP experience.

ERP refers to enterprise resource planning which is a type of software that organizations use to manage day-to-day business activities such as accounting, procurement, project management, risk management and compliance, and supply chain operations.

This research is conducted by a NOVA IMS student of a Master's Degree in Information Management. Answers are completely anonymous and will be accessed ONLY for academic purposes.

You will take approximately 10 minutes to answer.

If you have any questions, comments or feedbacks please contact me at m20190118@novaims.unl.pt.

Thank you very much for your participation!

Informed Consent Form

By agreeing with this form, I declare that I am over 18 years old and agree to participate in this research. I declare that I was informed that my participation in this study is voluntary and that I can leave this survey at any time without penalty. I am aware that my responses are anonymous, and that all data is collected for the sole purpose of the academic research. I understand that this study does not offer any serious risks.

Yes, I agree to participate.

No, I do not agree to participate.

(End questionnaire if answer is *No, I do not agree to participate*)

ERP System End-User

In the context of this study, end-users, or system-users, considers the individuals in which their daily work and tasks are performed using an ERP software.

Are you a current or former ERP system end-user?

Yes

No

(End questionnaire if answer is *No*)

9.1.2. Section 1. Individual User Impact

Select your level of agreement with the following statements regarding the impact of an ERP software in your daily work.

	Totally disagree	**Somewhat disagree**	**Somewhat agree**	**Totally agree**
Using an ERP system improves my performance.				
Using an ERP system increases my productivity.				
ERP and its components are an important and a valuable help in the execution of my daily work.				
The ERP system provides accurate information about how well, or poorly, I am executing my job.				
The ERP system provides reliable information about how well, or poorly, I am executing my job.				

9.1.3. Section 2. Technology Organization Environment

Select your level of agreement with the following statements regarding the impact of an ERP software in your daily work.

	Totally disagree	**Somewhat disagree**	**Somewhat agree**	**Totally agree**
I know what to do when I need any assistance with our ERP system.				
In my organization, we get an efficient technical support for our ERP system.				
The company ERP environment has positive impact in my adaption to the ERP system.				

9.1.4. Section 3. ERP User Role

Select your level of agreement with the following statements regarding the impact of an ERP software in your daily work.

	Totally disagree	Somewhat disagree	Somewhat agree	Totally agree
I feel like I have valuable inputs in deciding how I use the ERP system in my work.				
My feelings toward ERP system are taken into consideration.				
I am free to express my ideas and opinions when using the ERP system.				
I feel like additional end-user responsibilities lead to stronger and better configured systems.				
I feel like end-users should be included in all stages of an ERP project.				

9.1.5. Section 4. Satisfaction

Select your level of agreement with the following statements regarding the impact of an ERP software in your daily work.

	Totally disagree	Somewhat disagree	Somewhat agree	Totally agree
Overall, I like working with an ERP system.				
I feel satisfied when I work in an ERP system.				

ERP Project Participation

Have you ever participated in an ERP implementation project?

Yes

No

(Advance to section 6 if answer is *No*)

9.1.6. Section 5. Participation & Involvement

For the next questions, please consider the following ERP project phases:

- Phase 1: Pre-implementation (preparation and planning)
- Phase 2: Implementation (configuration and testing)
- Phase 3: Post-implementation (deployment and system utilization)

Select the best option when determining an ERP impact in your daily work.

	Totally disagree	Somewhat disagree	Somewhat agree	Totally agree
I wish I were more involved during the pre-implementation phase of the ERP project.				
I wish I were more involved during the implementation phase of the ERP project.				
I wish I were more involved during the post-implementation phase of the ERP project.				
I would rather be involved earlier in an ERP implementation.				
If I were included early and had more responsibilities in the implementation, my overall commitment would be higher.				

9.1.7. Section 6. System Usage

Select your level of agreement with the following statements regarding the impact of an ERP software in your daily work.

	Totally disagree	Somewhat disagree	Somewhat agree	Totally agree
I find the ERP system to be useful in my daily tasks.				
My interactions with an ERP system are clear and understandable.				
I find an ERP system to be easy to use.				
I find it easy to get the ERP system to do what I want it to do.				
I intend to use the ERP system for performing my job as often as need.				
I prefer to use an ERP system over manual tasks.				

9.1.8. Section 7. ERP long-term Efficiency

Select the best option when determining an ERP impact in your daily work.

	Totally disagree	Somewhat disagree	Somewhat agree	Totally agree
I intend to continue to use the system in the future.				
I want to use an ERP in my future job.				
The long-term success of and ERP implementation depends heavily on the end-users.				
I would like to be more involved in a future implementation.				

9.1.9. Section 8. Background Assessment

1. **Age**

(Answer must be a number)

2. **Gender**
    - *a.* Female
    - *b.* Male
    - *c.* Other
    - *d.* Prefer not to respond.

(Mandatory to select one option)

3. **Education Level**
    - *a.* Less than high school
    - *b.* High-school degree
    - *c.* College degree
    - *d.* Master's degree
    - *e.* PhD
    - *f.* PostDoc
    - *g.* Other (please specify)

(Mandatory to select one option)

4. **Industry**
    - *a.* Airline
    - *b.* Automotive
    - *c.* Banking
    - *d.* Energy
    - *e.* Entertainment
    - *f.* Finance
    - *g.* Food & Beverage
    - *h.* Government

i. Health
j. Hospitality
k. Human Resources
l. Manufacturing
m. Pharmaceutical
n. Real Estate
o. Retail
p. Technology
q. Telecommunications
r. Transports
s. Other (please specify)

(Mandatory to select one option)

5. **Main work location (city, country)**

(Answer must be text)

6. **Organization size**
    a. Less 100
    b. 100 – 500
    c. 500 – 1000
    d. More 1000

(Mandatory to select one option)

7. **Organizational role**
    a. Finance & Accounting
    b. Human Resources
    c. Logistics
    d. Marketing
    e. Procurement
    f. R&D
    g. Sales
    h. Technology
    i. Other (please specify)

(Mandatory to select one or more options)

8. **Hierarchical role**
    a. Junior
    b. Senior
    c. Project Manager
    d. Operational
    e. Other (please specify)

(Mandatory to select one option)

9. **ERP modules**
    a. BI
    b. CRM
    c. Finance & Accounting
    d. Logistics
    e. Real Estate
    f. Sales
    g. SRM
    h. Treasury

(Mandatory to select one or more options)

10. **How long have your worked with an ERP?**

(Answer must be a number)

11. **ERP providers**
    a. SAP
    b. Oracle
    c. SAS
    d. SAGE
    e. PHC
    f. Primavera
    g. Other (please specify)

(Mandatory to select one or more options)

9.2. INTERVIEW SCRIPTS

9.2.1. ERP Provider

- **Section 1. Overview**
  - In your perspective, what role must end-users play in an ERP implementation?
  - What are some of the critical factors for ERP long-term success?
  - What is the appropriate level of technology that an organization must have to benefit from long-term ERP success?
  - What is your perspective on including end-users earlier in an ERP implementation project?
  - Would be beneficial to have a user led ERP continuous development department or program?

- **Section 2. Individual questions for ERP provider**
  - What is your level of concern about the end-user in the process of system creation and design?
  - Do you collect end-user feedback from the system? If yes, how do you use them?
  - How do you incorporate the end-user in your implementation frameworks?
  - What is the ideal degree of involvement and system understanding that an end-user must have?
  - Are end-users a critical success factor in an ERP implementation?

9.2.2. ERP Vendor

- **Section 1. Overview**
  - In your perspective, what role must end-users play in an ERP implementation?
  - What are some of the critical factors for ERP long-term success?
  - What is the appropriate level of technology that an organization must have to benefit from long-term ERP success?
  - What is your perspective on including end-users earlier in an ERP implementation project?
  - Would be beneficial to have a user led ERP continuous development department or program?

- **Section 2. Individual questions for ERP vendor**
  - What is the level of concern that clients have on end-user input, training, and preparation?
  - What is the standard/recommended level of inclusion of an end-user in an ERP project?
  - Would you think that a higher end-user inclusion would lead less errors and better configured system?
  - What is the ideal degree of involvement and system understanding that an end-user must have?
  - Are end-users a critical success factor in an ERP implementation?

9.2.3. ERP Project Manager

- **Section 1. Overview**
  - In your perspective, what role must end-users play in an ERP implementation?
  - What are some of the critical factors for ERP long-term success?
  - What is the appropriate level of technology that an organization must have to benefit from long-term ERP success?
  - What is your perspective on including end-users earlier in an ERP implementation project?
  - Would be beneficial to have a user led ERP continuous development department or program?

- **Section 2. Individual questions for ERP project manager**
  - From your experience, how do end-users manage a new ERP implementation?
  - How do ensure end-user preparation?
  - Do you think inclusive end-user frameworks with regular system testing would allow for a more efficient system?
  - What is the ideal degree of involvement and system understanding that an end-user must have?
  - Are end-users a critical success factor in an ERP implementation?

9.3. INTERVIEW CODING TRANSCRIPTS

The coded transcripts were presented and analyzed according to the second-order coding structure presented in the research. All the codes considered relevant for the qualitative data analysis findings are mapped below and represent the interview transcriptions.

9.3.1. ERP Individual User Impact (IMP)

- It is important to involve them because you gain a lot in the future, and you end-up giving them the tools and molding them a little bit to what they will use.
- This has to do with the system no longer serving what we have. We can no longer use it for what we need and there are several requests and complaints where the users tell us that they need something different, something better, and in this case they it comes from all levels.
- Generation of user profiles. For example, we have user type A where they will need to accomplish task B and interact with these types of records, and we must ensure at the end of the day they are able to do all those things. We should go through and say that your product or system provides benefits for all those profiles.
- Go through those profiles and explaining why the company is implementing this and how can the system help them and how can they help the system matching those expectations.
- Having the flexibility to be able to make changes down the line because the role of the end-user is kind of invaluable. They are ultimately the ones who know what they want, but they also do not really know what they want until they see it.
- As part of our evaluation, we have something called an alignment call where I am bringing all kinds of the end-users or people who would be touching the system. Because to your point, there might not be people that are fully utilizing the system.
- I want to approach things slow making sure everyone is on-board and comfortable with what we are doing.
- End-users are the people that are really running the business on the ground. If they are not committed to the project as well, and they are not willing to move over and see the value that it could bring their day-to-day life, the project will not be successful.
- Those are the people that are going to be so resistant to change and to move forward. With that the implementation is never successful.
- Having people in a proper training environment where you can do practical cases in the test system will be much more beneficial and then in the go-live, in the post-go-live and in the hyper care you will notice that people already have a completely different understanding and more prepared.
- When you are a consultant, you do not go through any business, so you have no notion of the pains that many times the end users go through daily. I knew it was a completely different

system it had nothing to do with SAP, but I was aware of some of the things that you would find from day to day in the business and understanding that will create a connection between the consultant and the end-user.

- One of the biggest problems in the continuous improvement process is that the clients do not understand the process. They may know how to do the tasks, but they do not really know the processes. Knowing how to click buttons is not knowing the processes. I think preparation and process training is very worthwhile.

- Any system implementation implies in a first phase changes and costs, and these changes always have costs for people.

- Users have a great tendency to get complacent and do things in the same way, and they are comfortable, they have many comfort zones, and therefore new systems always take people out of these comfort zones in the first phase. That is why it is necessary to pay special attention to users during implementation.

9.3.2. Technology Organization Environment (TOE)

- The resistance of making the implementation or the introduction of the new system more successful relates to an environment where some users are identified as champions. For example, I am going to take these two or three individuals who are going to be my promoters within the company.

- Some companies have a very close-minded mentality and approach to business, in a sense that is very vertical which hinders and brings down the chances for a successful implementation.

- Maybe we will need more system functionalities because we have an environment where we have more champions, where we include more users and when we involve those people in the decision-making process. On the other hand, we may need additional system functionalities because of business requirements.

- I think it all depends on the budget and the client. When a company has an environment where each user plays a lot of hats, I think at the end of the day that is not the most efficient way to understand and resolve issues.

- There are very different roles in implementation, from technical, business requirements, support, IT, sales, etc. I think as much as you can separate those and have them owned individually, you can quickly approach and fully understand them.

- If you have a client who is not modernized, you will probably have a lot more work to provide and stabilize your solution. You should understand that as soon as possible to be sure you are providing a product that your client is prepared for at different levels.

- Part of my job in the beginning is to truly understand their long-term goals. Are they expanding? Moving to new warehouse? Different product lines? That is something that will

help us provide the best service and solution, because we are aligned with the client's goals and the environment that they want for its systems.

- It is critical that the client's IT teams frequently talk to the end-users for clear examples of day-to-day tasks.
- The company having that mindset is excellent. Because it is one thing having someone who only cares about the system usages, and it is another thing when they have a concern and focus for improvement. It is always going to be difficult because you are going to add work to people.
- The mindset and culture are very important because they will make the adoption easier and the implementation more efficient. I think the company should encourage people to look at the processes and explain that they are doing that because it will make their work better and more efficient.
- The issue of competition here is very critical. It is important to understand what others are doing, what our main competitors are doing and how they gain competitive advantages in developing their activities.
- Tomorrow my company has expanded to other geographies and opened more points of sale and has more than 100 employees. The business must be able to grow, and the system needs to follow such growth by being flexible and that is achieved by establishing a strong environment.

9.3.3. ERP User Role (UROL)

- That made all the difference and we have gained a lot in the future by having an implementation where people can enhance the tool and promote it within their teammate. The key is to have users as agents of change.
- A key stage at an implementation is a moment where end-users start feel like they will not say anything anymore because they know nothing will happen, or things will get even worse. The goal is to create achievable expectations of what it is possible and what it is not possible, to ensure everyone is always on the same page.
- I think it is a fine line between showing them what the system will look like, and then also be like, you will need time to play with it so you can fully understand what the best approach would be.
- I think efficiency is when you do not have a single person trying to do everything because at that point no one is having a good enough understanding of the requirements or the solution itself.
- Again, if there are only 5 people in the initial call, but I am told this company has, for example, 50 additional users from different departments, I am going to push to include all of them because it is never beneficial for someone to use all hats in a project.

- I think they should be involved and have participative roles in all stages. In stage 3 it is obvious since they are the ones using the system, in stage 2 for testing and other activities, but I also think they should be involved in phase 1 for them to understand the why and how of the process since, from my experience, most users are not aware what it takes for an implementation to be successful.

- There was a clear benefit for everyone, for us the sooner we understood their exact doubts and the sooner we could act on them. On the other hand, they also felt a better follow-up from us and from the person in charge. The communication was faster and more effective.

- When the customer creating the test scripts no matter how boring and complex, they are it usually decreases the number of errors later in the go-live Why? Because you have a system, or you have an ERP created from their perspective.

- In other words, I think that clearly if your test scripts were created by the client the process will go much better because we have a limited vision.

- I think that there should be a closer proximity so that we can correctly identify the problems and what the system can do and explain the involvement of the request to the customers so that they know where the pain is and really where they can be helped.

- No, it must be people that we recognize as having an added value to the organization and the ability to make positive contributions to the development of the system, not necessarily their hierarchical superiors. What is critical is to involve these people and explain to them the potential of the system. People need to realize that the system is going to make their work more efficient. If you can sell the system to these people, they will become real ambassadors.

- We when we are doing the diagnosis of the company it is important to address the different users that will be impacted during the implementation. Therefore, it is fundamental to include them in all phases and this must be planned in detail.

9.3.4. Satisfaction (SAT)

- I think that involving people is very beneficial, because it is the first step to show that you trust and support users or employees.

- If you do not involve them right at the beginning, it will be difficult for you to get them to be proactive in some way in the defense of the implementation or the project itself.

- It is super gratifying to get to the end and have the users say that the tool is with everything they had asked for. That makes all the difference. They are the ones that are going to use it, and it is also important for them to feel that they have participated and that there is a little bit of everyone in that system.

- Saying that the employees are happy because they can do that function much faster and they are not wasting hours, or that they are not confused. All these things, I think, are things that

at the end of the day end up being important, which is to add value and somehow bring some happiness to the end-users.

- Because I think without that conversation, someone will end- up being dissatisfied, right? Because the consultant was not able to get the requirements, and the client was not fully involved and at the end of the day the consultant will have to do more work to fix things and the client to pay more money. Because I think without that conversation, someone will end-up being dissatisfied, right? Because the consultant was not able to get the requirements, and the client was not fully involved and at the end of the day the consultant will have to do more work to fix things and the client to pay more money.

- And I think it is for the best that someone who obviously needs to understand them. That when you can take those rolls out of their hands in a way that is meaningful, in a way that will be helpful to them. That is just a key part of it. And then obviously, that usually results in them being very happy down the line.

- I always want to make sure I am aligned with the client and the users, because that will ensure we are all on the same page in terms of long-term goals and that everyone is comfortable with the things we propose and make this a strategic relationship more than just a project.

- It is important for the users to understand that when the report something we will be taking some action because that will create a trustworthy relationship which will allows to deliver a solution that they will be happy with.

- Those are the people that are going to be so resistant to change and to move forward. With that the implementation is never successful.

- The challenge is that users focus more on the day-to-day and always relate to their individual experience. The manager will have to integrate and incorporate that feedback and present a solution, after IT intervention, that will make users happy.

- If you think about it, if the project managers from the different functional areas do not communicate with the end-users that ultimate feeling from the user will be that they have implemented a system, but they do not see any benefit.

- The solution at the end will only be beneficial and have positive feedback if users are benefit and happy about. Including them all phases is crucial.

- You must care about the users. They are the people who will use the solution. Try to understand the requirement in a technical way and have the possibility to ask and challenge them to deliver the best solution. Have a vision in improving the solution and not just fulfilling what they need.

- It is a long-term investment, and you must have a management view to make sure that the customer is happy with this approach.

9.3.5. Participation & Involvement (P&I)

- It is critical that we include end-user not only because they are the ones that know what they do daily and their daily challenges, but above all, no one else can explain those things in detail like they can.
- it is always important to involve everyone, and we spent some time doing this survey, asking people, and involving people and even before the go-live we had several moments of demos to understand if we had covered all the requirements and if they were comfortable with the solution.
- An example from our implementation is that we introduced the tool to two end-user that immediately gave us ideas and feedback on how to shape to better suit their teams. That gave us the opportunity to adjust and include those changes. Without their participation that would not be possible.
- It is very difficult for people to not have an initial resistance to change. It is natural and therefore the more involved they are the better they will accept the new solution.
- We must be constantly getting feedback from the users. This makes a critical difference. If we fail do this and end-user are not benefiting from the tool, the confidence in the project and in the solution may be hindered and ultimately users may refuse to give us a second or third chance.
- It is important to involve them enough in all stages, but also give the consultants and technical teams to freely develop their work and present it for the users to test through demos for example.
- As part of our evaluation, we have something called an alignment call where I am bringing all kinds of the end-users or people who would be touching the system. Because to your point, there might not be people that are fully utilizing the system.
- The more end-users are involved from the beginning, the more prepared and equipped they will be to use the system. We are aware that almost all these individuals will not be involved in the decision making of purchasing solution A or B, but the earlier they are involved the more accepting they will be throughout the process.
- My motto is to have everyone involved from day one. From the CFO to the end-user since a joint decision will always be more solid.
- I know that when people are not involved earlier that is a red flag in the project.
- I think that the end-user should be involved in the first phase since that it when the business and solution requirements are established, and their input is critical.
- I think they should be involved and have participative roles in all stages. In stage 3 it is obvious since they are the ones using the system, in stage 2 for testing and other activities, but I also think they should be involved in phase 1 for them to understand the why and how of the

process since, from my experience, most users are not aware what it takes for an implementation to be successful.

- It is good to have a good balance between functional and technical team so we can involve end-users and let them know what the system can and cannot do for them.
- Consultants should emphasize the importance of status meetings where users are free to express their questions, doubts, or concerns in regard the implemented solution. This will enable consultants to fully identify the pain-points.
- I think that there should be a closer proximity so that we can correctly identify the problems and what the system can do and explain the involvement of the request to the customers so that they know where the pain is and really where they can be helped.
- Within all the users, you will have some that are naturally more accepting and positive of the process and those should be included and agents of change among the business.
- I find it critical because if these users reject the system, the entire investment is immediately lost.
- Users must be included and participate in all phases. There should be a significant presence in phases one and two because they can share concerns and ideas which you be positive later in the process. Also, having informal testing and demos would be positive because that will allow users to understand, accept and start becoming comfortable with the system.
- The main critical success factor of an implementation is exactly the involvement of the users. This is, by far, the main goal. A good implementation of the system and development of the company's system is not only about the information the users can give us about the fit of the system to the company and to our procedures, but also about the best adoption of the system by the users.
- It is critical to involve them in the process. Of course, you do not involve everybody, I mean that is where there is also planning of who to involve. Involve some key users who are sometimes informal leaders within the organizations and who influence others.
- Involving is a critical aspect in many different variables. Having participative users will speed the implementation process in both configuration, testing, adoption, etc. and increase the user's efficiency when using the system.
- We when we are doing the diagnosis of the company it is important to address the different users that will be impacted during the implementation. Therefore, it is fundamental to include them in all phases and this must be planned in detail.

9.3.6. Usage (USE)

- That is why we need to involve the end users and the people who use the system and use it daily because they can give us insights on what they are going to do or not do, what they want to do or not do as well, but then obviously that part of it.

- We should explain to people that there is this interface and that can now explore and try the process. We like to have the end-users using the system as often as they can before the go live. It gives them the opportunity to understand the new features and provide feedback.
- We must be constantly getting feedback from the users. This makes a critical difference. If we fail do this and end-user are not benefiting from the tool, the confidence in the project and in the solution may be hindered and ultimately users may refuse to give us a second or third chance.
- I think that for any project, the goal is to deploy a solution that will continue to be used for a long time.
- It is different to show the user what a system or a process looks like and giving them the opportunity to use and test the system.
- Because the implementation and the software may be great, but if the user is not using it in the most efficient way that will not be reflecting in overall system performance. Lots of things need to be address so that the user can fully experience of the system's features, capabilities, and functionalities.
- I always want to make sure I am aligned with the client and the users, because that will ensure we are all on the same page in terms of long-term goals and that everyone is comfortable with the things we propose and make this a strategic relationship more than just a project.
- There are things that will take a long time for a user to explain and for our account team to understand the requirements because, at times, the user does not fully know the process. Therefore, it is important to allow the user to know the process and not only the screens. This will facilitate communication and solution enhancements. Additionally, they will continue to use the old processes as they are the ones they know and are most comfortable with. So, it is important to maintain a strong communication.
- You must care about the users as they are the people who will use the solution. Try to understand the requirement in a technical way and have the possibility to ask and challenge them to deliver the best solution. Have a vision in improving the solution and not just fulfilling what they need.
- The end user-only frequently only knows small processes and have no idea what the full capabilities of the system.
- It would be important for the client to know the system better because we would ensure that requests were raised with higher quality, and we would avoid unnecessary requests being made for the faulty situation.

9.3.7. ERP Efficiency (ERPEFF)

- One of the most important things when implementing an ERP software is the partner. A high percentage of success comes from choosing the right partner.

- Those are the people that are going to be so resistant to change and to move forward. With that the implementation is never successful.
- The goal for us is to feel that, at the end of the day, we added value to the client. It could be a faster process, a new functionality, a simplification, or automation.
- For an implementation to be successful, there is always a financial component associated with it. It is not the only factor, but it is a key one. There are also organization factors that need to be accounted for when addressing a long-term strategy, because the goal is to ensure the system adds value to our business and the user are satisfied with the new tool.
- A key stage at an implementation is a moment where end-users start feel like they will not say anything anymore because they know nothing will happen, or things will get even worse. The goal is to create achievable expectations of what it is possible and what it is not possible, to ensure everyone is always on the same page.
- I think efficiency is when you do not have a single person trying to do everything because at that point no one is having a good enough understanding of the requirements or the solution itself.
- It is important to understand that most requests and implementations have strict deadlines, therefore a full commitment and a detailed roadmap is needed to ensure everyone is on board earlier in the process.
- The same way we should include different sets of end-users, different consultant profiles must be included such as functional, technical, sales, etc. Since the solutions are always changing, having those profiles will ensure the client will have the most accurate information.
- Our methodology is different than most industry standards, especially when compared to the software giants. We take the leading practices within the industry and apply it to our offer incorporate expert teams in each of the sector of that industry. We have a pre-built solution based on all those leading practice and years of experience. Of course, every company then has the chance to adapt those processes to best suite their business.
- The more end-users are involved from the beginning, the more prepared and equipped they will be to use the system. We are aware that almost all these individuals will not be involved in the decision making of purchasing solution A or B, but the earlier they are involved the more accepting they will be throughout the process.
- My motto is to have everyone involved from day one. From the CFO to the end-user since a joint decision will always be more solid.
- I always feel less comfortable when the end-users are not involved earlier because I know that means there will be more questions during the implementation, and I will not fully know what their concerns and expectations were.
- I know that when people are not involved earlier that is a red flag in the project.

- We offer an integrated solution with a diverse team from consultant and technical profiles to sales and pre-sales, therefore it is easy for us to understand the client. It is critical to have a multi-function team in all stages of the process.
- The solution at the end will only be beneficial and have positive feedback if users are benefit and happy about. Including them all phases is crucial.
- I think it is critical to involve technical profiles. Usually more senior as those profiles will enable the connection between the user and functional request to the system's feasibility.
- It is a long-term investment, and you must have a management view to make sure that the customer is happy with this approach.
- These are investments in long-lasting assets and therefore we cannot risk that in five years the software will disappear.
- The ability that the system must be integrated with other systems already existing in the company. This is also very important.
- The success of the company and the ability of the company is to be competitive and to be beating the competitors and to what extent the system has helped that.
- Therefore, it is critical to include the end-users in all phases and this must be planned in detail.
- It is very important that people challenge the system and propose changes. That is why we want flexible systems and that.

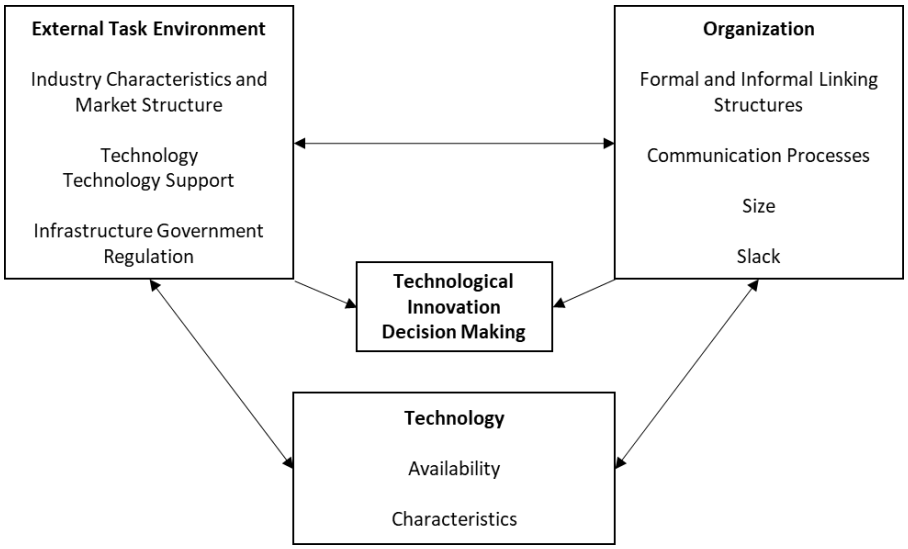
9.3.8. Future Project Actions (FPA)

- Include demos in all stages of an implementation or every time new solutions are introduced. Also, these demos should constantly, and the user should have access to the demos so they can also use and experience them in the system even if it is not the final product.
- A key stage at an implementation is a moment where end-users start feel like they will not say anything anymore because they know nothing will happen, or things will get even worse. The goal is to create achievable expectations of what it is possible and what it is not possible, to ensure everyone is always on the same page.
- Incorporate different roles when addressing a new solution. Having sales, technical and functional roles will facilitate the process of understanding the client's requirements and provide an accurate feedback of what is possible and what is an additional development.
- I think there should always be a well-defined implementation or project methodology. This methodology must be specific for the industry that your clients operate in because that expedited the implementation and ensures a specialized team that is aware of the system and the client’s business model.

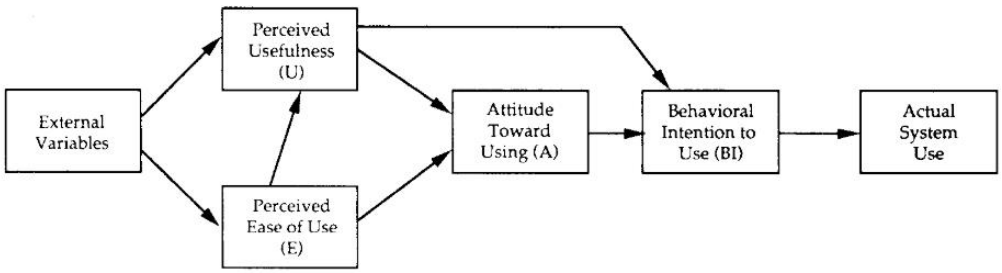
- It would be very nice to always have one or two people from the business to be constantly working with you on the implementation project.
- There was a clear benefit for everyone, for us the sooner we understood their exact doubts and the sooner we could act on them. On the other hand, they also felt a better follow-up from us and from the person in charge. The communication was faster and more effective.
- When the customer creating the test scripts no matter how boring and complex, they are it usually decreases the number of errors later in the go-live Why? Because you have a system, or you have an ERP created from their perspective.
- I think there should be a greater investment in phase 1 to ensure a better understanding on the client's requirements.
- It would be beneficial to include technical profiles in the discussion because they will bring a different perspective to the discussion. They will provide a quick technical analysis on the requirements raised by the client and quickly align with the functional team. They will ensure the requirements are well established and the functional specifications are created according with such feedback.
- Having a prototype would be something very important.
- Use of prototypes and inclusion of end customers in all phases.
- There must be a good planning to allow time for these types of tasks and to provide more robust solutions. A good relationship between manager, team, and client.
- Consultants should emphasize the importance of status meetings where users are free to express their questions, doubts, or concerns in regard the implemented solution. This will enable consultants to fully identify the pain-points.
- Set measurable goals to facilitate the evaluation of a project in all different stages. In short, set success targets in phase 1 of an implementation and monitor them throughout the system life cycle.
- Goals should be set with a long-term mindset as ERP implementations are long-term investments.
- Involving is a critical aspect in many different variables. Having participative users will speed the implementation process in both configuration, testing, adoption, etc. and increase the user's efficiency when using the system.
- There should be periodic evaluations of the implementation and use of the system. These evaluations can be done through periodic written reports. Ideally, there should be times when people make evaluations of the implementation and how things are going, and there should times when the system is evaluated in many different areas.

10.ANNEXES

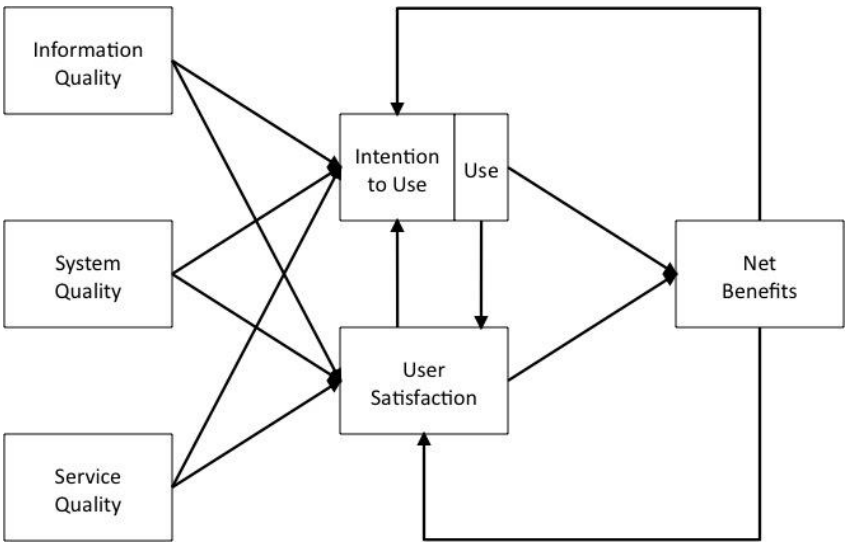
10.1. TECHNOLOGY ORGANIZATION FRAMEWORK



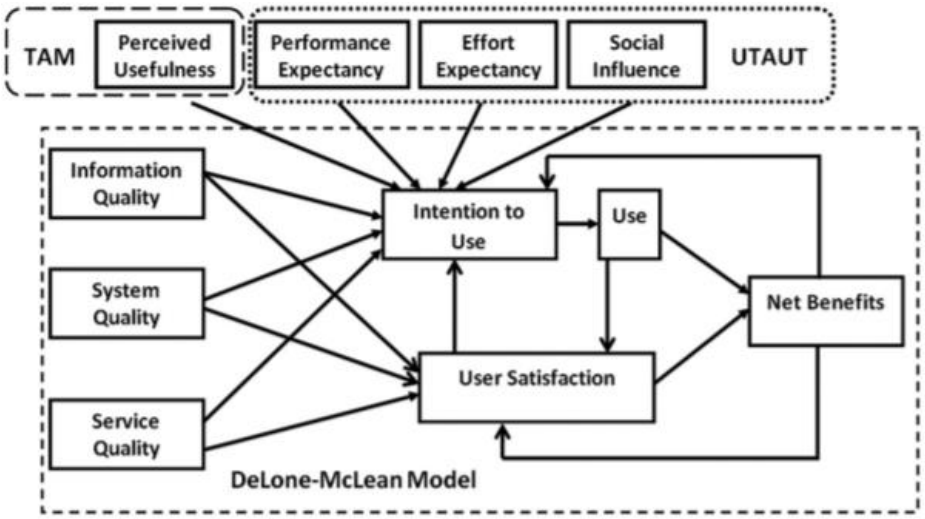
10.2. TECHNOLOGY ACCEPTANCE MODEL



10.3. INFORMATION SYSTEM SUCCESS MODEL

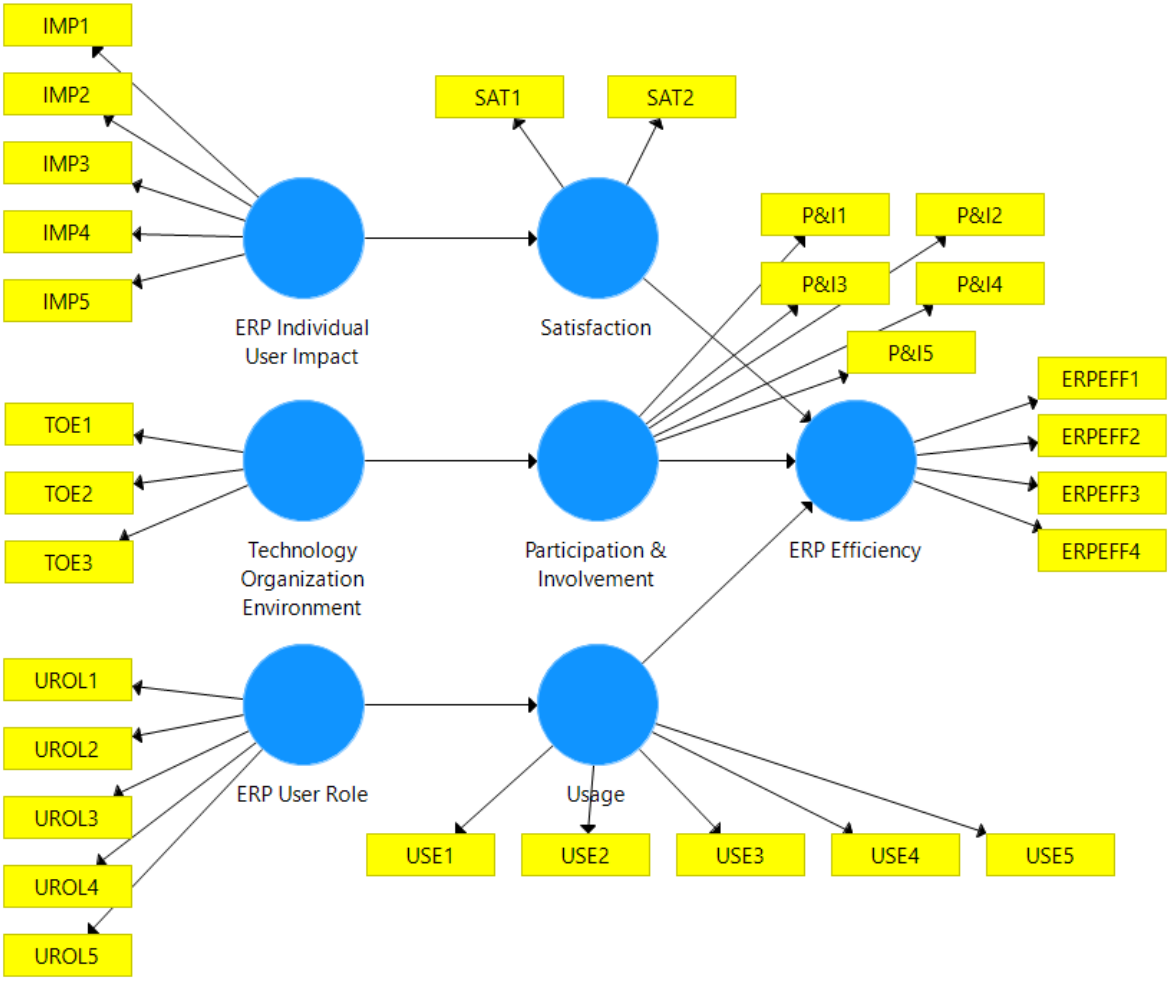


10.4. INFORMATION SYSTEM SUCCESS MODEL – EXTENDED



10.5. PLS Results Overview

10.5.1. Smart PLS mesurment model



10.5.2. Construct reliability and validity

	Cronbach's alpha	rho_A	Composite reliability	AVE
IMP	0.808	0.845	0.86	0.553
TOE	0.754	0.764	0.858	0.669
UROL	0.746	0.754	0.833	0.502
SAT	0.934	0.938	0.968	0.938
P&I	0.931	0.935	0.948	0.785
USE	0.850	0.872	0.894	0.631
ERPEFF	0.738	0.833	0.836	0.575

10.5.3. Collinearity statistics (VIF)

	VIF
IMP1	1.515
IMP2	2.132
IMP3	1.593
IMP4	2.879
IMP5	3.075
TOE1	1.678
TOE2	1.739
TOE3	1.343
UROL1	2.130
UROL2	2.504
UROL3	1.682
UROL4	1.430
UROL5	1.383
SAT1	4.332
SAT2	4.332
P&I1	4.346
P&I2	3.937
P&I3	4.406
P&I4	2.646
P&I5	3.699
USE1	1.740
USE2	2.512
USE3	1.649
USE4	2.617
USE5	2.778
ERPEFF1	4.274
ERPEFF2	4.618
ERPEFF3	1.149
ERPEFF4	1.286

10.5.4. Cronbach's alpha

	Cronbach's alpha
IMP	0.808
TOE	0.754
UROL	0.746
SAT	0.934
P&I	0.931
USE	0.850
ERPEFF	0.738

10.5.5. Latent variable correlations

	IMP	TOE	UROL	SAT	P&I	USE	ERPEFF
IMP	**1.000**	0.592	0.636	0.566	0.147	0.527	0.429
TOE	0.592	**1.000**	0.646	0.456	0.287	0.609	0.421
UROL	0.636	0.646	**1.000**	0.493	0.290	0.575	0.418
SAT	0.566	0.456	0.493	**1.000**	0.077	0.678	0.706
P&I	0.147	0.287	0.290	0.077	**1.000**	0.228	0.319
USE	0.527	0.609	0.575	0.678	0.228	**1.000**	0.752
ERPEFF	0.429	0.421	0.418	0.706	0.319	0.752	**1.000**

10.5.6. R square

	R^2
SAT	0.321
P&I	0.082
USE	0.314
ERPEFF	0.670

10.5.7. Cross loadings

	IMP	TOE	UROL	SAT	P&I	USE	ERPEFF
IMP1	0.733	0.289	0.344	0.406	-0.027	0.290	0.314
IMP2	0.866	0.662	0.668	0.532	0.169	0.522	0.352
IMP3	0.774	0.370	0.426	0.523	0.111	0.586	0.468
IMP4	0.660	0.458	0.467	0.262	0.151	0.207	0.180
IMP5	0.666	0.425	0.467	0.239	0.184	0.133	0.144
TOE1	0.392	0.798	0.475	0.310	0.189	0.510	0.321
TOE2	0.387	0.852	0.523	0.242	0.247	0.437	0.265
TOE3	0.647	0.802	0.575	0.546	0.256	0.549	0.438
UROL1	0.482	0.475	0.759	0.360	0.027	0.464	0.224
UROL2	0.436	0.473	0.785	0.21	0.120	0.399	0.179
UROL3	0.441	0.468	0.762	0.366	0.112	0.404	0.233
UROL4	0.369	0.288	0.567	0.360	0.411	0.348	0.420
UROL5	0.510	0.559	0.645	0.410	0.409	0.407	0.451
SAT1	0.561	0.457	0.498	0.971	0.077	0.691	0.712
SAT2	0.535	0.425	0.457	0.966	0.072	0.620	0.653
P&I1	0.149	0.23	0.248	0.087	0.904	0.213	0.324
P&I2	0.121	0.237	0.219	0.055	0.912	0.240	0.311
P&I3	0.118	0.256	0.246	0.094	0.909	0.193	0.306
P&I4	0.194	0.288	0.312	0.052	0.815	0.204	0.207
P&I5	0.072	0.239	0.266	0.047	0.885	0.156	0.253
USE1	0.470	0.365	0.312	0.525	-0.018	0.739	0.590
USE2	0.439	0.649	0.592	0.530	0.213	0.857	0.555
USE3	0.301	0.527	0.437	0.376	0.293	0.644	0.435
USE4	0.394	0.468	0.402	0.473	0.222	0.845	0.580
USE5	0.472	0.423	0.511	0.727	0.196	0.864	0.778
ERPEFF1	0.387	0.267	0.274	0.722	0.111	0.666	0.896
ERPEFF2	0.517	0.459	0.410	0.709	0.234	0.753	0.928
ERPEFF3	0.079	0.289	0.301	0.203	0.332	0.447	0.507
ERPEFF4	0.170	0.244	0.301	0.329	0.445	0.310	0.614

10.5.8. Average variance extracted

	AVE
IMP	0.553
TOE	0.669
UROL	0.502
SAT	0.938
P&I	0.785
USE	0.631
ERPEFF	0.575

10.5.9. Composite reliability

	Composite reliability
IMP	0.86
TOE	0.858
UROL	0.833
SAT	0.968
P&I	0.948
USE	0.894
ERPEFF	0.836