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HOW AND WHY? EXPLAINING THE FACTORS THAT INFLUENCE ERP SYSTEM USAGE FROM THE END-USERS PERSPECTIVE: A LITERATURE REVIEW

JYVÄSKYLÄN YLIOPISTO
TIETOJENKÄSITTELYTIETEIDEN LAITOS
2020

TIIVISTELMÄ

Semenoff, Jonatan
Miten ja miksi? Selvitys ERP-järjestelmän käyttöä koskevista tekijöistä loppukäyttäjän näkökulmasta: kirjallisuuskatsaus
Jyväskylä: Jyväskylän yliopisto, 2020, 67 s.
Tietojärjestelmätiede, pro gradu -tutkielma
Ohjaaja(t): Salo, Markus

ERP-toteutusprojekteja ja menestystekijöitä näissä projekteissa on tutkittu yksityiskohtaisesti viimeisten vuosikymmenten aikana. Vähemmän huomiota on kuitenkin kiinnitetty tekijöihin, jotka vaikuttavat ERP-järjestelmän käyttöön loppukäyttäjän näkökulmasta koko ERP-toteutuksen elinkaaren ajan. Tämä tutkimus kuvaa ensin ERP järjestelmän ja sen elinkaaren sekä erilaiset tietojärjestelmien käytön teoriat TRA:sta UTAUT2:een ennen kuin perehdymme kirjallisuuskatsaukseen kerätäksemme kokoelman tekijöitä, jotka vaikuttavat ERP käyttöön. Aikaisemman kirjallisuuden analysoinnin pohjalta tunnistamme kaksikymmentä kahdeksan ERP käyttöön vaikuttavaa tekijää. Nämä tekijät luokitellaan viiden UTAUT2 mallin pohjalta muokatun käsitteen alle; ERP käyttökelpoisuus, ERP helppokäyttöisyys, sosiaalinen vaikutus, mahdollistavat olosuhteet, ja henkilökohtaiset piirteet. Lisäksi luodaan integroiva malli havainnollistamaan, kuinka tunnistetut tekijät liittyvät ERP toteutuksen eri vaiheisiin. Tutkimuksessa todettiin, että monet tunnistetuista tekijöistä olivat merkityksellisiä, ja se antaa selkeän kuvan siitä, kuinka vaikuttavat tekijät muuttuvat, kun ERP-toteutusprojekti kypsyy. Tärkeimpiä tunnistettuja vaikuttavia tekijöitä olivat johdon tuki ja ERP-viestintä.

Asiasanat: Enterprise Resource Planning, ERP, loppukäyttäjä, käyttö, UTAUT2, tekijä, elinkaari

ABSTRACT

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How and why? Explaining the factors that influence ERP system usage from the end-users perspective: a literature review
Jyväskylä: University of Jyväskylä, 2020, 67 p.
Information Systems, Master's Thesis
Supervisor(s): Salo, Markus

Enterprise Resource Planning (ERP) implementation projects and success factors in those projects have been studied in details in the past decades. However, less attention has been given to the factos that influence ERP system usage from the end-users perspective throughout the full ERP implementation lifecycle. This study first explains the ERP system and lifecycle and the different information system usage theories from TRA to UTAUT2 before diving into a literature review to gather a collection of factors affecting ERP usage. Based on the analysis of prior literature a total of twenty eight factors are identified. These factors are categorized under five modified constructs of the UTAUT2 model; ERP usefulness, ERP ease of use, social influence, facilitating conditions and individual traits. Futhermore, an integrative model is constructed to illustrate how the identified factors link to the different ERP implementation phases. This study found many of the identified factors to be relevant, and shows a clear picture on how the affecting factors change as the ERP implementation project matures. Key influencing factors identified included management support and ERP communication.

Keywords: Enterprise Resource Planning, ERP, end-user, usage, UTAUT2, factor, lifecycle

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1 INTRODUCTION

> "The number one benefit of information technology is that it empowers people to do what they want to do. It lets people be creative. It lets people be productive. It lets people learn things they didn't think they could learn before, and so in a sense, it is all about potential. "(Ballmer, 2005)

1.1 Background

Companies rely on information systems to perform numerous operational, tactical, and strategic processes (Li, 2013). One widely used information system is the Enterprise Resource Planning (ERP) system. One definition of ERP is that it can "integrate information and information-based processes within and across functional areas in an organization" (Kumar & van Hillegersberg, 2000). The popularity of ERP systems has grown as organizations thrive to operations related to business and "integrate all aspects of their business into an integrated information system platform" (Nwankpa and Roumani, 2014). Companies continue to invest in ERP systems as expect that such systems will increase performance, create additional value, and enable a competive edge in a growingly aggressive and competitive business environment (Nwankpa & Roumani, 2014).

For the majority of adopters of ERP, the systems will improve operations, especially in terms of speed and value, which decreases uneconomical costs. Rehman and Ali (2019) mention that, ERP systems automate tasks, organize companies related to the sharing and flow of information, and incorporate various business functions. These include functions rangeing accounting and finance, logistics and supply chain, sales and marketing, HR and customer information (Rehman & Ali, 2019).

Normally, complex ERP system implementations are resource intensive (both time and money). According to Third Stage Consulting Group (2019), 50% of the companies experience operational disruption during an ERP implementation project. Also, these disruptions are reported to increase the cost of the implementation between 50% to 300%. As companies spend between 2% to 5% of their

annual revenue on the implementation project, these disruptions have a severe effect on the total costs (Third Stage Consulting Group, 2019). This is in line with the idea that large IT projects often are over budget and exceed their initial timelines. Based on this, it can be argued that ERP projects are one of the most challenging systems development projects. Amid, Moalagh, and Zare Ravasan (2012) mention that due to being so complex projects, they also require the organization to fundamentally re-evaluate their organizational culture and processes.

One way to deem if an ERP project is successful is to measure the usage of the system. Various theoretical models and frameworks have been applied to discover the factors that determine acceptance and use of new information technology (Venkatesh et al., 2003). These theories include the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), which is an essential theory used to describe human behavior (Venkatesh et al., 2003). Another widely used theoretical model is the technology acceptance model (TAM), which is used for predicting and explaining user behavior and IT usage (Davis, 1989). Several modifications and extensions to TAM have been made, and this study focuses on two of them; unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) and especially its extension, UTAUT2 (Venkatesh et al., 2012). According to Venkatesh et al. (2012, p. 3), "*theories that focus on a specific context and identify relevant predictors and mechanisms are considered to be vital in providing a rich understanding of a focal phenomenon and to meaningfully extend theories.*"

1.2 Problem

Schlichter and Kraemmergaard (2010) did an in-depth literature review which determined that ERP has been widely researched, but states that research is scarce regarding ERP optimization and post-implementation. Nwankpa (2015) adds to this by saying that the realization of the full benefits and value from an ERP investment is still an area that needs more research. Companies invest much of their time, money, and resources into the implementation of ERP systems and are committed to translating this investment into organizational success. Nevertheless, according to Nwankpa (2015), companies implementing ERP continue to struggle with low system use from ERP system end-users. Insufficient usage of ERP systems has been associated with a weak understanding of ERP systems leading to companies having multiple information systems and end-users to devise workarounds resulting in delayed migration (Markus & Tanis, 2000). There is an apparent lack of research literature on efficient ERP system usage at the post-implementation phase (Nwankpa, 2015).

Delone and McLean (2003) defined system usage to be a significant factor determining productivity. Amoako-Gyampah and Salam (2004) stated that organizational advantages could not be accomplished without the use of an ERP system. Thus, promoting ERP system usage is crucial for organizations (Amoako-Gyampah & Salam, 2004). This study attempts to study the factors affecting ERP system usage. Also, this study inspects how and why these found factors affect

ERP system usage from the end-users perspective. By answering these questions, this study attempts to discover the factors affecting ERP usage and the reasons behind them to provide insight into the field of ERP usage study and to provide better tools for future ERP usage research. Additionally, by shedding light on these factors and their implications on organizations, this study attempts to give organizations better tools for improving their overall ERP usage with the end-user in mind.

1.3 Purpose & research questions

The objective of this study is two-fold; first, to explain the context-specific factors influencing ERP system usage and second, to discover how and why these factors affect ERP system end-users. To answer these issues, we have formed the following research questions:

1. Which context-specific factors influence ERP system usage from the end-user perspective?
2. How do these context-specific factors influence ERP system usage, and why?
3. How do these specific factors vary depending on the implementation phase?

A substantial amount of research regarding ERP implementation and intention to use has been done previously (Schlichter & Kraemmergaard, 2010; Nwankpa, 2015) but much less focus on actual ERP system usage, especially taking in the account of the full lifecycle of an ERP implementation. Once we have identified the theories involved in information system usage research, we will review prior ERP system usage studies using these theories as their theoretical background. Based on the findings in these studies, several factors influencing ERP usage will be determined. The literature review will be summed up in the formation of a research model, which will also give answers to our first research question. We will answer our second and third research questions by applying the factors to the research model.

2 Theoretical foundation

> "The whole structure of science gradually grows, but only as it is built upon a firm foundation of past research." (Chamberlain, 1959)

This chapter presents the theoretical basis of this study. First, we will briefly explain the history of ERP, the ERP lifecycle, and how it fits with the factors discussed later in chapter 3, as well as a brief mention of the current major ERP players. Next, we will examine different theoretical models explaining information system usage, ranging from TRA to UTAUT2.

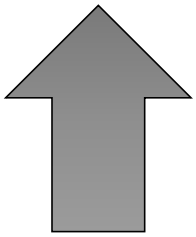
2.1 ERP

The history of ERP systems started in the 1960s with the creation of the first material resource planning (MRP) applications. According to Monk & Wagner (2012, p.23), these applications evolved from simple inventory-tracking systems. During this era, the prime factor pushing competition was cost, which leads to business strategies aiming to minimize expenses, gain high-volume productions, and an assumption of stable economic conditions. Early manufacturing planning and control (MPC) systems used magnetic tape as their storage medium. Not until the discovery of random access memory was it possible to develop complex applications like MRP. The early MRP application software was designed for planning and scheduling materials for intricate manufactured products. (Jacobs, 2007)

The 1970s saw development on MRP software as well as the birth of software companies (SAP, Baan Corporation, Oracle Corporation, JD Edwards, Lawson Software) that would be later known as major ERP retailers. As hardware and software developed, features that accessed a centralized database could be added. The development of technology allowed both system expansion for added features as well as the advantages of integration. As MRP systems became more complex with numerous functions, the phrase *manufacturing resource planning* was taken to use instead of material requirements planning. This was later called manufacturing resource planning II (MRP-II) to match the capabilities of more advanced systems. (Jacobs, 2007)

The 1980s saw a significant improvement in MRP II systems, and in the early 1990s, the term enterprise resource planning (ERP) was developed by the Gartner Group (Wylie, 1990). Monk & Wagner (2012, p.23) explain that ERP development gained momentum due to the hard economic times of the late 1980s and early 1990s. As many companies had to downsize and reorganize their operations, new information systems were in demand. (Monk & Wagner, 2012, p.25). This allowed ERP systems to gain momentum over traditional information systems used. Today, ERP systems are seen as "an information system that can integrate information and information-based processes within and across functional areas in an organization" (Kumar & van Hillegersberg, 2000). ERP systems

now incorporate functions associated with sales, marketing, production, logistics, accounting and human resources (Monk & Wagner, 2012, p.1-2)



2010s	Cloud-Based ERP
2000s	Extended ERP
1990s	Enterprise Resourse Planning (ERP)
1980s	Manufacturing Resource Planning (MRP II)
1970s	Material Requirements Planning (MRP)
1960s	Inventory Tracking Systems

FIGURE 1: Evolution of ERP (Based on the concept from "The Evolution of ERP Systems: A Historical Perspective" by Rashid et al., (2002))

2.1.1 ERP life cycle

Next, we explore the ERP lifecycle concept. Earlier, Esteves & Pastor (1999) came up with a research framework that gives a unified view of the ERP life cycle (see FIGURE 2). According to them, the ERP life cycle consists of six phases and four dimensions. Esteves and Pastor (1999) explain that "phases are the different stages of an ERP system life cycle within an organization, and dimensions are different viewpoints by which the phases could be analyzed." They add that the involved phases consist of different stages which an ERP system goes through during its lifecycle (Esteves & Pastor, 1999). The following phases are adoption decision, acquisition, implementation, use and maintenance, evolution, and finally, retirement (Esteves & Pastor, 1999).

Esteves & Pastor (1999) have identified four dimensions to examine the various phases of the life cycle: product, process, people, and change management.

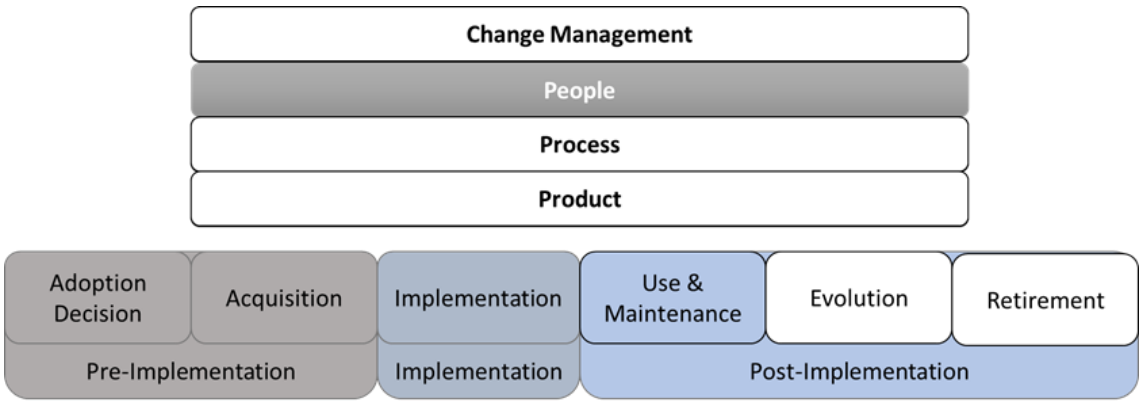


FIGURE 2: The ERP life-cycle (modified and adapted from Esteves and Pastor, 1999).

For this study, the mentioned phases are grouped into top-level groups: pre-implementation, implementation, and post-implementation. The factors affecting ERP usage will be categorized into these phases, and because the emphasis is on the end-user perspective, the people dimension is used as the viewpoint.

The people dimension is defined as "the human resources and their skills and roles in an ERP system life-cycle" (Esteves & Pastor, 1999).

The adoption decision phase and acquisition phase are grouped under pre-implementation. According to Esteves and Pastor (1999), the adoption decision phase includes the overall planning and decision making in finding the most suitable solution to fit the business/organization strategy. Additionally, it defines the ERP system requirements, goals, and benefits as well as provides an initial overview of ERP adoption from a broader perspective.

The acquisition phase focuses on product selection. Esteves and Pastor (1999) mention that factors such as price, training, and maintenance services are reviewed and inspected. This includes setting up the ERP system as per the needs of the business. Often includes outside consultants providing implementation expertise (Esteves & Pastor, 1999).

Based on the phases provided by Esteves and Pastor (1999), three different phases fit under post-implementation; use & maintenance, evolution, and retirement. However, in this study, we only account for Use & Maintenance under post-implementation. By Esteves and Pastor (1999), the use and maintenance phase comprises the use of an ERP system in such a method that delivers expected benefits and minimizes damage. Esteves and Pastor (1999) continue to add that we must be mindful of the details related to the adequacy, usability, and functionality to the organizational and business processes during the use and maintenance phase.

2.1.2 Major ERP systems

According to Gartner Research (*The ERP Software Market*, 2019), the global ERP software market is fragmented. Below, in FIGURE 3, mentioned top 5 vendors control 51% of the market. The top 5 ERP vendors are (in size order): SAP, Oracle, Workday, Sage, and Infor. Out of the top 5, only Workday is a "cloud-native" provider, the other top vendors either offer on-premise software or a mix of both.

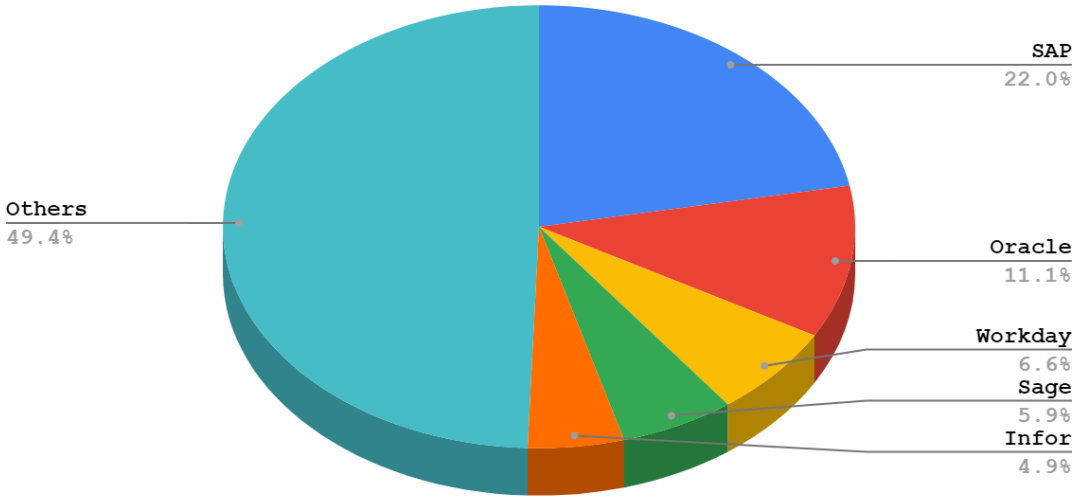


FIGURE 3: ERP market share in 2018. Chart constructed from data retrieved from Gartner Research ("The ERP Software Market," 2019)

2.1.3 SAP

One of the major software companies born in the 1970s was *Systemanalyse und Programmentwicklung* (System Analysis and Program Development) or SAP. SAP was founded by five ex-IBM system analysts in 1972 in Mannheim, Germany. Later, the acronym was changed to *Systeme, Anwendungen und Produkte in der Datenverarbeitung* (System, Applications, and Products in Data Processing). (Monk & Wagner, 2012, p.25-26). Their aim was to develop and sell standard applications for integrated business solutions (Jacobs, 2007).

The multinational company that SAP is, it has over 74,000 employees from 120 nationalities. They have over 282,000 customers in 190 countries, and over 80% of their customers are small to medium-sized enterprises. (SAP corporate fact sheet, 2015) It was estimated that 74% of the global transaction revenue touched an SAP system at some point (SAP corporate fact sheet, 2015).

2.2 IS usage research

Information technology adoption and use in organizations are major attention of information systems research and practice (Venkatesh & Davis, 2000). But, even with the great development in hardware and software capabilities, the underutilization of systems remains a problem (Venkatesh & Davis, 2000). Additionally, Venkatesh and Davis (2000) mention that a key research area is understanding and creating suitable conditions for information system usage in organizations.

One method of defining the success of an information system is to measure its usage.

For a long time, studies regarding information systems have researched *how* and *why* individuals embrace and use new information technologies. According to Burton-Jones & Straub (2006) , already since the late 1970s, system usage concept has been a key component in information systems research (see Barkin & Dickson, 1977). In this wide area of study have been various factions of research. Venkatesh et al. (2003) described that one research faction has focused on how individuals accept technology by applying personal intention to use or actual system use as conditional variable (e.g., Davis et al., 1989; Compeau & Higgins, 1995). A more comprehensive view of previous usage studies regarding ERP system context will be done in subchapter 2.4.

Understanding and explaining individuals acceptance and use of information technology is often described as one the most mature fields of information systems research (see Hu et al., 1999; Karahanna et al., 2006; Benbasat & Barki, 2007; Venkatesh et al., 2007). Several theoretical frameworks which have tried to explain the acceptance and use of technology have resulted from this research, primarily with earlier background in psychology, information system, and sociology (Venkates et al., 2012). Next, we will examine these theoretical models to understand the history of usage research, structure, and components related to usage research and to build a foundation for the formation of my research model.

2.3 Theoretical models

The following subchapters will look at the different theories aimed at explaining information system usage. Starting from TRA and continuing through the evolvement of the theories (TAM/UTAUT) until ending in UTAUT2, which is used as the basis for the theoretical framework of this study.

2.3.1 TRA / TPB

Forty years ago, Fishbein and Ajzen (1975) introduced the Theory of Reasoned Action (TRA). The theory aims to explain and predict how humans behave. TRA consists of three common elements: behavioral intention, attitude, and subjective norm. According to TRA, the behavioral intention of an individual depends on the attitude of the individual with regard to attitude and subjective norms. (Fishbein & Ajzen, 1975). But the theory had limitations, and many researchers suggested the addition of new components.

TRA was extended by Ajzen (1991) with the introduciton of the Theory of Planned Behavior (TPB) by adding a new construct called perceived behavioral control. Ajzen (1991) defines perceived behavioral control as "the perceived ease or difficulty of performing the behavior."

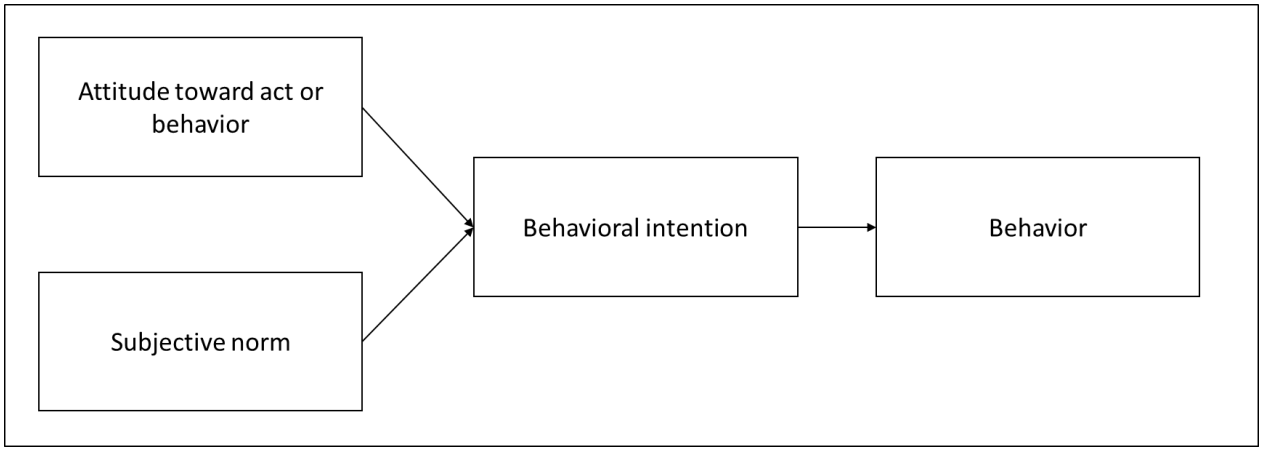


FIGURE 4: Theory of Reasoned Acceptance (TRA) (Fishbein & Ajzen, 1975).

2.3.2 TAM

Technology Acceptance Model (TAM) is one of the most widely applied theoretical models in the information system field (Lee, Kozar, & Larsen, 2003). Davis (1989) introduced TAM to develop a better instrument for predicting and explaining information system use. TAM is a modified version of TRA, explicitly designed for "modeling user acceptance of information systems" (Davis, Bagozzi, & Warshaw, 1989). The theory aims to not only predict but as well explain information system usage. According to Davis et al. (1989, p. 985), the key purpose of TAM is "to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intentions."

TAM poses that the two key determinators of information system acceptance are perceived usefulness and perceived ease of use (Davis et al., 1989). Perceived usefulness can be described as the extent to which the individual feels that the use of a specific application will increase their job performance (Davis et al., 1989.

The second determinant, perceived ease of use, reflects the user's impression on the ease of use of a certain application. Together perceived usefulness and perceived ease of use affect the user's attitude towards using the system. Thus the formed attitude and perceived usefulness influence the user's intention to use a certain application. The intention to use finally leads to actual system use. (FIGURE 2). (Davis et al., 1989)

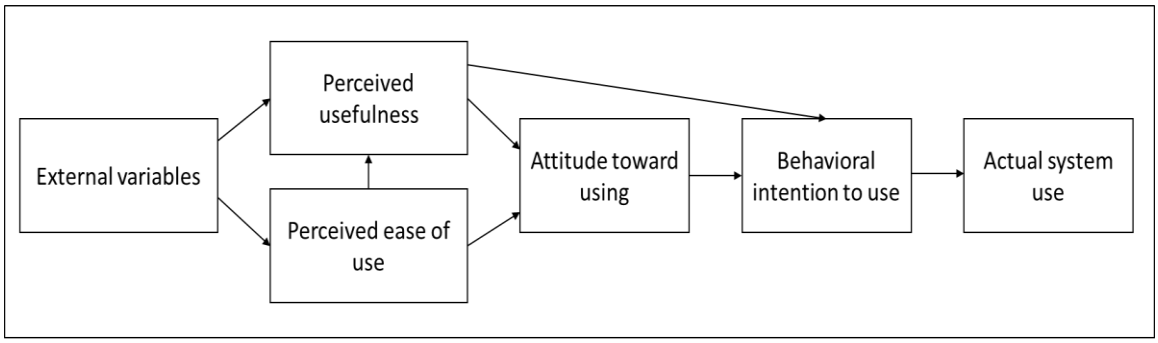


FIGURE 5: Technology Acceptance Model TAM (Davis et al., 1989).

A key finding by Davis (1989) and Davis et al. (1989) is that user intentions are more affected by perceived usefulness than by perceived ease of use. Davis (1989) noticed that users do not mind that there is difficulties in using the system, if the system allows users to perform critical, needed functions. He also explains that users use applications mainly because of the functions they perform and not because of the ease or hardness of getting the application to perform those functions. Both Davis (1989) and Davis et al. (1989) mention in their research findings that perceived ease of use also has an important role in determining user intentions. However, Davis (1989) mentions that the adoption of effective applications can be diminished if there is difficulty found in the use of the application. Nevertheless, even the easiest to use application does not interest users if it does not perform useful functions (Davis, 1989).

Although TAM has been widely used, it has also gained much criticism, mainly due to its simplicity. Bagozzi (2007) argues that one model, especially such a simple one, is not capabale of explaining the related decisions and user behavior across such a wide range of situations, technologies and stakeholders. Another often heard critique of the TAM model is that the model does not provide enough support to increase the users acceptance of new technologies in an organization (Bradley, 2012). Due to the criticism, TAM has gained several reviewed versions.

2.3.3 UTAUT

As mentioned before, TRA/TPB and TAM give us good tools to measure and predict information system usage, but they lack depth. There have been several changes and alterations made to the original TAM model, the most famous one is the Unified Theory of Acceptance and Use of Technology (UTAUT) (see FIGURE 5). The unified model is based on eight models and their extension: the theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behavior, a model combining the technology acceptance model and the theory of planned behavior, the model of PC utilization, the innovation diffusion theory, and the social cognitive theory. (Venkatesh et al., 2003)

According to Venkatesh et al. (2003), there are four direct factors that determine user acceptance and usage behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions. Attitudes toward using technology, self-efficacy, and anxiety are not seen as direct factors determining intention to use. The key moderators of UTAUT are gender, age, voluntariness of use, and experience (Venkatesh et al., 2003). Both the TAM and UTAUT describe and explain the organizational acceptance of a technology (Carlsson, Carlsson, Hyvonen, Puhakainen, & Walden, 2006).

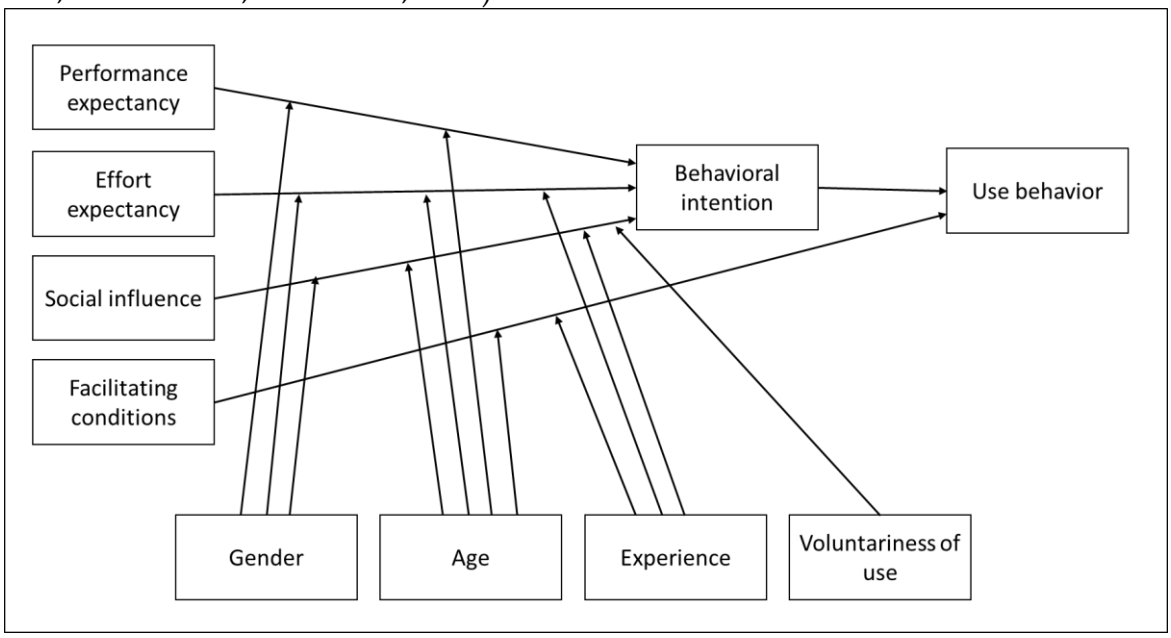


FIGURE 6: Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al.,2003).

2.3.4 UTAUT2

UTAUT views usage from an organizational perspective; hence there was a need for a revision to implement more of a consumer perspective to the model. Venkatesh, Thong & Xu (2012) introduced a new version, UTAUT2 (see FIGURE 6), which adds three new constructs into the model: hedonic motivation, price value, and habit. UTAUT2 is meant to study the acceptance and use of technology in a customer or consumer context (Venkatesh et al., 2012). But we believe that the same factors influencing consumers affect organizational end-users.

Hedonic motivation is defined as "the fun or pleasure derived from using technology" (Venkatesh et al., 2012). Previous IS research (Thong, Hong, & Tam, 2006; Heijden, 2004) has shown that hedonic motivation (perceived enjoyment) influences technology acceptance and usage directly. This leads to the belief that end-users, businesses, and consumers alike are affected by hedonic motivation in their IS usage.

Although in an organizational context, employees do not have the monetary cost for IS use, which consumers usually have, it can be argued that price value may have an impact on the usage in this context as well. According to

Venkatesh et al. (2012), a price value, which positively impacts intention to use, was reached when a user feels that using the technology is more valuable than the actual monetary cost of the of technology. It can be assumed that the large monetary investment made into implementing and acquiring ERP systems have some effect on usage. Presumable to say that price value has less effect in an organizational context versus consumer context.

The final extension made to UTAUT is habit. Previous research introduces two similar yet distinct constructs, experience, and habit. The first distinction is that ”experience is a necessary but not sufficient condition for the formation of habit” (Venkatesh et al., 2012, p. 9). The second distinction is regarding the pass of time (i.e., experience), which can “result in the formation of differing levels of habit depending on the extent of interaction and familiarity that is developed with a target technology” (Venkatesh et al., 2012, p. 9). Based on the above mentioned theoretical interpretations of experience and habit, Venkatesh et al. (2012, p. 10) defined habit as “a perceptual construct that reflects the results of prior experiences.” Habit is considered to be a contributory factor irrespective of the user's position (e.g., consumer vs. employee).

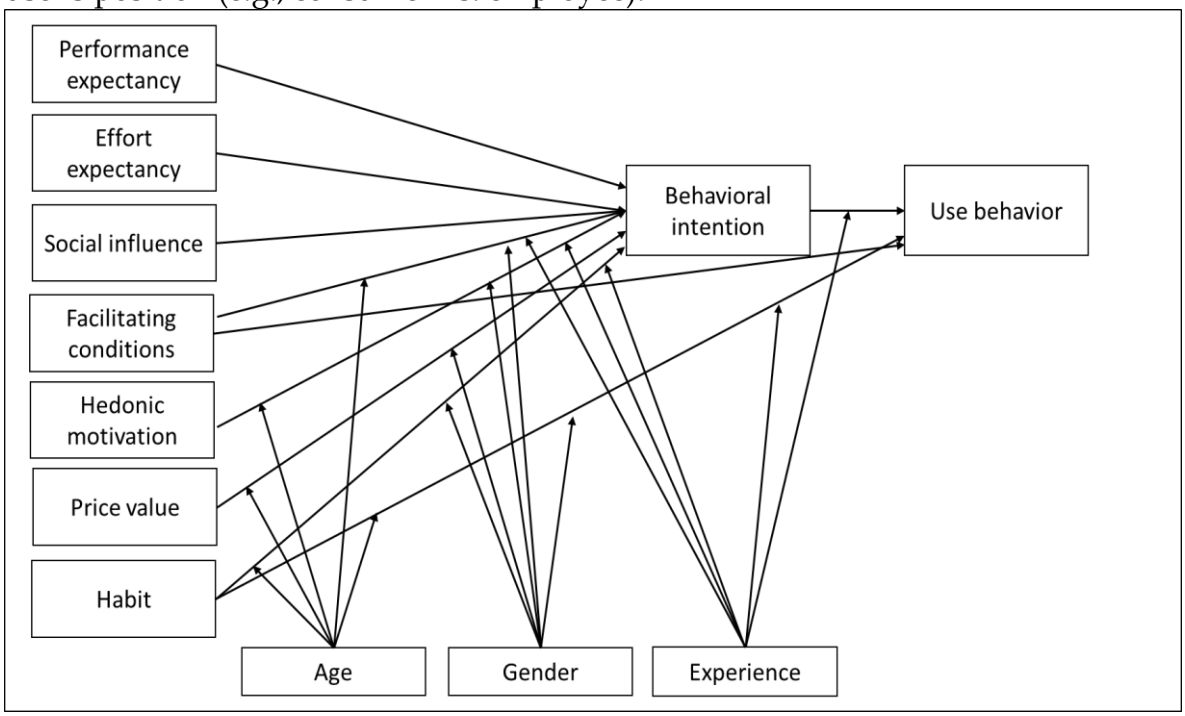


FIGURE 7: Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)(Venkatesh et al.,2012)

Although UTAUT2 was primarily designed to study acceptance and use of technology in a non-organizational context, it was chosen as the theoretical foundation for this study due to it has extended and tested construct. UTAUT2 explains a substantial proportion of the variance in use of technology (ranging between 40 and 52 percent) and behavioral intention (ranging between 56 and 74 percent) compared to UTAUT (Venkatesh et al., 2012). Based on UTAUT2, an integrative model is introduced, which can be found in subchapter 3.3. Following

these theoretical models is a deeper look at previous ERP usage studies using the aforementioned theories as to their foundation as well as an introduction to the discovered factors affecting ERP usage.

2.4 Summary

ERP systems have developed over the past 50 years. They have transformed from simple inventory tracking systems to an enterprise system that covers all aspects of a business. Similarly, the adoption of an ERP system in a business has its path that develops as the project matures. Taking into account the organization's people, processes, and readiness for change, the complete implementation of an ERP system is a complex task from the initial planning done in the pre-implementation to the actual implementation of the system. Moreover, finally using and developing the system in post-implementation.

This chapter first presented the history ERP system in the past 50 years and how they transformed from simple inventory tracking systems to an enterprise system that covers all aspects of an organization. Next, we described the ERP lifecycle and which aspects of it would be used in this study to build a research model with the identified factors. A complete ERP implementation project was divided into three phases: pre-implementation, implementation, and, finally, post-implementation. Also, we briefly described the current ERP market situation and provided a short history of SAP, the largest vendor.

Following the ERP introduction, we go through the development of IS usage research. We start from TRA / TPB in the seventies that aimed at explaining and predicting human behavior. This was followed by TAM, which expanded on TRA's framework and aimed to explain information system usage. However, as a more detailed approach was needed, a new modified model was created. UTAUT aimed to give a deeper view of what affects IS system usage. Finally, we describe UTAUT2, which was born from the need for a more customer-centric approach compared to the previous research models.

3 Literature identification and analysis

> "Basic research is what I am doing when I don't know what I am doing." (von Braun, 1957)

The goal of the literature review was to recognize factors influencing ERP usage, especially in the different implementation phases, to provide future research material on ERP usage in IS research. Literature was identified in a two-step process – literature searching and literature analysis.

The research focused on articles published from 2000 to 2020. In the first step, we focused on the leading journals, as suggested by Webster and Watson (2002), for identifying key articles related to ERP system usage studies. This included journals such as but not limited to, Management Information Systems Quarterly (MISQ), International Journal of Enterprise Information Systems (IJEIS), Information and Management (IM), Business Process Management Journal (BPMJ), Journal of Enterprise Information Management (JEIM), and Industrial Management & Data Systems (IMDS). An electronic search was conducted using Google Scholar, which covered multiple academic and scientific journal databases. The search was done based on keywords including, but not limited to, "ERP system usage," "ERP usage factor(s)," and "ERP usage." Articles were picked based on the title and abstract that addressed ERP usage. The focus was on articles related to ERP implementation. Due to time constraints, only a total of 66 articles related to ERP usage and/or factors were selected in this initial phase.

The next step focused on literature analysis. After reading the 66 articles, 18 articles met the defined scope that included IS usage theory as a basis and were included in this study. The remaining 48 articles were dismissed for several reasons, such as discussing ERP adoption with a focus on the factors concerning the vendor instead of the end-user (Seethamraju, 2014). It should be noted that the review performed is not necessarily extensive. However, it does provide an initial direction on ERP usage factors during the ERP implementation lifecycle. A more thorough review could uncover additional factors and add an overlap between the implementation phases. During the review, we noticed that the main focus in the studies was mainly on the post-implementation stage of an ERP project. Out of the eighteen studies reviewed, only three were from another stage. This could be due to having a focus on the usage of the system when the system is stable, and the actual implementation project has finished. A table (see Table 1) was built into which the reviewed literature was organized. The built table is somewhat based on Sternad et al.'s (2011) table "Table I - ERP literature review regarding TAM." Sternad et al. (2011) reviewed ERP literature from 2004 – 2010 and concentrated on studies which used TAM as their theoretical framework. We modified their table by adding a fourth column describing the theoretical framework used as we introduced previous studies from various theoretical backgrounds beyond TAM. Also, more recent studies were included ranging from 2003 to 2019.

Based on the prior ERP usage studies and new literature identification, a set of twenty-eight factors influencing ERP usage were identified and constructed to the newly created models. These are described in detail from chapter 3.2 onwards.

3.1 ERP system usage studies

A total of eighteen prior ERP usage studies were reviewed for this study. Various studies (e.g., Nah, Tan, & Teh, 2004; Umble, Haft, & Umble, 2003) imply there is a link between user's attitudes towards the ERP system and ERP failure. The studies reviewed below all use various IS usage theories to explain ERP acceptance or usage, mainly TAM or UTAUT or variations of them. The next subchapters will explain the individual studies in more detail as well as their findings. The subchapters are organized loosely by the theoretical framework used.

TABLE 1: Prior ERP Usage research

Reference	**Focus**	**Lifecycle phase**	**Theoretical framework**
TAM or extensions of it			
*Amoako-Gyampah & Salam (2004)	*"The impact of one belief construct (shared beliefs) in the benefits of technology) and two technology success factors (training and communications) on perceived usefulness and perceived ease of use in one global organization"* (Sternad et al., 2011, p. 1515)	Implementation	Extension of TAM
*Youngberg, Olsen, & Hauser (2009)	Describes how perceived usefulness and its impact on usage behaviour are impacted by perceived ease of use, result demonstrability, and subjective norm. (Sternad et al., 2011).	Post-implementation	TAM/TAM2
Sternad, Gradisar & Bobek (2011)	The influence of organizational process characteristics, system and technological characteristics, personal characteristics, and information literacy on ERP usefulness and ERP ease of use and their impact on	Post-implementation	Extension of TAM

	attitude towards the ERP system.		
Zhang, Gao & Ge (2013)	The influence of training, communication, subjective norm, and output quality on perceived ease of use and perceived usefulness and their impact on actual usage.	Post-implementation	Modified from TAM
Weli (2019)	Examine student satisfaction in using ERP systems	Post-implementation	TAM and Expectation Confirmation Theory (ECT)
UTAUT or extensions of it			
Sun & Bhattacherjee (2011)	Developing a framework of organizational IT usage that incorporates important organizational-level variables (such as training, management support, and technical support) inside an individual-level framework to propose a multi-layer framework of IT usage	Post-implementation	Extension of UTAUT
Fillion, Braham, & Ekionea (2012)	Identify influencing factors on the use of ERP systems in six medium to large-sized Canadian enterprises	Post-implementation	UTAUT
Alleyne & Lavine (2013)	The impact of personal antecedents (attitudes toward use, performance expectancy, effort expectancy, self-efficacy, and social influence) on behavioral intention to use and their impact on actual usage together with facilitating conditions.	Post-implementation	Extension of UTAUT
Kalema (2013)	The impact of moderating factors (gender, experience with online tools, age, level of education, and users' first interaction with ERP) on ERP usage	Post-implementation	Extension of UTAUT
Soliman, Karia, Moeinzadeh, Islam & Mahmud (2019)	Identify factors that affect the use of ERP systems in the context of higher education.	Pre-implementation	Extension of UTAUT
Miscellaneous theories and their extensions			

Bagchi, Kanungo, & Dasgupta (2003)	ERP system acceptance on the individual level in three case studies.	Implementation	Variation of TRA (Barki & Hartwick, 1994)
Chang, Cheung, Cheng, & Yeung (2008)	Understanding ERP system adaptation (the impact of individual, organizational and innovation factors on usage) from the user's perspective based on 240 ERP user's	Post-implementation	A conceptual model derived from Triandis framework (Triandis, 1977, 1980)
*Calisir, Gumussoy, & Bayram (2009)	Examine "*factors (subjective norms, compatibility, gender, experience, and education level) that affect behavioral intention to use an ERP system based on potential ERP users at one manufacturing organization*" (Sternad et al., 2011, p. 1515)	Implementation	Modified framework based on TRA, TAM, and IDT (Innovation Diffusion Theory)
*Sun, Bhattacherjee, & Ma (2009)	"*Impacts on IT usage such as the role of ERP's perceived work compatibility with user intention, usage and performance in work settings*" (Sternad et al., 2011, p. 1515)	Post-implementation	Hypothesized model based on TAM/UTAUT and TTF (Technology-task fit)
Ruivo, Oliveira, & Neto (2012)	Developing a framework for measuring ERP use (DOI) and value (RBV) in SME's	Post-implementation	Diffusion of Innovation (DOI) model and Resource-Based View (RBV) theory
Ruivo, Oliveira, & Neto (2014)	Using TOE to describe how compatibility, complexity, efficiency, best practices, training, and competitive pressure explain use of ERP and further using RBV to explain how ERP use, cooperation, and analytics describe ERP usefulness	Post-implementation	Technology–organization–environment (TOE) framework and Resource-Based View (RBV).
Chou, Chang, Lin, & Chou (2014)	The impact of social capital and post-training self-efficacy on learning opportunity, learning willingness and learning capability and their impact on post-implementation learning and further on ERP usage	Post-implementation	Hypothesized model

	(decision support, work integration, and customer service)		
Wibowo & Sari (2018)	Using the TOE and IS success model to determine ERP system success.	Post-implementation	Technology–organization–environment (TOE) framework and Delone and McLean IS success model

Note: Modified and extended from "The influence of external factors on routine ERP usage" by Sternad, S., Gradisar, M., & Bobek, S. 2011. Industrial Management & Data Systems, 111(9), 1511–1530. The studies taken from the original table are marked with an asterisk symbol (*).

3.1.1 TAM and its extensions

Amoako-Gyampah and Salam (2004) presented an extension to TAM, which was examined in an ERP implementation environment. They expanded the TAM model to incorporate one belief construct, a widespread value in the advantages of an ERP system, and two external variables, ERP related training, and project communication (Amoako-Gyampah & Salam, 2004). Furthermore, Amoako-Gyampah and Salam (2004) discovered that shared beliefs in the benefits of ERP systems affect both perceived usefulness and perceived ease of use of an ERP system. They also discovered that both ERP training and effective communication within the project influence confidence in the value of the ERP system, and the confidence in the effectiveness of the ERP system is critical in developing positive attitudes towards the ERP system. (Amoako-Gyampah & Salam, 2004).

Another paper that used TAM was Youngberg et al. (2009), who studied user expectations linked to a variety of technology adoption factors for an ERP system component. Youngberg et al. (2009) focused on "end-user perception of ERP component usefulness, intention to use the system, and self-reported usage of a system component." The results gathered by Youngberg et al. (2009) support most of the constructs of TAM2, focusing on perceived usefulness. Nonetheless, Youngberg et al. (2009) agree in findings with Amoako-Gyampah & Salam (2004), that successful complex technology acceptance occurs to be inseparably linked with skills in both system and communication area. This is in alignment with the findings of Beltramo (2005), who states that complex communication demands are directly linked with increased system complexity.

Both Amoako-Gyampah & Salam (2004) and Youngberg et al. (2009) only use a few external factors in their study. This fact is addressed in Sternad et al.'s (2011) study on the influence of external factors on regular ERP usage utilizing TAM. Sternard et al. (2011) research the factors which have an impact on ERP usage in the post-implementation phase. Their findings show that multiple, extended external factors have an influence on ERP usefulness and ERP ease of use as well as influence on the attitude toward using the ERP system in the post-

implementation phase of an ERP (Sternard et al., 2011). An important finding by Sternard et al. (2011) is the identification of multiple external factors which before were lacking. These factors include "organizational process characteristics, system and technological characteristics, personal characteristics, and information literacy" (Sternard et al. 2011). The found factors will be looked at in more detail later as they will be implemented into the theoretical framework used in this study.

Zhang et al. (2013) examined the impact of organizational support, subjective norm, and output quality on the end-users usage of ERP. They discovered that perceived usefulness of ERP is determined by both subjective norm and output quality. Agreeing with earlier mentioned studies, Zhang et al. (2013) also noted that communication, as well as the subjective norm, have a significant role in both perceived ease of use and perceived usefulness of ERP, which both impact ERP usage as proposed by Venkatesh and Bala (2008). Zhang et al. (2013) also discovered that, in this case, contrary to prior studies, there was no significant relationship between training and perceived variables. Zhang et al. (2013) add that while their work contributes to the understanding of the factors that influence the use of ERP, additional variables can be included to generate wider findings, which is in line with the findings of Sternard et al. (2011).

Weli (2019) studied the effect of ERP training on the intentions of using ERP systems by utilizing the TAM and Expectation Confirmation Theory (ECT). He noted that a meaningful and pleasant training experience had an impact on perceived ease of use of ERP. However, Weli (2019) did not find a strong link between perceived usefulness and satisfaction towards the training. This is in line with previous studies stating the importance of training in adopting an ERP system.

All the above studies had different views on the usage of ERP, yet similarities were shown. Many studies agreed on the importance of communication-related to ERP usage (Amoako-Gyampah & Salam, 2004; Youngberg et al., 2009). Additionally, training was found to be a key factor in ERP usage (Amoako-Gyampah & Salam, 2004; Weli, 2019). There were also differences in the number of external factors used, with studies mostly only using a handful of factors in determining ERP usage, except for Sternard et al. (2011), who discovered numerous factors involved. The following subchapter will look at ERP usage studies utilizing UTAUT or extensions of it.

3.1.2 UTAUT and its extensions

The theoretical models of TAM and UTAUT describe IT usage as an individual-level phenomenon. Both TAM and UTAUT have been criticized for being simplistic and missing the organizational context in which they are often researched (Lee et al., 2003).

This lead to Sun and Bhattacherjee (2011), to propose a model of organizational IT system use which combines important organizational-level parameters inside an individual-level model with the goal to theorize a multi-

layered model of IT usage. According to Sun and Bhattacherjee (2011), organizational-level variables influence ERP usage by molding important user perceptions that encourage the use of IT. Sun and Bhattacherjee (2011) discovered that user training distinctly influences perceived usefulness and perceived ease of use. They also add that subjective norms are influenced by top management, and technical support influences perceived behavioral control. Besides, Sun and Bhattacherjee (2011) mention that additional organizational-level variables may exist and influence ERP usage, but additional research is needed.

As the above study concentrated on developing a better model for researching organizational IT usage Fillion et al. (2012) returned to the 'basics' and concentrated on identifying the factors influencing ERP usage. This was done by studying ERP usage in medium- to large-sized Canadian enterprises. Their findings emphasize facilitating conditions, anxiety, and behavioral intention as the key independent variables influencing ERP system use in their study context. Besides, age as a moderator was found to be influencing ERP usage. However, the independent variable of social influence had a lesser role in the usage of ERP (Fillion et al., 2012). Their results are in line with previous usage studies (e.g., Venkatesh et al. 2003) when the cultural aspects are taken into consideration. Fillion et al. (2012) add that most of the ERP users were using the systems on a mandatory basis and not voluntarily. Thus, their findings have implications for the studies on the factors influencing adoption and use of ERP systems in enterprises as there is, generally, no voluntary basis for usage in that context. Although, their findings are logical when considering the users are employees of the company who use the system to perform their work tasks.

Alleyne and Lavine (2013) researched the factors influencing ERP usage of accountants utilizing a model based on UTAUT. Alleyne and Lavine (2013) proposed that "individual antecedents (attitudes toward use, performance expectancy, effort expectancy, self-efficacy, and social influence) will influence behavioral intention to use." They also add that both facilitating conditions and behavioral intention would influence actual ERP usage. According to the findings of Alleyne and Lavine (2013), attitudes towards use, performance expectancy, self-efficacy, and effort expectancy predicted behavioral intention to use the ERP system. Also, they discovered that behavioral intention and facilitating conditions had a notable and positive influence on actual ERP usage, which is in line with the findings of Fillion et al. (2012). Instead, social influence was a non-significant factor. Alleyne and Lavine (2013) do add that their findings should be taken cautiously due to the research method and relatively small sample size.

Kalema (2013) researched the role of the moderating effect of the users' demographics and situational factors on ERP usage. These factors included: gender, experience with web-based tools, age, education level, and users' first interaction with ERP (Kalema, 2013). The results of Kalema (2013) indicated that all the tested moderating factors had a significant impact on both effort and performance expectancy. An important note Kalema (2013) made is that recognizing the influence of users' characteristics to ERP usage is vital for success. Kalema (2013) also implies management's responsibility in better accounting for the users in the

implementation and use of ERP. This is an important finding for managers in the implementation and post-implementation phase of an ERP project. These findings are also in line with previous studies (see Amoako-Gyampah & Salam, 2004; Nwankpa, 2015) on ERP usage in that more focus should be put on the users using the ERP system.

Soliman, Karia, Moeinzadeh, Islan & Mahmud (2019) studied the factors that influence ERP user's intentions to use the system, specifically in a higher education context. Soliman et al. (2019) constructed their model based on UTAUT and included ten (10) factors. Furthermore, the factors were divided into three higher-level factor groups: technology, individual, and organization. The technology group included four (4) factors: compatibility, performance expectancy, effort expectancy, and complexity. Individual factors included self-efficacy and personal innovativeness. The last group, organization, include the following factors: social influence, readiness for change, facilitating condition, and training. Age and gender were used as moderating effects. Finally, Soliman et al. (2019) tied the model with the outcome of symbolic adoption. The factors collected by Soliman et al. (2019) are in line with previous studies (Amoako-Gyampah & Salam, 2004; Alleyne and Lavine, 2013; Fillion et al., 2012).

The above studies covered ERP usage from different perspectives. Sun and Bhattacherjee (2011) concentrated on the organizational aspects of ERP usage and factors influencing it. Both Fillion et al. (2012) and Alleyne and Lavine (2013) focused on the factors influencing ERP usage in their respective contexts. Kalema (2013) focused on individual characteristics of users and their effect on ERP usage. Finally, Soliman et al. (2019) focused on especially the higher education context in their study. As seen earlier, much focus was put on the different factors influencing ERP usage, be it from an organizational or individual perspective. This strengthens the basis for the factors introduced later in this study, from which the theoretical framework will be constructed. The following subchapter will look at studies using different theoretical usage frameworks as their basis.

3.1.3 Miscellaneous theories and their extensions

This subchapter combines all leftover research, which consists of different studies with variable theoretical frameworks ranging from TRA to resource-based view. Although the theories used are not the 'conventional' picks, they give a different insight into the factors and variables behind ERP usage.

Bagchi et al. (2003) researched user involvement and participation on the individual level in an ERP context in the implementation phase. A revised version of Barki and Hartwick's (1994) extension to TRA was used as the theoretical framework. The goal was to examine ERP system acceptance on the individual level and find differences like user participation and involvement participation (Bagchi et al., 2003). Bagchi et al. (2003) discovered that although a theoretical model describes user actions concerning user participation and involvement, a further closed model indicates that the ERP implementation dynamics are distinct. Their findings have implications for organizations regarding the unused

value of user involvement from the beginning of the ERP project (Bagchi et al., 2003). These results are comparable to earlier research (e.g., Kalema (2013) implicating the importance of user involvement.

Chang et al. (2008) take a more traditional route and aim to analyze the factors affecting ERP system usage by utilizing a conceptual framework based on the Triandis framework (Triandis, 1980). According to the Triandis model, several factors assess the likelihood of executing a given action: "(1) habit of performing the behavior, (2) facilitating condition, and (3) intention" (Triandis, 1980). According to the findings of Chang et al. (2008), three factors have a significant effect on ERP usage: social factors, compatibility, and near-term consequences. Out of these factors, social factors have the strongest influence. This is explained by possible peer colleagues and top management pressure to use ERP as well as the fact that ERP is a complex system, and communication and coordination are needed amongst users (Chang et al., 2008). This is per earlier findings regarding communication as a key factor in ERP usage. Other factors, which feature perceived long-term consequences, complexity, facilitating conditions, and affect, have an insignificant effect (Chang et al., 2008). Based on Chang et al.'s (2008) findings, end-user involvement during implementation is crucial as well as having a social atmosphere that supports and encourages ERP system use. Their study continues the theme of the significance of user involvement in ERP system implementation and use.

Calisir et al. (2009) examine several factors affecting users' behavioral intention to use ERP. Calisir et al. (2009) base their research on a modified framework, which combines TRA, TAM, and innovation diffusion theory, and a set of individual difference factors: gender, education level, and experience. According to Calisir et al. (2009), subjective norms, perceived usefulness, and education level are causal factors of behavioral intention to use ERP. Additionally, perceived usefulness affects attitude toward use, and both compatibility and perceived ease of use affect perceived usefulness. Out of the personal characteristics, education level has a significant effect on both perceived ease of use and behavioral intention. Kalema (2013) also implied the importance of education level on effort and performance expectancy. However, attitude and behavioral intention do not have a significant relationship (Calisir et al., 2009). These results are comparably inline with the original TAM model (Davis et al., 1989), except for the lacking connection between perceived ease of use and attitude (Calisir, 2009).

Sun et al. (2009) researched what impact does the role of ERPs perceived work compatibility have in modifying user's intend to use the system, actual system usage, and system performance in a work setting. According to Sun et al. (2009), their goal was to both incorporate the role and impact of organizational work and evaluate the impact of IT usage on organizational outcomes. This was done by combining prior usage research models (TAM & UTAUT) with task-technology fit (Sun et al., 2009). Additionally, perceived work compatibility was added as a dimension of task-technology fit (Sun et al., 2009). According to the results of Sun et al. (2009), future IT-usage research should incorporate perceived work compatibility and task-technology fit into the mix. They do also note that

previous models explain IT involuntary usage circumstances, but less in organizational, mandatory settings such as ERP usage, whereas adding perceived work compatibility to the mix can alleviate this (Sun et al., 2009).

As most studies reviewed concentrated on the factors affecting ERP usage Ruivo et al. (2012) took a different approach and aimed at developing a research model for measuring ERP post-adoption and its results on Spanish and Portuguese SME's performance. According to Ruivo et al. (2012), the goal was to "identify the determinants that explain ERP post-adoption concerning usage and value." Ruivo et al. (2012) combined the diffusion of innovation model and resource-based view theory to develop their model. ERP use was explained through six determinants based on the diffusion of innovation model, and ERP value was explained by three determinants based on the resource-based view theory (Ruivo et al., 2012). They discovered that compatibility, training, competitive pressure, and best-practices are significant factors of ERP use, whereas usage, analytics capabilities, and complexity contribute to ERP value (Ruivo et al. 2012). Results did vary between Spanish and Portuguese companies; thus, the cultural context has some effect on the results.

Ruivo et al. (2014) continued to research ERP usage by measuring and analyzing the motives of ERP use and value in a specific framework. They used the technology–organization–environment framework to speculate how "compatibility, complexity, efficiency, best practices, training, and competitive pressure explain ERP use." In addition, they used the resource-based view to theorize how ERP use, analytics, and collaboration explain ERP value (Ruivo et al., 2014).

According to Ruivo et al. (2014), compatibility, complexity, best-practices, training, competitive pressure, and efficiency are the main components for ERP use. Additionally, technological, organizational, and environmental characteristics are seen as the primary motives of ERP use. They also suggest that system capability characteristics are the primary motives of ERP value as cooperation and analytics are of greater importance for ERP value consequent to use. They conclude that their research is the first to prove the theoretical importance of combining technology–organization–environment framework and resource-based view to explain ERP use and value (Ruivo et al., 2014).

Chou et al. (2014) researched the drivers and effects of post-implementation learning on ERP usage. As mentioned before, due to the complexity of the ERP system, businesses often under-utilize the system. Chou et al. (2014) used a hypothesized model to investigate the antecedents and consequences of post-implementation learning. Chou et al. (2014) discovered that post-implementation learning directly contributes to ERP usage and that social capital and post-training self-efficacy are essential backgrounds to learning during post-implementation. More specifically, social capital can create new opportunities for learning, improve user's willingness to learn, and strengthen the overall learning capability. Additionally, they discovered that learning willingness has a stronger relation to social capital compared to post-training self-efficacy. Furthermore, they add that post-training self-efficacy benefits user capability for learning more than social capital does. Their study incorporated social capital theory and social

cognitive theory to propose a better detailed theoretical model to explain post-implementation learning (Chou et al., 2014). According to Chou et al. (2014), this allows for better tools to facilitate effective ERP usage during the post-implementation phase.

Wibowo and Sari (2018) studied the factors that affect ERP system success. They used a refined model of Delone and McLean's information system model, together with the technology-organization-environment (TOE) framework, to identify these factors. Their findings indicate that system quality, service quality, and information quality all impact user satisfaction furthermore, influence perceived usefulness (Wibowo & Sari, 2018). On the organizational level, they discovered that management support was a critical success factor in ERP system success, which is in line with previous studies (Law & Ngai, 2007; Lin, 2010).

Similar findings and themes can be found in the above studies reviewed. One strong theme is the importance of user involvement (e.g., Chang et al., 2008; Bagchi et al.,2013; Kalema, 2013), which can also be closely linked with communication. Education level was found to affect the determinants of usage by both Calisir et al. (2009) and Kalema (2013). Ruivo et al. (2012, 2014) discovered several factors affecting ERP usage in Iberian companies; these findings are much in line with the previous finding of Sternard et al. (2011). Important factors found by Ruivo et al. (2012, 2014) were compatibility, training, complexity, efficiency, competitive pressure, and best-practices. Chou et al. (2014) investigated how post-implementation learning affects ERP usage. They discovered that ERP usage is directly affected by learning and that both social capital and post-training self-efficacy are a decisive background to learning during post-implementation (Chou et al., 2014). These are similar factors found by Sternard et al. (2011). They argued that, for example, computer self-efficacy, ERP training and education, and social effect and support are factors influencing ERP usage in the post-implementation phase (Sternard et al., 2011). Finally, Wibowo and Sari (2018) supported the notion that management support has a strong impact on ERP success.

The next subchapter takes a more detailed look at the external factors involved in ERP usage. These found factors are later combined to construct the research model used in this study.

3.2 Factors related to ERP systems

Although UTAUT2 can be applied to a wide range of technologies, the constructs of UTAUT2 should be broadened by reshaping factors for specific information systems (Calisir et al., 2009). According to Moon and Kim (2001), when choosing additional factors, the target technology, primary users, and context should be taken into account.

A set of factors have been identified and described (see TABLE 2). Sternard et al. (2011) were used as the foundation, and additional previous research was used to supplement and adjust the found factors to match the theoretical basis. A total of twenty-eight (28) factors were identified. As factors were identified,

they were matched with the modified categories of UTAUT2. Also, the concept of the ERP implementation phase was introduced.

The factors are organized under five (5) high-level themes: ERP usefulness, ERP ease of use, social influence, facilitating conditions, and individual traits. Eight (8) external factors are linked to ERP usefulness: usefulness, ERP communication, ERP system performance, personal relevance, information quality, user satisfaction, documentation, and ERP implementation goals. Five (5) external factors are related to ERP ease of use: ease of use, ERP data quality, ERP system functionality, system quality, and data accuracy.

Social influence is constructed of four (4) different external factors: argument for change, shared beliefs, social factors and subjective norms, and cultural readiness. Next is facilitating conditions, which consist of seven (7) factors: initial ERP training, management support during implementation, ERP training after implementation, organizational support for ERP use, ERP user manuals, company size, and initial management commitment. Finally, we have individual traits, which includes four (4) factors: computer self-efficacy, computer anxiety, technological innovativeness, and employee attitude. These factors are separated under an integrative model based on UTAUT2.

TABLE 2: Identified factors by authors

Factor	**Authors**	**Description**	**Implementation phase**
ERP usefulness			
Usefulness	Amoako-Gyampah & Salam (2004), Amoako-Gyampah (2004), Sternard et al. (2011), Zhang et al. (2013)	How useful do the users perceive the ERP system to be	Implementation, Post-implementation
ERP communication	Kelley (2001), Amoako-Gyampah & Salam (2004), Amoako-Gyampah (2004), Motwani et al. (2005), Youngberg et al. (2011)	Does communication increase understanding and usage of the ERP system	Implementation & post-implementation
ERP system performance	Venkatesh et al. (2003), Boudreau (2003), Liu and Ma (2006)	The reliability and usability of the ERP system.	Post-implementation
Personal relevance	Amoako-Gyampah (2004)	ERP system's ability to improve employees productivity	Implementation
Information quality	Lin (2010), Amoako-Gyampah (2004)	ERP system's ability to produce quality information	Implementation

User satisfaction	Amoako-Gyampah (2004), Lin (2010)	How does the ERP system meet the requirements of the users	Implementation
Documentation	Motwani et al. (2005)	Documentation of the implementation of the ERP system	Post-implementation
ERP implementation goals	Motwani et al. (2005)	Recognizing the strategic needs and goals for the ERP system	Pre-implementation
ERP ease of use			
Ease of use	Amoako-Gyampah & Salam (2004), Amoako-Gyampah (2004), Sternard et al. (2011), Zhang et al. (2013)	How easy do the users perceive the use of the system to be	Implementation
ERP data quality	Vosburg & Kumar (2001), Gattiker & Goodhue (2005), Insiti (2007)	How accurate and relevant data is used in the ERP system	Post-implementation
ERP system functionality	Goodwin (1987), Rolland & Prakash (2000), Lu et al. (2003)	How stable, easy to use, flexible and responsive the system is	Post-implementation
System quality	Lin (2010)	How in an ERP system, system quality measures a functional feature of the system	Implementation
Data accuracy	Umble et al. (2003), Motwani et al. (2005)	How consistent, unambiguous and correct data values are given to the system	Implementation
Social influence			
Argument for change	Amoako-Gyampah (2004)	The business reason for the ERP system	Implementation
Shared beliefs	Amoako-Gyampah (2004)	Belief about the overall impact of the ERP system on the organization concerning its benefits	Implementation
Social factors and subjective norms	Yi et al. (2006), Chang et al. (2008), Calisir (2009), Sharif Abbasi et al. (2011)	Also known as social effet and support, includes social factors and subjective norms	Implementation, Post-implementation

Cultural readiness	Motwani et al. (2005), Lee et al. (2016)	Cultural readiness for change in the organization.	Pre-implementation
Facilitating conditions			
Initial ERP training	Amoako-Gyampah (2004), Soliman et al. (2019)	Training regarding the use of the ERP system	Implementation
Management support during implementation	Law & Ngai (2007), Lin (2010), Lee et al. (2016)	Support received from management regarding technology and business requirements	Implementation
ERP training after implementation	Amoako-Gyampah & Salam (2004), Bradley & Lee (2007), Kalema (2013)	The degree of formal and informal training received regarding the ERP system, post-implementation	Post-implementation
Organizational support for ERP use	Boudreau (2003), Lee et al. (2010)	Organizational support users receive regarding the usage of the ERP system	Post-implementation
ERP user manuals	Kelley (2001), Boudreau (2003)	The usefulness and availability of ERP user manuals	Post-implementation
Company size	Buonanno et al. (2005)	How company size and complexity affect ERP adoption.	Pre-implementation
Initial management commitment	Motwani et al. (2005), Wibovo & Sari (2018)	The commitment and support by management towards the change.	Pre-implementation
Individual traits			
Computer self-efficacy	Shih (2006)	How an individual believes in their ability to perform tasks in the ERP system	Implementation
Computer anxiety	Venkatesh (2000), Venkatesh et al. (2003), Venkatesh & Bala (2008)	An individual's negative emotional response to using a computer	Post-implementation
Technological innovativeness	Agarwal & Prasal (1999), Rogers (2003), Thompson et al. (2007)	The rate an individual adopts new information technologies	Post-implementation
Employee attitude	Abdinnour-Helm et al. (2003), Altamony et al. (2016)	The attitude of the employees towards the ERP system	Pre-implementation

The above table (Table 2) has its origin in Sternard et al.'s (2011) earlier research but has been modified and extended based on prior literature seen in

subchapter 3.1. The found factors have also been organized according to the main factors of UTAUT2 and include the implementation phase.

3.3 ERP usefulness

3.3.1 Usefulness

Usefulness describes how useful do the users perceive the ERP system to be (Amoako-Gyampah, 2004; Sternard et al., 2011; Zhang et al., 2013). Several previous studies (as seen in more detail under chapter 3.1 and its subchapters) have linked that perceived usefulness affects the use of the ERP system. Similarly to ease of use, perceived usefulness is affected by various factors, such as shared beliefs, ERP communication, personal relevance, etc.

3.3.2 ERP communication

ERP communication is found to be a significant factor by several authors (see Kelley, 2001; Amoako-Gyampah & Salam, 2004; Youngberg et al., 2009). According to Amoako-Gyampah and Salam (2004), effective communication leads to better understanding and usage of the ERP system. Kelley (2001) view inadequate communication regarding the ERP system as a reason for unsuccessful ERP performance. Youngberg et al. (2009) add that skills in both system and communication are needed for successful ERP technology usage. Based on the studies, ERP communication was most strongly linked to both the implementation and post-implementation phases.

3.3.3 ERP system performance

The concept of ERP system performance is related to system performance and organizational productivity. ERP system performance applies to the extent to which an individual considers that a system is dependable and responsive at the time of regular use. (Liu & Ma, 2006.) This factor is linked to the post-implementation phase, as the usage of the system is required to gather the data of the performance of the system.

3.3.4 Personal relevance

According to Amoako-Gyampah (2004), the personal relevance of technology refers to the degree in which workers perceive that the ERP system would be useful in their jobs, improve their productivity at work, and the extent to which the system would adapt to their changing work requirements. Additionally, they

discovered that during the implementation of the ERP system, end-user felt less personal relevance about the ERP system than the user-managers.

3.3.5 Information quality

DeLone and McLean (1992) describe information quality as "the quality of information that the system produces, primarily in the form of reports." It focuses on the information systems output. Lin (2010) adds that "information quality measures semantic success." In an ERP context, information quality describes the quality of the information produced by the ERP system (Lin, 2010).

3.3.6 User satisfaction

User satisfaction is defined as "the opinion of the user about a specific computer application, which they use" (Doll & Torkzadeh, 1988). According to DeLone and McLean (2002), user satisfaction is a prime measure of computer system success. Lin (2010) concluded in their research that information quality, system quality, and perceived usefulness combined form user satisfaction. Amoako-Gyampah (2004) construe satisfaction with technology as the ERP systems capability of providing unified, detailed, and appropriate information. Additionally, it describes expectations on the new system outperforming its predecessor. From the user's perspective, it has also been noted that satisfaction with technology differs widely between end-users and user-managers. According to Amoako-Gyampah (2004), this could be due to user-managers having more exposure to the adaptation of the new ERP technology compared to end-users. This resulted in a better understanding of the new technology and its potential.

3.3.7 Documentation

Here documentation refers to the documenting of the implementation project and not ERP manuals or similar documents that are covered under 3.2.27. Based on the study concluded by Motwani et al. (2005), documentation of the ERP project is critical for a successful ERP implementation. This includes evaluating and monitoring the implementation via documentation as well as communicating the success during the post-implementation phase.

3.3.8 ERP implementation goals

Motwani et al. (2005) indicate that defined clear and strategic goals for the ERP project are crucial during the pre-implementation phase. They add that well defined ERP goals are the backbone for a successful ERP implementation as having realistic and achievable expectations from the start increases the likelihood of finishing the ERP implementation successfully. Similarly, Ahmadi et al. (2015)

discovered that adjusting the organization's strategic goals with ERP goals increased the organization's ERP readiness.

3.4 ERP ease of use

3.4.1 Ease of use

Similarly to usefulness, ease of use is related to several factors. Amoako-Gyampah (2004) describe ease of use as "how easy do the users perceive the use of the system to be." Based on numerous previous studies (described in more detail under chapter 3.1 and its subchapters), it has been linked that perceived ease of use has an impact on the usefulness of the ERP system. As explained in more detail in previous and upcoming chapters, various factors are affecting perceived ease of use; computer anxiety, technological innovativeness, ERP training, ERP support, etc.

3.4.2 ERP data quality

Vosburg and Kumar (2001), as well as Somers et al. (2003), imply that the benefits from an ERP system will not be achieved without data quality. Besides, Gattiker and Goodhue (2005) mention that without timely and relevant data (data quality), an organization is lacking in the benefits of coordination and work efficiency gained from an ERP system. Insiti (2007) adds that using accurate, relevant, and timely data enables more complex ERP system usage.

3.4.3 ERP system functionality

According to Goodwin (1987), users chose systems that have functions that allow them to do their work tasks. More importantly, how the functions are implemented directly influences the usability of the system. Lu et al. (2003) mention that system functions are used to assess the stability, ease of usage, flexibility, and the response to changes in the system. This is even more important in the case of ERP systems due to their complex nature. Rolland and Prakash (2000) point out aligning ERP functions to business processes is difficult due to the complexity of the system, and organizations tend to see the system in terms of the organization's goals and objectives and not in terms of the ERP systems functions.

3.4.4 System quality

System quality is described by Lin (2010) as a measure of a functional feature of the ERP system. It includes features such as reliability, response time, flexibility, integration, and accessibility. Based on their research, system quality has a

substantial impact on ERP system usage. It could increase users' acceptance of ERP system usefulness and thus improve ERP implementation success (Lin, 2010).

3.4.5 Data accuracy

The accuracy of data is a significant data quality factor. Umble et al. (2003) determine that data accuracy crucial for a functioning ERP system. Thus, system users should be trained on the importance of accurate data (Umble et al. (2003). Motwani et al. (2005) found similar results in their study. They discovered that the importance of data accuracy was exceptionally high during the ERP systems implementation phase.

3.5 Social influence

3.5.1 Argument for change

In an ERP system context argument for change can be described as the (business) rationale for implementing the ERP system. Previous studies have found argument for change to affect the perceived usefulness of an IT system (Jackson, Chow, and Leitch, 1997). Also, Amoako-Gyampah (2004) found that there was a notable difference between managers and end-users perception of the argument for changing technology.

3.5.2 Shared beliefs

Amoako-Gyampah and Salam (2004) describe shared beliefs as user's belief in the overall impact of the ERP system on the organization in terms of its benefits. As ERP systems cover the whole organization, it is vital to reach a level of mutual trust and commitment between ERP users. Shared beliefs allow the organization to achieve this. (Amoako-Gyampah, 2004)

3.5.3 Social factors and subjective norms

Social effects and support include social factors and subjective norms. According to Ajzen (1991), subjective norm refers to "*the perceived social pressure to perform or not to perform the behavior.*" Calisir et al. (2009) discovered that perceived usefulness is significantly influenced by subjective norms. Also, Yi et al. (2006) noticed that a user's social networks influenced their intention to use technology.

3.5.4 Cultural readiness

Cultural readiness or organizational culture is described by Ravasi and Schultz (2006) as a collection of shared beliefs that direct actions. Motwani et al. (2005, discovered that an open and information sharing culture improves ERP implementation success. Similarly, Lee, Shieu, and Chen (2016) concluded that an organization's culture and top management affect software implementation. Although management support is closely tied to the organization's culture (Motwani et al., 2005; Lee et al., 2016), in this study, they have been separated as individual factors due to having an impact in different phases of the implementation.

3.5.5 Management support during implementation

Several studies (Law and Ngai, 2007; Lin, 2010; Lee at al., 2016) mention that management support, especially top management, is critical for successful ERP implementation. Law and Ngai (2007) point out that clear objectives set and followed up by management had an impact on project success. Similarly, Lin (2010) discovered that top management support influenced ERP system usage, both directly and indirectly. It also affected perceived usefulness as the management support motivated users to participate (Lin, 2010). However, Lee et al. (2016) state that although top management support can be a factor for implementation success, it needs to be paired with active knowledge sharing to reap the benefits.

3.6 Facilitating conditions

3.6.1 Initial ERP training

Initial ERP training refers to training received during the ERP implementation regarding the use of the ERP system. Amoako-Gyampah (2004) highlights training as one of the critical success factors for ERP implementation success. Both Amoako-Gyampah (2004) and Soliman et al. (2019) conclude that active end-user ERP training influences the end-users acceptance of the ERP system and has a clear effect on the intention to use the ERP system.

3.6.2 ERP training after implementation

Amoako-Gyampah and Salam (2004) learned that training affects beliefs in the benefits of the ERP system. Training allows users to gain direct information and experience regarding the ERP system, and it enables users to explore the perceived ease of use of the system (Amoako-Gyampah & Salam, 2004). Bradley and Lee (2007) discovered that training satisfaction influences the usefulness of the ERP system. Further, proper training and measurement of training satisfaction

can be used to foresee user attitudes toward the ERP system during post-implementation (Bradley & Lee, 2007). Kalema (2013) also notes that training can be used to reduce the user's ERP dissatisfaction and resistance.

3.6.3 Organizational support for ERP use

Lee et al. (2010) mention that organizational support leads to increased interest in the ERP system. Additionally, they discovered that organizational support is a notable factor for both perceived usefulness and perceived ease of use (Lee et al., 2010). According to Boudreau (2003), formal support from the organization is needed to utilize the ERP system fully. They also note that a lack of formal support can lead to increased informal training between users (Boudreau, 2003).

3.6.4 ERP user manuals

Under the findings of Kelley (2001), a lack of high-quality support, such as proper ERP user manuals, can hinder the usage of ERP systems. Also, ERP self-efficacy may be negatively affected by lacking ERP user manuals. Boudreau (2003) as well mentions the importance of suitable ERP user manuals to improve user satisfaction. Up to date, quality user manuals are needed to support a complex, evolving system such as ERP (Boudreau, 2003).

3.6.5 Company size

In general, the size of a company reflects its organizational complexity. Buonanno et al. (2005) concluded that company size affects the adoption of ERP systems. Based on their research, the larger the company is, the higher their rate of ERP system adoption (Buonanno et al., 2005. This is in line with the consensus that ERP systems are complex and costly systems to adopt and thus tend to interest larger organizations.

3.6.6 Initial management commitment

Initial management commitment describes the management's support and commitment during the beginning of an ERP implementation project in the pre-implementation phase. Motwani et al. (2005) define management commitment (with a clear vision) as a critical success factor for ERP implementation. Wibovo and Sair (2018) support this claim and add that top management support has a definite effect on both the perceived usefulness of the ERP system use and the business benefit of the ERP system.

3.7 Individual traits

3.7.1 Computer self-efficacy

Compeau and Higgins (1995) define computer self-efficacy as "a judgment of one's capability to use a computer (p.192)". Shih (2006) observed that ERP system use was higher with users with high self-efficacy. Besides, both perceived ease of use and perceived usefulness were significantly influenced by computer self-efficacy. Finally, it was also noted that these same users received more form their use of the ERP system compared to the users with lower computer self-efficacy (Shih, 2006).

3.7.2 Computer anxiety

Rosen and Weil (1992) defined computer anxiety as "*anxiety about present or future interactions with computers.*" Venkatesh (2000) adds that computer anxiety is an individual trait that harms the perceived ease of use of a new system. Venkatesh (2000) and Venkatesh and Bala (2008) noticed that computer anxiety diminishes over time as experience using the system grows.

3.7.3 Technological innovativeness

Agarwal and Prasad (1999) discovered that individuals who are more familiar with technology, have higher education levels, and have prior experience with technologies are more willing to try out new information technology innovations. Rogers (2003) adds that perception is important for technological innovativeness as the user's perceptions of the attributes of innovation affect the rate of its adoption, not the attributes described by experts or change agents. Additionally, Thompson et al. (2007) discovered that technological innovativeness had a direct, positive impact on computer self-efficacy. It was also recorded influencing intentions to use as well as perceived ease of use.

3.7.4 Employee attitude

Abdinnour-Helm et al. (2003) studied employee attitudes about ERP systems. They concluded that employee attitude is a crucial factor in determining the success of an ERP implementation. Based on their study, the early influence on employee's attitudes towards the system affects the user's views about the system throughout the whole implementation cycle (Abidnour-Helm et al., 2003).

3.8 Integrative model

Based on the ERP literature, ERP implementation phases by Esteves & Pastor (1999), and the UTAUT2 research model proposed by Venkatesh et al. (2012), we derived an integrative model to structure the identified factors too. The framework consists of an implementation timeline divided into three phases (see FIGURE 8): pre-implementation, (2) implementation, and (3) post-implementation. Each phase then includes a set of factors identified from previous research. The identified factors that affect ERP system usage have been grouped under five categories: (A) ERP usefulness, (B) ERP ease of use, (C) social influence, (D) facilitating conditions, and (E) individual traits. The categories serve as a basis for the factor groups, and prior studies provide the linked ERP implementation phases.

Analysis of previous research revealed multiple factors influencing an ERP implementation project. The factors displayed in the model constructed are divided under the three implementation phases based on earlier research. These phases are pre-implementation, implementation, and post-implementation. Despite that, it should be mentioned that many of these factors can be found throughout all of the phases. For example, as Motwani et al. (2005) mention, data accuracy is part of the whole cycle but plays a crucial role during the implementation phase. Similarly, support for ERP use is most vital during the post-implementation phase, although it should be present in organizations since the beginning of the implementation project (Lee at al, 2010). Nevertheless, in the context of this study, they are linked to the phase they were deemed to have the most impact.

For each central category, we first structure and summarize key research results on an aggregated level. We then expand this summary by explaining key themes related to the specific linked implementation phase. In addition to dividing the factors under a specific implementation phase, they were categorized into five categories based on UTAUT2. Next, these key categories in their specific implementation phase and the included factors are discussed in more detail.

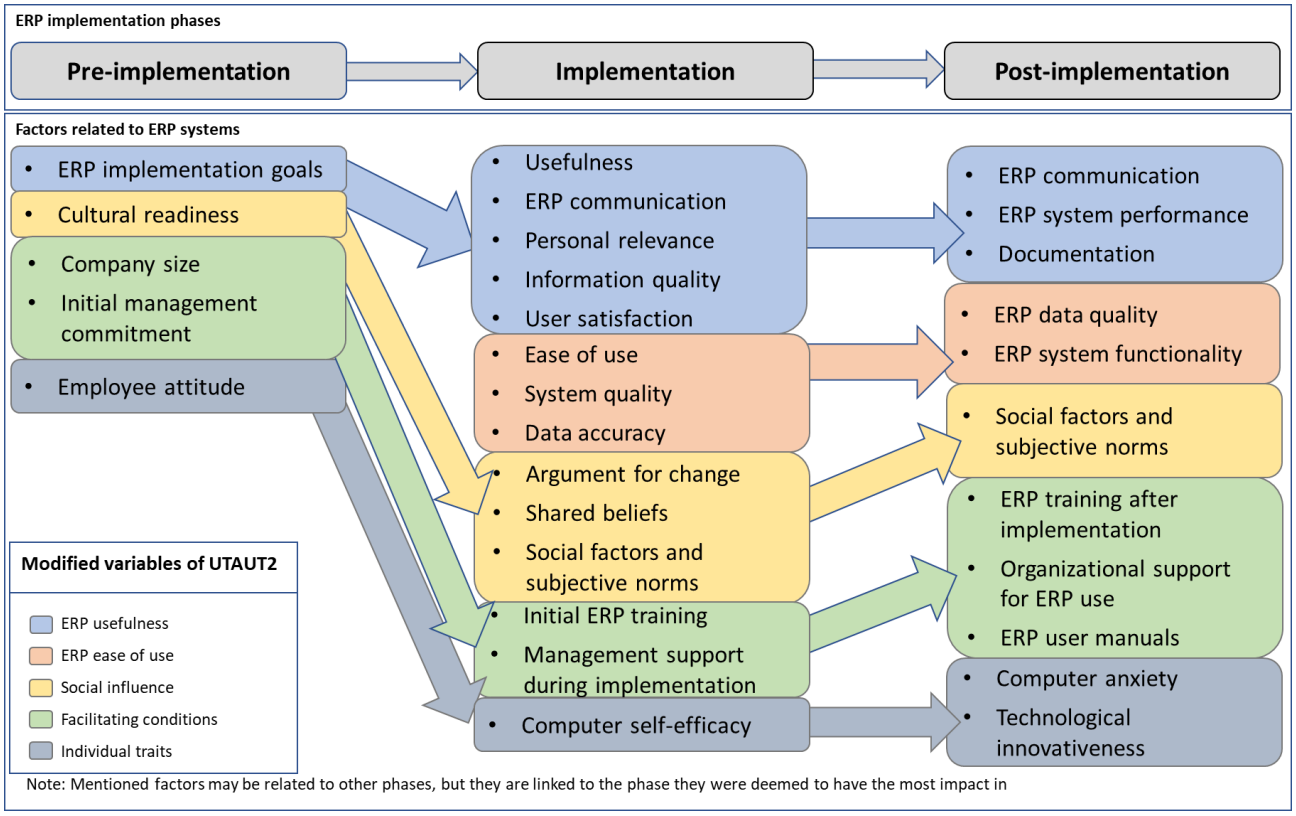


FIGURE 8: Integrative model.

3.8.1 The categories of ERP use

The first category is ERP usefulness. According to Venkatesh et al. (2003), performance expectancy is the degree to which an individual believes an information system will increase their work performance. In this case, the information system stands for an ERP system, and ERP systems are designed to integrate business processes efficiently. (Lee, Siau, & Hong, 2003; Gargeya & Brady, 2005) Therefore, ERP usefulness here describes to which degree a user feels that the ERP system will increase their work efficiency. ERP usefulness includes nine external factors: ERP goals, ERP communication, personal relevance, information quality, user satisfaction, satisfaction with technology, ERP system performance, and ERP documentation. It can be seen that based on the previous research, the effect of ERP usefulness focuses on the later phases of the ERP implementation.

Ease of use has been theorized to be closely linked with individual self-efficacy and procedural knowledge, which requires practical experience and skills (Davis et al., 1989; Venkatesh, 2000; Venkatesh & Bala, 2008; Sternad et al., 2011). In UTAUT2, ease of use is defined as the measure of ease associated with the use of the system. According to Venkatesh et al. (2003), this factor was constructed from the perceived ease of use factor, as mentioned in TAM. Additionally, Venkatesh (2000) describes that ease of use is composed of generic assumptions regarding computers and computer use and individual variables.

Venkatesh and Bala (2008) advocate that ease of use would be influenced by system-related characteristics as well. Combining these views, we speculate that the eight external factors of ease of use, system quality, data accuracy, computer self-efficacy, ERP data quality, ERP system functionality, computer anxiety, and technological innovativeness are linked to ERP ease of use. As could be presumed, no factors related to ERP ease of use were linked to the first phase. As there is no ERP system available in the initial phase of an ERP implementation, naturally, no factors linked to the use of the system are found. However, it can be argued that the longer the implemented system is in use, the more crucial these factors become.

The third category is social influence. It is defined by Venkatesh et al. (2003) as "the degree to which an individual perceives that important others believe he or she should use the new system." This factor is similar to the factor "subjective norm," as defined in TRA. Venkatesh et al. (2003) discovered that in a voluntary context, none of the social influence constructs have a significant effect. Only when use is mandatory, they become significant. However, both Venkatesh et al. (2003) and Venkatesh and Davis (2000) observed that social influence seems to be significant only during the initial experience an individual has with the technology. They add that social influence loses its importance as the individual's experience grows, and eventually, its effect becomes non-significant (Venkatesh et al., 2003). In this study, social influence is affected by the five external factors of employee attitude, cultural readiness, argument for change, shared beliefs, and social effect and support. In contrast to the first two categories, social influence factors are more present in the early stages of the implementation project, and their impact lessens over time.

Facilitating conditions are defined by Venkatesh et al. (2003) as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system." The fundamental structure for facilitating conditions is operationalized to incorporate aspects of the technical and/or organizational setting that are intended to eliminate obstacles to usage (Venkatesh et al., 2003). Venkatesh et al. (2003) discovered that facilitating conditions become non-significant in predicting usage if not moderated by user's age and experience. Eight factors were identified in the literature review affecting facilitating conditions: company size, organizational change factors, management commitment, training, management support, ERP training, ERP support, and ERP user manuals.

Finally, we have individual traits. Individual traits were introduced to group the factors that are linked to the individual rather than the ERP system or organization. Four factors were included under individual traits: computer self-efficacy, computer anxiety, technological innovativeness, and employee attitude. However, factors such as age, gender, or experience were dismissed in this study.

When grouping the factors under their category group's certain categories introduced by UTAUT2 were dismissed. The category of hedonic motivation was considered. According to Venkatesh et al. (2012), hedonic motivation decisively predicts behavioral intention. Hedonic motivation is characterized as enjoyment

or pleasure derived from the use of technology, and it has been shown to have a significant role in deciding the use of technology (Brown & Venkatesh, 2005). According to Heijden (2004), perceived ease of use has a crucial role in the user acceptance of hedonic information systems. Ease of use and enjoyment have more predictive value than perceived usefulness regarding hedonic information systems (Heijden, 2004). But, Venkatesh et al. (2012) also discovered that the impact of hedonic motivation on usage decreases as the user gains experience. However, as ERP systems are organization-wide, complex systems, the choice to implement them is rarely made with end-users enjoyment or pleasure as a key driving factor. Thus, hedonic motivation was not directly included in this study. Similarly, the four indirect categories related to UTAUT2 were not included in this study. These include age, gender, education level, and experience. Next, we will present the three implementation phases and related factors.

3.8.2 The first phase – preparing for implementation

The first phase is known as the pre-implementation phase. According to Hasibuan and Dantes (2012), this phase is the preparation stage for the project. It includes steps such as: defining project goals and objectives, establish project budget and timeline, business process reengineering, assess IT investment, and examination of current IS/IT. Additionally, it can also include technology selection (Hasibuan & Dantes, 2012). This phase is linked to five factors: ERP implementation goals, cultural readiness, company size, initial management commitment, and employee attitude. As with any complex project, planning is key. Thus it can be generally agreed that pre-implementation is a critical phase.

One of the first critical decisions to make is selecting the ERP system, and company size has a crucial role in determining the type of ERP to fit the organization (Noureddine & Oulid, 2018). In general, the larger the organization, the more complex the ERP solution needed. Soliman et al. (2019) deduced that the intention to use the ERP system is clearly influenced by facilitating conditions related to the ERP system. The pre-implementation phase, according to Ali and Miller (2017), sets the attitudes that will affect future implementation phases. The decisions made and steps taken have a direct impact on the later phases and the outcome of the implementation (Ali & Miller, 2017). Additionally, previous research has proven that management support and commitment is the most critical success factor in an ERP system implementation (see Motwani et al., 2005; Shatat & Dana, 2016; Ali and Miller, 2017; Wibovo & Sari, 2018; Leandro, Méxas, da Silveira Batista, Dias, and Drumond, 2019). In a study with 70 ERP specialists, over 83% of the respondents ranked top management support as the most important factor (Leandro et al., 2019). This supports the importance of initial management commitment to support and guide the end-users during the whole implementation. Similarly, setting clear ERP implementation goals can be tied to the initial management commitment. The factor of cultural readiness during the pre-implementation phase describes how open and information sharing the organization's culture is (Motwani et al., 2005). Although communication was not listed as a

factor under pre-implementation, it is heavily tied to the cultural readiness factor. Be it communication or cultural readiness; several studies support the claim that an open and information sharing implementation process is key for success (Shatat & Dana, 2016; Leandro et al., 2019).

The last factor related to the pre-implementation phase is employee attitude. Altamony et al. (2016) noted that employee attitude affected the ERP system implementation. They add that influencing the employee attitudes positively in the early stages was crucial for a successful implementation. Mahmud, Ramayah, and Kurnia (2017) discovered that the concepts of status quo bias and technostress have a notable impact on employee attitudes towards a new ERP system implementation. Alshare, El-Masri, and Lane (2019) researched student effort at learning ERP systems, and their conclusions are in aligning with the UTAUT model, which means that the students' perceptions of ERP ease of use and ERP usefulness significantly affect their attitudes towards learning the ERP system. They also highlighted the importance of educators' influence on these student attitudes (Alshare et al., 2019). This highlights the need for strong managerial involvement as well as having in place the organizational culture to minimize the effect of these negative concepts. Beside company size, the other four factors rely on strong communication, leadership, and co-operation.

3.8.3 The second phase – actual ERP system implementation

During the implementation phase, the actual ERP system is installed, configured, standardized, and customized (Mdima, Mutagehywa, Mohamed, & Mahabi, 2017). The goal is to configure the system and make it run in a production environment. We have linked thirteen factors with the implementation phase, which we will next go through.

Several factors are found to affect the end-users work efficiency or to which degree a user feels that the ERP system will affect his performance expectancy, or in this case, ERP usefulness. Past research has shown that ERP communication is a crucial factor during both implementation and post-implementation (see Kelley, 2001; Amoako-Gyampah & Salam, 2004; Youngberg et al., 2009; Leandro et al., 2019). Although communication is vital during an ERP implementation project, it is shown by Leandro et al. (2019) that effective communication, especially during the implementation phase, is needed. In general, the more complex a project is, the more effective communication is needed, and ERP implementation projects are no different from this.

User involvement can be described as a specific mindset or psychological state, which highlights how important and personally relevant a user feels the system (Barki & Hartwick, 1994). In a study related to the intention to use blogs, Shiau and Luo (2010) argued that a high level of user involvement with information is associated with the perceived enjoyment of the system. During the implementation phase, it is important to involve the end-user in the actual ERP implementation. Organizations should emphasize the importance of including end-users during the implementation process to create personal relevance

towards the ERP system (Schaffer, 2016). This would lead to better overall usage of the ERP system.

Information quality is defined by DeLone and McLean (1992) as the quality of information that a system produces. In an ERP context, this means the quality of information produced in reports and on-screen by the ERP system (Jayawickrama, Liu and Smith, 2017). In a study on ERP influence on company success, Suprapto, Tarigan, and Basana (2017) discovered that ERP implementation affects information quality. In addition, they found a significant positive link between information quality and information sharing. Another study on E-learning systems found that information quality has a strong effect on both user satisfaction and intention to use (Ngemba & Hendra, 2017). These findings highlight the importance of quality information to increase end-users information sharing and system usage.

Masa'deh, Mufleh, and Alrowwad (2017) studied the impact of software usability on ERP implementation success in Jordan and concluded that user satisfaction has a significant impact on ERP implementation success. However, their study focused on only interviewing managers, and as Amoako-Gyampah (2004) mentioned, satisfaction with technology can differ between end-users and managers. Costa, Ferreira, Bento, and Aparicio (2016) also found system quality to influence user satisfaction in an ERP system heavily. Based on 155 ERP end-users' responses, it was concluded that proper management support, together with a focus on system quality, improved user satisfaction and adoption of the ERP system during an ERP implementation (Costa et al., 2016). These findings (Amoako-Gyampah, 2004; Costa et al., 2016; Mada'deh et al., 2017) imply that managers should take actions to involve the end-users better during the implementation phase to ensure their user satisfaction towards the ERP system is also increased. Additionally, special focus should be put on system quality to increase ERP usage. These findings regarding user satisfaction and system quality further support the need for active management support during the implementation phase.

Scholtz, Mahmud, and Ramayah (2016) studied how interface usability affects ERP system usage and notes that improved interface usability positively affected the user's attitudes towards the ERP system. The perceived ease of use and perceived usefulness of an ERP system increased by improving the ERP systems navigation, presentation, and learnability during the implementation of an ERP system. Naturally, this would lead to increased usage of the system (Scholtz et al., 2016). It can be argued that inaccurate data can harm ERP usage. Based on a study done in Saudi-Arabia by Mutahar (2016), data accuracy was considered a less significant factor in ERP implementation when compared to factors such as top management support or training. This is in line with previous research. However, the risks of giving data accuracy, less focus can cause problems later in the implementation or post-implementation, such as problematic data migrations (Bahtijarevic, 2018).

Management support is seen as a critical factor for the success of ERP projects (Law and Ngai, 2007; Lin, 2010; Lee at al., 2016; Bueno & Gallego, 2017) and can be seen affecting several factors as mentioned earlier. Furthermore, it is

known that training increases management support (Bueno & Gallego, 2017). Top managers are usually supportive of new information systems as they see them useful. Based on this, Bueno & Gallego (2017) add that training has a motivational effect on management support. The more knowledge of the system the managers acquire, the better they can support the end-users. Now, when implementing a new ERP system, this support is especially needed. According to Shao, Feng, and Hu (2016), the leadership and management style should adjust during different life-cycle phases. Their study shows that during the implementation phase, management should have a transactional leadership style. This would include characteristics such as coordination, execution, and leveraging training. They add that special focus should be put on knowledge transfer (Shao et al.,2016). Initial ERP training is seen as an effective method in positively affecting the end-users behavior to use the ERP system (Soliman et al., 2019). However, not all training is equally effective. Alcivar and Abad (2016) studied what effect gamification would have on ERP training. They pointed out that common training methods often did not provide the required information and left end-users unsatisfied. But they discovered that gamification improved the learning results and satisfaction (Alcivar and Abad, 2016).

Next, we will inspect the factors under the social influence category. A study by Althunibat, Al-mahadeen, Altarawneh, and Al–Qaremm (2019) on higher education ERP users in Jordan suggested that social influence (compared to performance expectancy, effort expectancy and facilitating conditions) had the strongest influence on ERP adoption. Based on their research, it directly affected the user's intention to accept the ERP system (Althunibat et al., 2019). Similarly, an earlier study by Zabukovšek and Bobek (2015), found social influence to have a weak, but significant effect on the perceived ERP usefulness and perceived ease of use of an ERP system. One of the factors under social influence in the implementation phase is an argument for change. A previous study by Amoako-Gyampah (2007) proposed that a change instigated by top management was expected to create a positive perception. Soliman et al. (2019) suggest that when employees feel positive and ready for organizational change, they tend to be more open towards using a new system. They add that employees find the system more useful when they are ready for change (Soliman et al.,2019).

During the implementation phase, it is important to have a shared belief between the end-users of the ERP system. Amoako-Gyampah and Salam (2004) stressed the need for an open and sharing environment to create mutual trust and commitment. This can enable the employees to find a common, shared purpose related to the ERP implementation (Amoako-Gyampah & Salam, 2004). Similarly, Keong, Ramayah, Kurnia, and Chiun (2012) state that employees and their managers should have shared feelings to improve the end user's usage of the new ERP system under implementation. According to their study, shared beliefs related to the ERP system would have a direct, positive effect on the intention to use the new ERP system (Keong et al., 2012). This is in line with the findings of Ramayah and Lo (2007), who argued that shared beliefs positively affected the perceived ease of use and perceived usefulness of the ERP system. The findings

of Sharif Abbasi et al. (2011) suggest that the influence of co-workers and management can affect technology use. Chang et al. (2008) found that social factors have a strong influence on the usage of ERP systems. Also, they noted that top management might pressure their employees to use the ERP system. Due to the complexity of ERP systems, cooperation is needed among different factions to utilize the system fully. (Chang et al., 2008.) These findings support the claim that management support is the most critical success factor in ERP implementation. Without management actively building and supporting a culture of trust and openness and leading by example, many of the benefits of shared belief are lost.

The last factor related to the implementation phase is computer self-efficacy under the individual traits' category. An early Albashrawi and Motiwalla (2016) theorize that computer self-efficacy positively affects the intention to use mobile ERP. They add that increased computer self-efficacy would also benefit system quality, information quality, and service quality related to the use of mobile ERP (Albashrawi & Motiwalla, 2016). Initial ERP training is required during the implementation phase, and a prior study by Arasanmi and Ojo (2019) found that end-users ' higher computer self-efficacy had a positive effect on the training results and knowledge transfer. Hasan (2018) add that high user computer self-efficacy can be tempting to organizations. But, organizations, and especially management, should facilitate factors that enable increased and sustained ERP use (Hasan, 2018).

3.8.4 Third phase: using the implemented ERP system

Post-implementation is the last phase of an ERP implementation. It includes steps such as system stabilization, bug fixes, system maintenance, user support, and system upgrades (Hasibuan & Dantes, 2012). This phase is linked to twelve factors. The post-implementation phase includes activities after the ERP system go-live, such as stabilization, operation, and extension of the ERP system (Hecht, Wittges and Krcmar, 2011). First, we will discuss the factors related to ERP usefulness.

ERP communication was linked to the implementation phase in the previous chapter, but it remains a crucial factor during the post-implementation phase as well. A prior study by Ju, Wei, and Tsai (2016) on how network centrality affects user participation in an ERP system post-implementation shows that ERP communication is a critical dimension in regards to user participation. Their results show that communication activities have a significant and positive effect on both user satisfaction and ERP system use during the post-implementation phase (Ju et al., 2016). Chadhar and Daneshgar (2018) studied the reasons behind an ERP failure in a large Australian IT service management company. Based on their findings, both a lack of ERP communication and inadequate ERP training after implementation were significant reasons for failure (Chadhar & Daneshgar, 2018). Thus, these findings support the importance of two-way communication between end-users and management as wells as practical post-implementation ERP training.

Next, we have ERP system performance. Shen, Chen, and Wang (2016) created a post-implementation ERP performance evaluation system. They viewed the ERP system performance from four perspectives: financial, customer, innovation and learning, and internal business process. However, they viewed the ERP system performance only from an organizational viewpoint (Shen et al., 2016). Similarly, earlier Batada and Rahman (2012) studied ERP system performance and user satisfaction but concentrated on the organizational aspect. We know there is a need for ERP project documentation during the post-implementation phase (Motwani, 2005). Gathering critical project documentation can be done while measuring ERP system performance.

Based on the earlier ERP system performance studies, it seems that there is a lack of research on measuring ERP system performance from an end-user perspective. These findings are supported by a prior literature review by Ullah, Baharun, Nor, Siddique, and Sami (2018) on ERP systems and user performance, which also concluded the lack of studies related to ERP system performance from the end-users perspective. According to Suprapto et al. (2017), ERP system performance has a positive effect on end-users. Thus, we can assume that if an organization measures high in its ERP system performance, it should reflect the end-user perspective positively as well.

Two factors are linked to ERP ease of use during the post-implementation phase. The first is ERP data quality. ERP systems are known to have a positive impact on data quality (Aoun, Vatanasakdakul, and Yu, 2009; Glowalla & Sunyaev, 2013; Glowalla & Sunyav, 2014). When studying the ERP post-implementation performance in Chinese manufacturing firms, Aoun et al. (2009) found data quality to have a strong influence on the overall performance of the manufacturing plant. A prior study by Glowalla and Sunyaev (2013) on the use of ERP systems in data quality management in the insurance sector highlighted the need for high data quality due to regulations associated with the insurance industry. Based on the interviews of top management, it is shown that ERP systems do positively impact data quality (Glowalla & Sunyaev, 2013). Based on the prior literature, there is a clear link between improved data quality and ERP implementation.

Often when an ERP system is implemented, it only contains the standard solution with minimal customization. As the ERP system matures, the probability that there will be additional customization needed grows. (Rothenberger and Srite, 2009). The more complex the system is, the greater the risk of misunderstanding the ERP system functionality. According to Rothenberger and Srite (2009), this misunderstanding often results in customization. Thus, they summarize that immature ERP systems tend to lead to many customizations (Rothenberger and Srite, 2009). Gool and Seymour (2018) described 15 factors that impacted ERP customization during the post-implementation. One of the main factors discovered was ERP system functionality. They add that a lack of business process knowledge, which translated to lower ERP system functionality knowledge, was a key driver for customization (Gool & Seymour, 2018). When end-users have less knowledge of the ERP system functionality, it seems that

customization is requested when instead by increasing their ERP system knowledge and maturing the system, these needs could be met without system customization.

Following, we inspect in detail how the factors under facilitating conditions are linked to the post-implementation phase. We have earlier discussed the importance of communication during the post-implementation phase and how training and communication affect each other. Chadhar and Daneshgar (2018) mention that one of the key factors for ERP failure was the "disconnection between the training that the vendor provided and actual work practices." (Chadhar & Daneshgar, 2018, p.138). According to Gool and Seymour (2018), there is a need for training covering processes end-to-end. In addition, they found that inadequate user training related to business processes could lead to customization needs (Gool & Seymour, 2018). Kalema (2013) noted that training could be used to reduce the user's ERP dissatisfaction and resistance. These findings point to the fact that special focus should be put on ERP training after implementation as it can reduce customization needs and increase user satisfaction towards the ERP system.

Based on a review of ERP post-implementation literature Osnes, Olsen, Vassilakopoulou, and Hustad (2018) propose organizations to create high-quality training programs, maintain or create change management programs and communicate benefits related to standardization to gain commitment to a shared system. Organizational support is a known factor for perceived usefulness and perceived ease of use (Lee et al., 2010). Shao et al. (2017) found that having a strong organizational culture of participatory decision-making and psychological security fostered organizational learning. Thus, organizations should strive to have a culture that supports ERP use and skilled management to lead the organization during the post-implementation phase.

We have discussed the importance of ERP training after implementation. A part of the training is ERP user manuals. According to Sternad and Bobek (2013), user manuals together with data quality and system performance were seen as a system and technological characteristics that affected the perceived ease of use of an ERP system. A prior study by Chayakonvikom and Cannell (2018) on ERP end-users learning styles in Thailand found ERP user manual content to be non-relevant to the organization's needs. They also noted that users used the manual to find solutions to problems rather than learning. Essentially, the format of the manuals did not sufficiently support Thai ERP end-users learning habits (Chayakonvikom & Cannell, 2018). Basically, a one-size-fits-all approach to ERP user manuals do not meet the requirements of an organization. Thus, the use of ERP user manuals can be insignificant, and this can affect the perceived ease of use of the implemented ERP system.

Last, we take a look at which individual traits affect during the post-implementation phase. Prior studies have shown that technological innovativeness and computer anxiety influence perceived ERP ease of use through information literacy during the post-implementation phase (Sternad & Bobek, 2013). According to Zhu and Kraemer (2005), if specific new information technology is viewed

as being difficult to use, or requiring extensive training or learning, adoption is much less likely. The relative ease of use often influences the desire of individuals to use a particular technology (Zhu & Kraemer, 2005). However, a prior study by Zabukovsek and Bobek (2017) on student's ERP system acceptance showed that although technological innovativeness was an important individual trait which had an impact on student's ERP usage, computer anxiety did not. As these were third-year IT students and thus had more experience, it is natural that their computer anxiety had decreased. This diminishing effect is in accordance with the earlier findings of Venkatesh and Bala (2008). Based on this, any possible computer anxiety experienced during the post-implementation phase should decrease, both over time and through ERP training.

3.9 Summary

This chapter has reviewed previous literature in different fields of information systems usage and ERP system research. Starting by explaining the methodology behind the literature identification and analysis, we continued to explain prior ERP system usage studies. We have looked at four linked information system usage theories and analyzed ERP usage studies based on them. Based on previous research, we have postulated a list of factors affecting ERP usage. A total of twenty-eight factors were defined and listed under five categories of ERP usefulness, ERP ease of use, social influence, facilitating conditions, and individual traits. Which then have been incorporated into the integrative model that is based on the UTAUT2 construct and three phases of ERP implementation lifecycle. The model was explained in more detail by describing each phase and the unique factors linked to it. Next, we will discuss the findings of this research in more detail.

4 Discussion

> "Those among us who are unwilling to expose their ideas to the hazard of refutation do not take part in the scientific game." (Popper, 1959)

In this chapter, we will answer the research questions and explore the findings. Furthermore, contributions and future research direction, practical contributions, and limitations will be discussed. The main objective of the present study is to provide a review of the existing literature on ERP usage studies and the factors involved. Research on ERP implementation is ample, and studies often focus on a single phase of the implementation and from the organization's perspective. In this study, we focused on the end user's perspective and the factors related to them. Besides, we combined the found factors with the individual phases. Through a search of various IT related journals, as large electronic databases, we identified 18 papers related to ERP usage during the different implementation phases. Based on ERP implementation literature, we identified and summarized factors related to the essential implementation phases. We also proposed an integrative model for the study of the factors influencing ERP system usage from the end-users perspective.

4.1 Findings

Our research aimed to identify factors that influence ERP usage in three main phases of the ERP lifecycle. By doing so, we identified a total of 28 factors. The factors were divided into five categories: ERP usefulness, ERP ease of use, social influence, facilitating conditions, and individual traits. Furthermore, the factors were linked to specific ERP implementation phases: pre-implementation, implementation, and post-implementation. Based on our findings, the found 28 factors influence ERP system usage from the end-users perspective. However, there are differences in the significance of the factors. The significance also differs between each phase, with arguably the latter phases having more of an influence than pre-implementation.

The research questions of the study were the following:

1. Which context-specific factors influence ERP system usage from the end-user perspective?
2. How do these context-specific factors influence ERP system usage, and why?
3. How do these specific factors vary depending on the implementation phase?

The post-implementation phase has the least number of factors linked. Naturally, no factors related to ERP ease of use were linked to the pre-

implementation phase as at that point, the ERP system is not yet materialized, and thus, direct system use is not possible. The linked factors support the planning phase. Initial management commitment is a strong factor influencing ERP usage, and the effect of management support stays healthy throughout the whole ERP lifecycle. Management should lead by example to introduce an organizational culture that supports the ERP implementation. Company size does affect the ERP solution selected, but from an end user's perspective, all ERP systems tend to be complicated. Thus, its significance is less. Employee attitude is a strong influence on ERP usage; however, it is heavily tied to management support. It is highlighting once again the need for strong management to run the ERP project.

Communication was highlighted by many studies to be a critical factor during ERP implementation. Similarly, management support is seen as a crucial factor for implementation success. Overall, management support, in some form, is noticed to influence many of the factors. Prior research (Shiau & Luo, 2010; Schaffer, 2016) suggests that ERP users should be heavily involved during the implementation phase to enable the project to succeed. However, this might not always be the case. It was noticed that system quality and information sharing increase ERP usage. Management should enable and involve end-users to increase satisfaction and, therefore, ERP usage. Although data accuracy had some effect on ERP usage, it was not seen as significant. However, it should be noted that data accuracy should not be ignored entirely. Here as well, management support has a role to play. Organizations should focus on ensuring their management has all the knowledge needed to lead the ERP implementation project and thus provide the support and guidance needed to the end-users. Comparably, this would enable them to facilitate practical ERP training, leading that can improve the end user's ERP use and satisfaction. We discovered that although initial ERP training is important, the style of the training is more important. Computer self-efficacy was found to influence ERP training. Similarly, it could influence system quality. While training provides some incentive, another essential aspect is the shared beliefs of the end-users, more the social factors involved. Here as well management support was found to be a crucial factor during the implementation phase.

The four factors under ERP usefulness were found to have an effect on ERP use in the post-implementation phase. Current IS literature recognized ERP communication and documentation as direct factors influencing end-users ERP use. ERP system performance was identified to be affecting use via other factors such as ERP training. Similar to the implementation phase here as well, ERP communication has the most substantial influence. Previous research has clearly shown communication to be a vital factor affecting IS implementations. The same can be applied to ERP system implementations. However, the literature on ERP system performance influencing end-users ERP use was scarce. Based on the studies related to the organizational aspect of ERP system performance, we argue that the level of an organization's ERP system performance has a positive effect on end-users ERP system use. Both ERP data quality and ERP system functionality were found to be influencing factors during the post-implementation.

All three factors under facilitating conditions were found to have an impact on ERP use during the post-implementation phase. ERP training after implementation was found to be a critical factor. Nevertheless, the effectiveness and style of the training widely influenced how useful end-users perceived it. Naturally, the better the training, the more useful the ERP system was seen. Organizational support for ERP use was found to influence ERP use in conjunction with ERP training and the organization's social factors. We concluded that organizations should enable a culture that fosters organic support throughout the organization.

Based on prior research, computer anxiety and technological innovativeness were found to affect ERP use. We argue that their effect diminishes as the end-users become familiar with the ERP system, and the system matures. However, possible customization and changes to the system could lead to increased computer anxiety. The effect of customization on the found factors should be studied in more detail in future papers.

4.2 Contributions and future research direction

The present research was inspired by apparent deficiencies found in the related literature in the same area. In order to resolve these differences, the current research used a literature review. The Unified Theory of Acceptance and Use of Technology 2 of Venkatesh et al. (2012) seems to be an advantageous technique for explaining IS use. Although the theory is mainly meant to explain the acceptance and use of technology in a consumer context, we suggest that with modifications, it can also be used to study IS use in an organizational end-user context. This study presents a simple and clear model that unifies ERP usage factors to the ERP implementation lifecycle. This theoretical model can be used as a basis for future ERP implementation research.

Organizations benefit from the ERP system only to the extent that their users accept and use the full capacity of the system (Bobek et al., 2016). We examined three ERP implementation phases – pre-implementation, implementation, and post-implementation – and how they influence organizational end-users ' ERP usage. The findings of this study support the claim that the early participation of users in the development of the ERP system is the most important opportunity to implement strategies that maximize the use of the system (Schaffer, 2016). Also, the results of this study are consistent with the previous research regarding factors related to ERP projects, e.g., Sternard et al., 2011; Esteves & Pastor, 2016; Sun & Bhattacherjee, 2016; Chatzoglou et al., 2016. These prior studies have clearly defined the most common critical success factors, such as top management support, organizational culture, business process reengineering, and training. However, there is a lack of studies on the factors that affect the end-user through the full ERP lifecycle. This study introduces more nuanced versions of some of the known critical success factors. By taking into account the different phases and the end-users perspective, we suggest that factors such as top

management support, training, and organizational culture be divided into more phase-specific and user-centric factors as described in this study.

Interestingly, it was discovered that although training is seen as a critical factor (e.g., Amoako-Gyampah, 2004; Kalema, 2013; Soliman et al., 2019), organizations tend to pay less attention to the quality of the training (Alcivar & Abad, 2016). Thus, top management can be unknowingly diminishing the effects gained from quality training. However, it should be noted that we feel that more research regarding these ERP training-related factors is needed.

We also discovered signs of other external factors such as status quo bias and technostress could affect ERP usage through employee attitudes (Mahmud et al., 2017). The other factors under the individual trait category may be as well affected by these. However, this study did not take into account the darker sides of IT use. Thus, we propose that additional research on these darker external factors and other dark sides of IT use related to ERP implementation is needed. Although, as Pirkkalainen and Salo (2016) suggest, this would require interdisciplinary research to understand these wicked phenomena fully.

Similarly, emphasis should be put on how customization and changes to the ERP system affect the found factors. The integrative model presented does not take into account the maturing of the ERP system. When the ERP implementation project is finished, the ERP system is still in its early stages and is prone to customization needs (Rothenberger & Srite, 2009). There have been studies on how customization affects organizational-level factors (e.g., Gool & Seymour, 2018), but there is a lack of studies that include the end-user perspective.

As the previous literature regarding ERP usage through the whole ERP implementation lifecycle is scarce, more research regarding the full ERP implementation lifecycle is required. Also, because of the nature of this study, we suggest that quantitative studies related to this topic be done.

Quantitative studies are needed to confirm the findings of this study in a practical manner. Similarly, emphasis should be put on how customization and changes to the ERP system affect the found factors. More studies are needed to see how factors evolve as the system matures and evolves. These studies should include both theoretical and practical research.

4.3 Practical contributions

This study offers some practical contributions to the field of information systems. First, many of the identified factors affecting ERP usage are in line with the success factors influencing IS implementations in general. This study brings a new understanding of the relationship between factors influencing ERP usage and the different ERP implementation phases. Now, based on the factors identified in this research, organizations can better prepare themselves for ERP implementation or change projects.

Project preparation is a crucial stage during the pre-implementation phase (Hasibuan & Dantes, 2012). In general, organizations, and especially top

management, can use the found factors as a checklist and tool during the planning and implementation of an ERP system. The twenty-eight factors listed under their specific categories can provide support throughout the organization when starting an ERP implementation project. All departments in an organization, from HR to top management to outside consultants and vendors can benefit from recognizing the different factors involved. Factors such as initial management commitment and management support combined with effective ERP communication indicate that leaders today must have the resources, motivation, and organizational commitment to lead their organization through a complex project such as ERP implementations are. Furthermore, organization leaders can use the results of this report to define and execute approaches from the outset of an ERP implementation that can provide the best opportunities for success.

Another practical contribution is the integrative model for planning and preparing an ERP implementation project in order to ensure project success. The contribution of this research is to explain, based on prior research, how the ERP usage factors can be taken into account to ensure a successful implementation. We suggest that the integrative model introduced can be used as a roadmap or checklist in organizations during the ERP implementation.

Finally, the findings of this study show that including the end-users actively in the implementation project improves the overall ERP system's success. We know that clan culture and top management support increase knowledge sharing in software process improvement (Lee et al., 2016). Now, based on the factors presented, organizations can find new areas in which to try to improve overall participation and knowledge sharing during the ERP system implementation lifecycle.

4.4 Limitations

> “Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world." (Einstein, 1929)

This work has its drawbacks. Most notably, we have limited ourselves to reviewing and synthesizing a defined set of scientific papers published in journals. We have likely missed some of the latest studies on the subject during the earlier literature review. Also, we have not included analysis of the extensive organization-oriented literature on ERP changes; such analyses could provide additional and valuable insights into available factors affecting ERP changes after implementation. Finally, based on Webster and Watson (2002), we addressed the literature intending to extend our current knowledge about factors influencing ERP use throughout the ERP system implementation lifecycle. For that reason, we designed the literature analysis with the approach of introducing an up-to-date, integrative model that links different factors affecting ERP use to the specific phases. While this approach has concentrated on the analysis and established a

set of factors and a simple model, it has also provided a specific and somewhat limited perspective on the broad knowledge that is available about ERP usage.

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