

Mobile Enterprise Resource Planning Adoption and
Implementation in Norwegian Organizations
A Case Study of RamBase

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Abstract

In an age of ongoing technological advancements and mobility, there is an ever-increasing need by the companies to find smart solutions to manage their businesses. Organizations around the world use Enterprise Resource Planning (ERP) system, a systemic technological tool, to increase their performances. Researchers agree upon the fact that mobile information technology (MIT) is an indispensable asset for the longevity of an organization's innovation practices and economic stability. With the IT revolution, the number of enterprises adopting, implementing, and using mobile information and communications technology has increased. The mobile enterprise generates productivity in small projects and saves costs in the medium to large scale companies giving competitive advantages. RamBase, a straightforward cloud-based Norwegian ERP provider, has a desire to evaluate its current mobile computing application potential in both IOS and Android operating systems and to look for improvement opportunities in this branch. Cloud ERP enhances tracking of incoming raw material and outgoing final products to extend the visibility and control inside and outside the enterprise.

As very few studies have been done on the implementation and adoption of a mobile ERP (M-ERP) application so in this thesis, we aim to explore the importance of Mobile ERP (M-ERP) for today's business environment. We specifically studied the research question: How can RamBase develop a productive M-ERP for its customers while considering the crucial implementation success factors? We applied the qualitative approach by conducting a literature review in addition to a case study. An online survey related to experiences with mobile ERP use, strengths and challenges and opinions on the implementation of mobile ERP was conducted. A questionnaire was formulated to collect data points for the desired variables and was sent out to major firms which were using RamBase's ERP system. It consisted of both open-ended and closed-ended questions. The questionnaire data were analyzed using descriptive statistics, thematic analysis, and content analytical techniques. Survey results were discussed during a consultation with fellow students to identify key considerations in the implementation of mobile ERP.

Our findings suggest that the critical ERP modules for small-medium enterprises (SMEs), which have employees ranging from 10 to 249 and are operating in the manufacturing industry are administration, production, and finance. Previous studies have shown that the access to required modules through the mobile phone enhances the productivity and performance of an organization.

The core features of the M-ERP applications include the real-time query of information regardless of location, traceability of information and approval of workflow. The challenges identified by the users and validated by the literature include security, screen size, platform compatibility, training, and user interface. Due to significant complexities in each ERP module, it is not feasible to start developing a mobile application for the whole module. A simple application with the key features of the module will have more usability than a complex whole module application.

RamBase should identify the functionality of production, administration, and finance M-ERP modules according to the insights available from their customers. The initial applications should be small with specific functionality for a single group of people. This bottom to top approach will save time and money.

Keywords: Enterprise resource planning (ERP) – RamBase – Mobile ERP – Norway – Enterprise Mobility

Acronyms

API	Application Programming Interface
ATO	Assemble To Order
BI	Business Intelligence
BPMN	Business Process Management Notation
BPR	Business Process Reengineering
CC	Cloud Computing
CFF	Critical Failure Factors
CRM	Customer Resource Management
CSF	Critical Success Factors
DSBC	Diverging Stacked Bar Chart
ES	Enterprise System
ERP	Enterprise Resource Planning
ETO	Engineer To Order
GSMA	Global System of Mobile Communications
IOS	iPhone Operating System
IS	Information System
IT	Information Technology
M-ERP	Mobile Enterprise Resource planning
MIT	Mobile Information Technology
MRP	Material Requirement Package
MTO	Make to Order
MTS	Make to Stock
PC	Personal Computer
SAP	Systems, Applications, and Products
SBC	Stacked Bar Chart
SME	Small Medium Enterprises

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“The trouble is you think you have time.”

~Jack Kornfield~

Chapter I. Research Introduction

1.1 Introduction

In an age of ongoing technological advancements and mobility, there is an ever-increasing need by the companies to find smart solutions to manage their businesses. Organizations around the world use Enterprise Resource Planning (ERP) system, which is a systemic technological tool, to increase their performances. The main aim of an ERP system is to integrate all functional units of the enterprise (Elmonem, Nasr, & Geith, 2016). It is a comprehensive software package that seeks to integrate the complete range of a business's processes and functions to present a holistic view from a single information and IT architecture. By re-engineering, an organization's workflow via ERP, companies can achieve various benefits, for instance, an increase in efficiency and productivity plus synchronization between different departments. RamBase, a straightforward cloud-based Norwegian ERP provider, has a desire to evaluate its current mobile computing application potential in both IOS and Android operating systems and to look for improvement opportunities in this branch. Using RamBase as a selected case study, a qualitative exploratory approach is followed in this study. There is much literature on ERP, but very few studies on the implementation and adoption of a mobile application for ERP (M-ERP). In this study, we investigate the potential of developing a cost-efficient and highly productive M-ERP by RamBase based on the overarching available literature on facilitators and barriers to implementing ERP.

1.2 Importance of this research

ERP system plays a decisive role in an organization. With the new ERP system, it is possible to process millions of transactions per second. Mobile ERP leads to reduced cost on IT and helps companies to focus on their strategic core activity (Saini, Yousif, Saini, & Khandage, 2011). Hence, this study is vital to help ERP providers to find a suitable model for upcoming ERP generations. Also, this research is essential for ERP developers, users, and researchers. It is especially useful for companies and business enterprises as it might help in finding a practical method for mobile ERP implementation. It is challenging to get comprehensive information in the

literature regarding theory and practice of mobile ERP as it is the newest trend of ERP system. Since the topic is in its infancy, it is worth being investigated.

1.3 Research Goal

In this thesis, we aim to explore how Mobile ERP (M-ERP) is necessary for today's business environment. We applied the qualitative approach by conducting a literature review in addition to a case study. This study conducts field research in a Norwegian ERP vendor to map a framework and develop a Mobile ERP implementation success framework.

One of the goals for this research is to map the limitations and find possible potentials for ERP System of RamBase, and to provide a possible mock-up application that can be used as a model to help RamBase managers. This thesis aims to find a solution which can provide a better market opportunity and competitive advantage, save cost and be a cost-effective tool for customers of ERP systems. This research mostly proposes a mapping methodology for Mobile ERP implementation of the most-commonly used ERP modules based on the users' needs. This approach would help in future ERP deployments and ERP modules prioritization at early phases.

Despite the significant research that has been conducted on the ERP system and cloud ERP, few studies have investigated the topic of Mobile ERP, especially in the Norwegian context. Although this technology is ubiquitous nowadays, and business companies are using an ERP system to cooperate their operational functions, M-ERP still is a new topic and requires more research in practice and theories. After having identified and narrowed down the topic, we developed a general research question. The main question of this study is:

How can RamBase develop a productive Mobile ERP (M-ERP) for its customers while considering the crucial implementation success factors?

The answer to this question will shape the preliminary solution framework for Rambase (fig 1). It will help the firm to understand user's requirement, challenges, and future orientation. It will also explore the organizational factors which have an impact on ERP implementation. In order to

achieve the primary research objective, this study aims to investigate the following sub-questions as well:

- What M-ERP modules are important for RamBase’ customers?
- What are the critical success factors (CSF) for M-ERP implementation?
- What are the critical failure factors (CFF) for M-ERP implementation?
- How do the organizational variables affect the ERP solution?

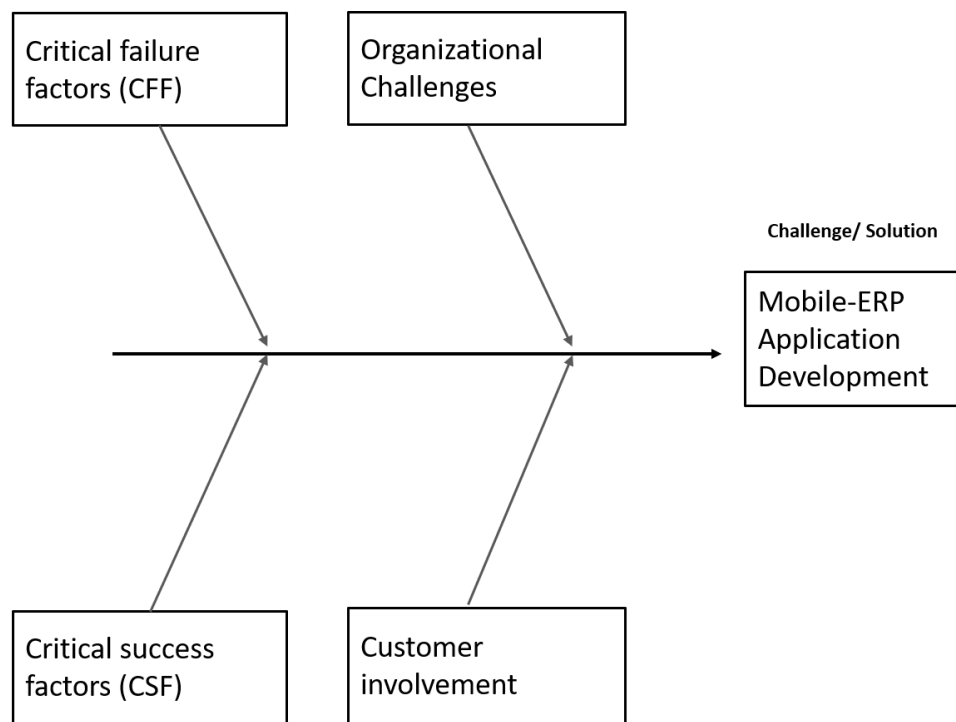


Figure 1: Fishbone diagram demonstrating the potential variables/factors considered while developing the solution to the research question.

1.4 Research motivation

We are in the time of the IT revolution, and changes are occurring at a very high rate. Every second we come across information related to “*innovation based on digitalization, Artificial Intelligence and cloud-based technologies*” (Olberg, 2019). Therefore, organizations need to re-engineer their

processes and structures to cope with these innovations. The architecture of the ERP system is also changing. The aim is to implement a suitable ERP which meets companies' needs. According to Olberg, “*competition in the ERP market is no longer about functionality, but more about flexibility to adopt the ERP system match with merging technologies*” (Olberg, 2019).

1.4.1 Motivation behind M-ERP

According to an online survey, conducted by Redshift Research Ltd. by interviewing 1500 companies in 10 different countries, some findings related to M-ERP adoption and implementation are listed below:

- Sixty-five per cent of the companies recognize the significance of mobility, access to information and communication for virtual staff (Omar, 2015).
- Only 50 % have any form of remote access to their ERP systems.
- Only 25 % can access their ERP via smartphones and tablet PC.
- In the future, 43% want ERP access via their smartphones, and 38% want to access via tablets. (Omar, 2015).

Hence, much work is being done in the field of M-ERP applications. According to a study, there are many M-ERP options available in the market, but the choices are limited when it comes to the usefulness and applicability of these applications (Căilean & Sharifi, 2014).

1.5 Readers' Guide

In this thesis, the word **ARTICLE** has been used to refer to research publication either in journals or online, research literature review papers, conference publication and master thesis. **Double quotation** marks have been used when the information is cited directly from the work of other researchers or scholars.

1.5.1 Disposition

The layout of this thesis structures as below:

- Chapter 1 includes an introduction, the motivation of research and research questions.

- Chapter 2 describes the background of the study and reviews the literature on the topic.
- Chapter 3 defines the research goal and objective.
- Chapter 4 propounds the related theories, definitions, and different aspects of the research topic.
- Chapter 5 explains the research methodology. This chapter also explains the research design, data collection and sampling.
- Chapter 6 starts with data analysis and presents the results from the data analysis.
- Chapter 7 discusses the validation of the research.
- Chapter 8 finally, a conclusion is given; theoretical implications, recommendations, limitations of the research, and suggestions for future research are made.

Chapter 2. Research Background

2.1 Introduction

As stated in the previous chapter, we see many studies on ERP, but only a few papers on the implementation and adoption of a mobile application for ERP (M-ERP). Studies suggest that modern society and smart cities rely tremendously on software systems and apps which ensure mobility. Such software can “*enable or even accelerate human, social, economic, and technological changes*” (Mens, Guéhéneuc, Fernández-Ramil, & D’Hondt, 2010). Besides, mobility in this technologically advancing age is becoming more and more critical (Dospinescu, Fotache, & Munteanu, 2008). Any technology that can deliver tangible information flow and make information more accessible is considered pertinent (Basole, 2008). The increased use of mobile advancements stimulated an increasing debate on technology and business innovation (Sørensen, Al-Taitoona, Gibsone, & Kietzmann, 2008). Smartphones with countless applications have gained much attention in academia as well, and researchers agree upon the fact that mobile information technology (MIT) is an indispensable asset for the longevity of an organization’s innovation practices and economic stability (Sørensen, Al-Taitoona, Gibsone, & Kietzmann, 2008). However, despite the increased acceptability of enterprise mobility, implementation, and adoption of a mobile application for ERP remain questionable. To understand that, we would first look at what ERP is and what does it constitute, followed by the status of enterprise mobility in the Nordic region and then study the case of the Norwegian cloud ERP provider, RamBase.

2.2 ERP Definition

The term ERP is not very old. It was introduced as an acronym for “*Enterprise Resource Planning*” by Gartner in 1990 (Lenart, 2011). Based on the literature review, ERP as a subject for research was not a widely studied topic in the early 90s. Nevertheless, after 1996, ERP implementation and ERP adoption have gained attention from scholars and academia (Hurbean & Fotache, 2014). Figure 2 shows the Chronological evolution of ERP systems. According to Davenport and colleagues, ERP package software links and manages “*information flows within and across complex organizations, allowing managers to make decisions based on information that truly*

reflects the current state of their business” (Davenport, Harris, & Cantrell, 2004). Usually, ERP package is not custom-made for organizations, but companies could choose to customize the ERP package to meet their specific needs. This modification needs money, resource, and time (Smedsrud, 2015). Also, ERP vendors have an in-depth understanding of the core business processes and their needs, for instance, ordering, shipping, production planning, supply chain management, customer relationship management. Hence, *“ERPs do not merely aim to address the needs of a specific function or department within an organization, but it aims to meet the needs of the entire organization, across functions”* (Smedsrud, 2015). Other scholars have considered it as the backbone for an enterprise and an organization information system (Lenart, 2011), that these configurable information systems *“integrate information and information-based processes within and cross-functional areas in an organization”* (Zhang, Lee, Huang, Zhang, & Huang, 2005), and that they *“integrate and optimize the business processes and transactions in a corporation”* (Moon, 2007). In a brief period, ERP systems have become an indispensable resource for enterprises.

Although different experts and specialists have applied and defined ERP differently, we see a consistent trend amongst all these definitions. ERP system is a systemic technological tool to increase a company’s performance (Al-Mashari, Al-Mudimigh, & Zairi, 2003) by integrating all departments and functions in one place (Wailgum, 2007). Monk & Wagner (2007) defines Enterprise Resource Planners (ERPs) as *“core software used by companies to coordinate information in every area of the Business”* (Monk & Wagner, 2012). Organisations widely use it as a practical way to attain integrated information systems (Moon, 2007). It is a computing organizational paradigm (Lenart, 2011). Saade and Nijher (2016) defined ERP as *“an organizational IS which have been used to enhance business process efficiency by providing real-time data”* (Kohansal , 2019). The main aim of an ERP system is to integrate all functional units of the enterprise (Elmonem, Nasr, & Geith, 2016). The system can verify the integration and automation of the processes, trigger performance and improvement, and cost reduction (Bahssas, AlBar, & Hoque, 2015).

2.3 Types of traditional ERP systems

According to Klaus and colleagues, traditional ERP systems can be classified into two categories, on-premises ERP, and hosted ERP (Klaus, H. 2000). In the case of on-premises ERP, the system loads and run over the enterprise infrastructure such as servers, network, platforms, computers, etc. The enterprise run, operate and manage the ERP system according to the software license model. The enterprise covers the running cost, operational cost, and maintenance cost as well as disaster recovery. Hosted ERP can be defined as a service offered to an individual or an organization by a provider that hosts the physical servers and runs that service somewhere else. The service is mostly offered through a direct network connection that may or may not run via the internet (Elmonem, Nasr, & Geith, 2016). A traditional ERP software package supports almost all the enterprise activities such as marketing, sales, distribution channels, production, quality management, cost control, project management, financial and accounting (Navaneethakrishnan, 2013). The required packages of software are installed and loaded onto computers in the house. The company itself is responsible for implementation and ongoing maintenance and periodic upgrades (Navaneethakrishnan, 2013). ERP Market is dominated by large vendors, including SAP, Oracle, and Microsoft (Bahssas, AlBar, & Hoque, 2015).

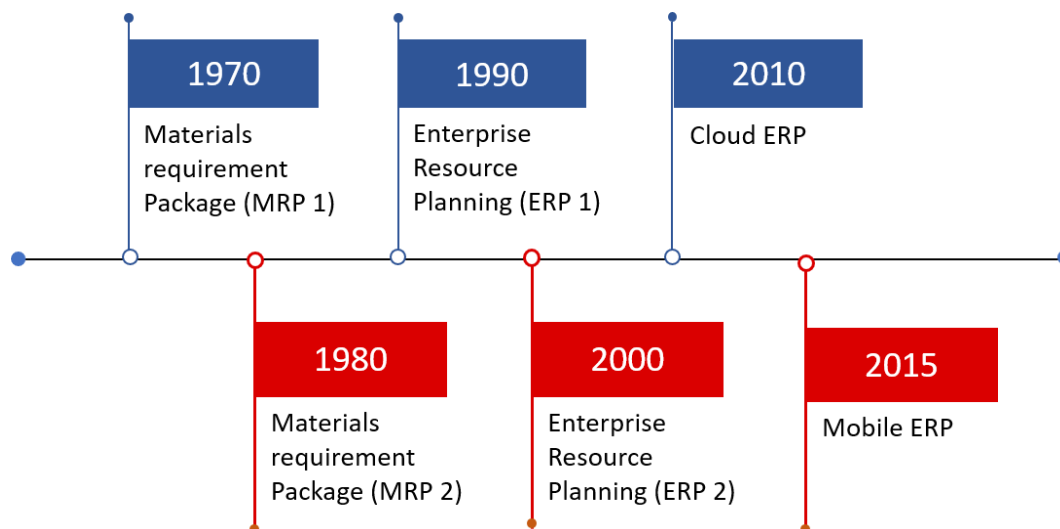


Figure 2: Chronological evolution of ERP systems (Omar,2015)

2.4 ERP Trends and modules

ERP vendors provide verticalization trend in their package. Verticalization refers to “*not just adding new functionality to a given industry solution, but adding vertical functionality to the horizontal functions within the ERP package*” (Dospinescu, Fotache, & Munteanu, 2008). It allows workflow, supply chains, data warehouse all be vertical-specific (Dospinescu, Fotache, & Munteanu, 2008). SAP is a pioneer in verticalization as they understand and build it to deep levels in the vertical market. Oracle, on the other hand, has more under construction technology to vertical market (Dospinescu, Fotache, & Munteanu, 2008).

The ERP systems have several modules, such as:

- a) Capital Management – manages all account-related transactions, e.g., voucher preparation, balance sheets, and profit and loss statements.
- b) Make Payment – manages profit & loss, account trial Balance and cost analysis.
- c) Advertising - seamlessly handles the media and advertisement arena of any organization.
- d) Warehouses and Inventory Management - manages warehouse and inventory activities such as space utilization, storage units, stock utilization and reports, and tracks stock of items in the warehouse.
- e) Purchase - provides the functionality of processes related to the procurement of materials/assets needed in the organization. Supplier/vendor details, purchase indent, quotation management, purchase orders, GRN and stock updating form the crux of this module. This module also provides the functionality of import and custom declaration.
- f) Fixed Assets Management - handles recording and depreciation of company assets. It offers higher control over assets and thereby better monitoring and management.
- g) Human resource - monitors employee information, performance reviews, payroll and attendance, and travel & training management.
- h) Production - focuses on different functionalities related to product manufacturing in a manufacturing unit like production planning, machine scheduling, bill of materials, daily progress tracking etc.

- i) Sales and Distribution - manage sales, product pricing, promotions, comparison, sales targets, stock transfers etc.
- j) Transportation Management - offers support to the transportation functionalities in the organization.

2.5 ERP in the Nordic context

In general, about forty cloud ERP are available in the Scandinavian market (Olberg, 2019). Table 1 lists some of them.

Vendor name	ERP cloud product	Short name
24SevenOffice	24SevenOffice	24Seven
Alterview Net Solutions	NetSuite Oneworld	NetSuite
Ataio Affärssystem	ATAIO Affärssystem	ATAIO
E-conomic International	E-conomic	E-conomic
FinancialForce.com	FinancialForce.com	Fin.Force
HansaWorld	HansaWorld Enterprise	Hansa
<i>Jakob Hatteland Computer</i>	<i>RamBase</i>	<i>RamBase</i>
Oracle	Oracle Fusion ERP Cloud	Oracle
Rexor	Rexor	Rexor
SoftOne	SoftOne XE	SoftOne
Specter	Specter Business Management	Specter
Visma Software	Visma.net	Visma
Workday	Workday	Workday
Xledger	Xledger	Xledger

Table 1: ERP vendors in the Scandinavian market (HerbertNathan & Co, 2015)

2.5.1 ERP in Norway

Norway is a technologically modern country with advanced infrastructure and telecommunications. The Internet Penetration Rate in Norway according to World Stats (June 2019) is 98.4%. Recent research revealed that the importance of having an ERP system has increased among Norwegian companies during the last decade. A large number of Norwegian companies rank their ERP system as very or highly critical for their business (Smedsrud, 2015).

According to Smedsrud’s master thesis (2015), four major ERP platforms in the Norwegian market are SAP, MS Dynamics, Oracle and Visma (fig 3). According to another research done by HerbertNathan & Co (2013), SAP, Visma, and Microsoft has the most significant market share in Norway (HerbertNathan & Co (2013)).

Even with a high capacity to innovate in enterprise mobility, Norwegian companies take up to a decade to update their ERP systems (Mæland, Haddara, & Fagerstrom, 2014). According to the survey conducted by Smedsrud on the use of ERP systems in the Norwegian firms, a majority of respondents in the sample claimed they needed to customize their ERP system to some degree. In regards to the age of ERP system, 20% of the companies were older than five years, and an estimated 42% of the companies were using ERP system for over eight years (Smedsrud, 2015).

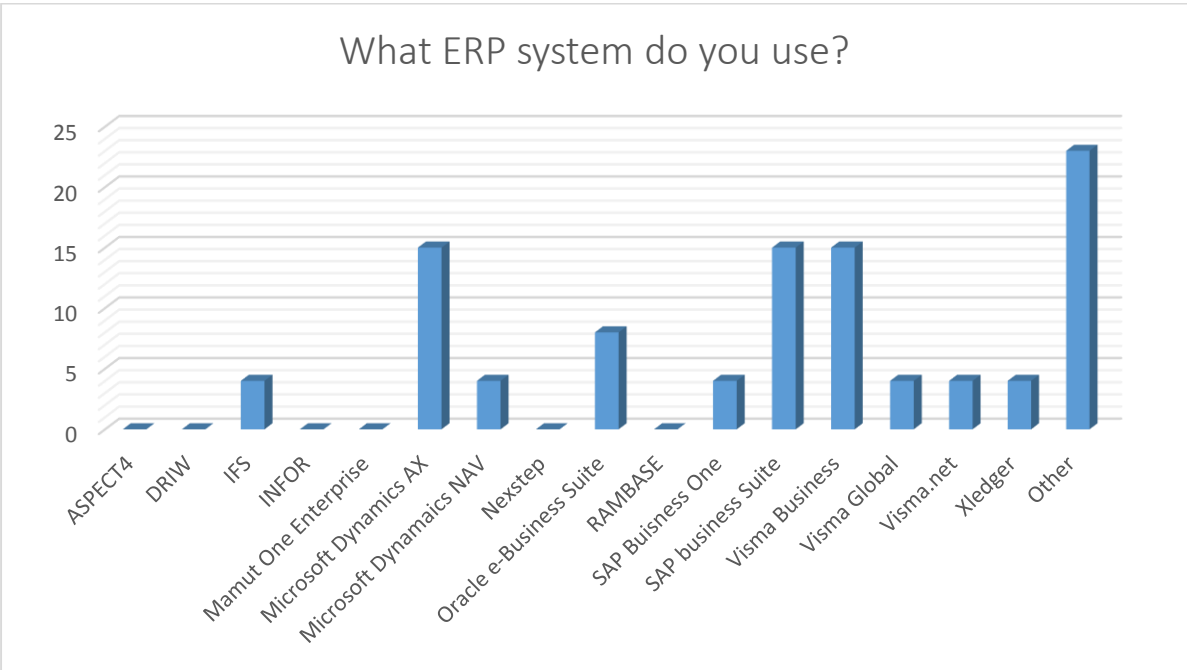


Figure 3 Common ERP-systems in Norway (Smedsrud, 2015)

2.5.2 ERP in Sweden

Sweden is considered one of the earliest economies to adopt innovation and technology. It is the home of some leading ERP vendors, for instance, Intenia, IFS and IBS. Olhager and Selldin (2003) surveyed the implementation of ERP systems in Swedish manufacturing firms. They concluded that Swedish companies have high levels of ERP maturity, i.e., 83.6% of the companies

have adopted the system (Olhager & Selldin, 2003). Other significant findings of this study state that the cost for implementing ERP systems ranges from 0.5% - 3.5% of annual revenues for companies, and that many of the companies are on the road to advance their ERP systems “*with functional support for upstream and downstream supply chain operations*” (Olhager & Selldin, 2003).

In conclusion, we see an accelerated use of technologies and an increased inclination towards enterprise mobility in the Nordic countries. Both Norway and Sweden have successfully implemented ERP systems, and more investment is being made in advancing these systems.

2.6 A Case Study of RamBase

2.6.1 Introduction

RamBase, as Hatteland’s ERP solution, is a straightforward cloud-based Norwegian ERP framework, conveyed as Software as a Service (SaaS). It is a business answer for assembling, conveyance and web-based business associations that spread the whole value chain from deals to creation and conveyance. The company was established in Hatteland, Norway. Today, the organization fashions business ideas and brands that provide reasonable solutions to a range of business issues¹.

RamBase is not only an ERP vendor but also an ERP platform provider. It is active in the ERP market over three decades. It is expanding to Sweden and the Baltic region. It offers innovative ERP/business arrangements planned from the beginning as a cloud arrangement, which is a finished business stage that gives full oversight by connecting the value chain into one framework that cooperates, evens out and rearranges all procedures. It reinforces a broad scope of businesses, including those that have elevated levels of administrative and quality control. It is a SaaS stage with a far-reaching set of APIs, empowering unparalleled reconciliation to the current

¹ From RamBase’s website. Available from: <https://www.rambase.com/industry-solutions/>

outside frameworks, sites, machines, and units. About 30 customers are working with the company and its partners².

RamBase ERP provides a start to finish arrangement covering Finance, Sales and Distribution, Manufacturing, Rental and Service. It principally engages ventures that have elevated levels of administrative and quality control inside production and circulation. Instances of where RamBase is conveying an incentive for clients is inside Hi-Tech, for example, AutoStore that produces robot innovation for computerized warehousing, and inside Mechanical Manufacturing at Wepco that administers the Oil and Gas industry.

The digitalization and Internet of Things gives an extraordinary chance to utilize information in a superior manner; however, it can also cause problems. Business significant data can be everything from client data to conveyance status and data given by a machine park. Many factors will assist in collecting the needed information. The challenge is to utilize this data and to coordinate it with the data given by the ERP framework. RamBase believes that their offered solution and usage of current technologies can handle these questions.

Moreover, at the point when the center of an ERP framework can talk legitimately to other programming applications and sites, much time can be saved. RamBase precisely offers this. The littlest things can be incorporated in their system and framework. To save time and eradicate the potential for human blunders, the status on conveyances can be made accessible legitimately in the company's coordination module, and Machine Park can straightforwardly communicate to ERP framework.

RamBase has many APIs, making it conceivable to coordinate almost everything with a web association. The APIs are the associations between the ERP framework and the remainder of the world – permitting genuine digitalization of any business. The APIs assemble data from external programming and convey it to the ERP framework. They can, in the same way, separate data from the ERP framework and show it in external applications, for example, a client entryway, a business intelligence (BI) application etc. All platforms are synced with the client information in the ERP

² Accessed from RamBase's information manual and discussion with the employees.

framework for a superior comprehension of client and client potential. There is a possibility likewise to make rearranged portable applications for requests or time step.

Lastly, an innovative ERP framework should be robust, adaptable, and configurable. It is anything but a one-size-fits-everything. RamBase has over 40 years of experience in global logistics providing solutions for involved customers and therefore, offers complete customization to all its clients. Its API entry gives the apparatuses to redo the ERP framework to accommodate to any business. A portion of their clients have in-house IT mastery who will realize how to utilize RamBase APIs; however, the more significant part of RamBase clients utilize their accomplices' aptitude on the topic. Every new client will be allotted to the accomplice that is best able to comprehend their business, ensuring their requirements are met continuously.

2.6.2 Value Proposition

RamBase is a complete ERP-system offered exclusively (Bech, 2019). The primary competitive edges are completeness and possibilities for fast implementation (mostly in less than eight weeks). RamBase does country-specific localization in Norway based on specifications provided by chartered accountants and market analysts in each country. Simplification seems to be an attractive value proposition for those customers that have experienced the customization trap and have paid the associated premium.

2.6.3 Market segmentation

The main market focus for RamBase is discrete manufacturing and distribution companies in Norway, Sweden, The UK, and Poland. The company is open to entering additional countries but have made no priority list yet. Market entrance is highly dependent on the quality of people they can find and where their current customers may require local support. RamBase targets small and medium organizations in various fields.

2.6.4 Further advantages with RamBase

Here the benefits of transparent cloud based RamBase ERP system are listed:

1. The smooth and speedy flow of information

2. Access to one centralized data system – whenever and wherever business demands
3. Protection of business data by the highest level of security and integrity available
4. Provision of a simple license model, growing in line with the organization
5. High efficiency in less time and money due to the speed of information
6. Elevation services to upgrade an outdated ERP system
7. Flexible subscription model – per user per month to meet client demand
8. No hidden costs
9. Scalable – both in geography and size
10. Access from anywhere with an internet connection of 99.9% availability
11. Growth in vertical market share rapidly – supply chain

2.6.5 The RamBase Ecosystem

RamBase is divided into three segments, i.e., distribution, production, and auction. The entire RamBase business suite covers all necessary business processes. All modules are rich in functionalities and fully integrated, which gives companies total control of their information (Hatteland; RamBase ERP solution).

The list below summarizes the advantages of RamBase ERP system:

Why RamBase?	
Easy to do business with	<ul style="list-style-type: none"> • Low cost, rapid partner onboarding • Proactive partner support service
A modern, scalable cloud-based solution	<ul style="list-style-type: none"> • Innovative • Easy to integrate with other products • Incremental partner revenue opportunities
Customer satisfaction	<ul style="list-style-type: none"> • Fast implementation • Rapid speed to value and compelling ROI • No ongoing upgrade costs or upheaval risks

Chapter 3. Conceptual framework and literature review

In this chapter, we will discuss the conceptual framework behind this thesis. Our framework is based on one initial question: Is enterprise mobility a need or a luxury? We have reviewed the available and relevant literature under this umbrella question to extract underpinnings, which were used to analyze and present our findings.

In principle, technology, like the Internet, is a platform that supports marketplaces for goods and services. Hence, a firm's and its network's ability to leverage digital technologies are an increasingly important source of competitive advantage because businesses must respond to market dynamics (Kumar and Reinartz 2016). Digital technologies are changing market behavior, and how firms and networks are organized becomes blurred. Digital technologies can provide a highly personalized and immersive environment that allows for interactivity and productive information exchange between the network and customers. Business managers and researchers need to rethink theory and practice to adjust to the consequences of digitalization, such as increasing complexity, high information availability, high reach, frequent interactions, and faster speeds of transactions (Wedel and Kannan 2016).

3.1 Enterprise Mobility

With the IT revolution, the number of enterprises adopting, implementing and using mobile information and communications technology has increased (Basole R. C., 2008). With mobile computing, clients are interconnected through personal, local, and global digital networks (Sørensen, 2014). A wide range of research has been done on mobile information field, including studies on mobile information technology used for the work purpose. This category is also labelled as "*Enterprise mobility*". There is no arguing that the mobilization of interaction at work is changing existing procedures, and organizations have adopted ubiquitous integration systems to support instant connectivity. The mobile enterprise generates productivity in small projects and saves costs in the medium to large scale companies giving competitive advantages.

3.1.1 What mobility brings for the enterprise?

Mobility technology can offer businesses new capabilities and represent new solutions for their problems. Sørensen (2014) suggested six enterprise mobility capabilities for a better understanding. First comes connectivity. 5G network has connected the world globally, and the use of smartphones has augmented. According to GSMA real-time intelligence data, there are now over 10 billion mobile connections worldwide, which surpasses the current world population of 7.79 billion. By 2023, the world will see the growth of all cellular-enabled phones, tablets or IoT devices on a global scale ³. Second, the portable nature of computational devices gives them an advantage over fixed business resources. Third, mmobile technologies and devices are closely situated near human bodies, and this is one critical factor in the user-technology relationship. Fourth, the pervasiveness of this technology, which means the quality of spreading a business widely or being present all over an area or a group of people and the capability of relating directly to the environment. Next, is memory, which is necessary “*for comprehensive support of complex decision processes*”. Lastly, mobile technology can assist in the prioritization of interface through different filtering- and awareness mechanisms (Sørensen, et al., 2008). The figure below summarizes these six capabilities:

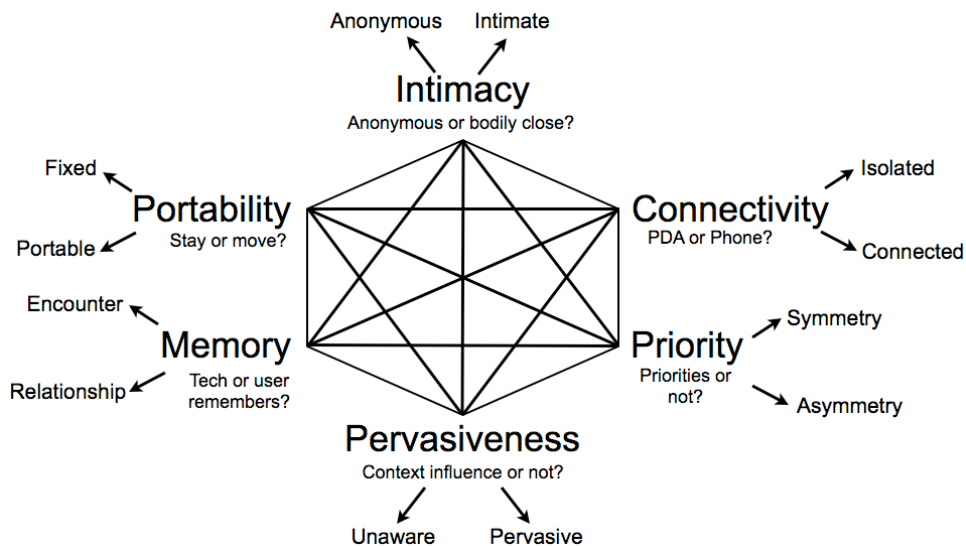


Figure 4: Six enterprise mobility capabilities (Sørensen, 2014)

³ From UN digital analyst estimates. Available from: <https://www.bankmycell.com/blog/how-many-phones-are-in-the-world>).

According to Basole (2004), mobility in the enterprise will be highly beneficial for an organisation. It provides access to networks anywhere and anytime. It decreases expenditures as pricey computing systems can be replaced with portable and less expensive equipment. Moreover, a mobile enterprise has the potential for more accuracy by use of mobile solutions. Also, it can respond faster to market conditions and provide accurate information to increase productivity. It can get accurate data quickly and pass them on for quick action. Lastly, it provides an opportunity to control the whole enterprise, people, processes, and information in a better way, hence increasing efficiency (fig 5).

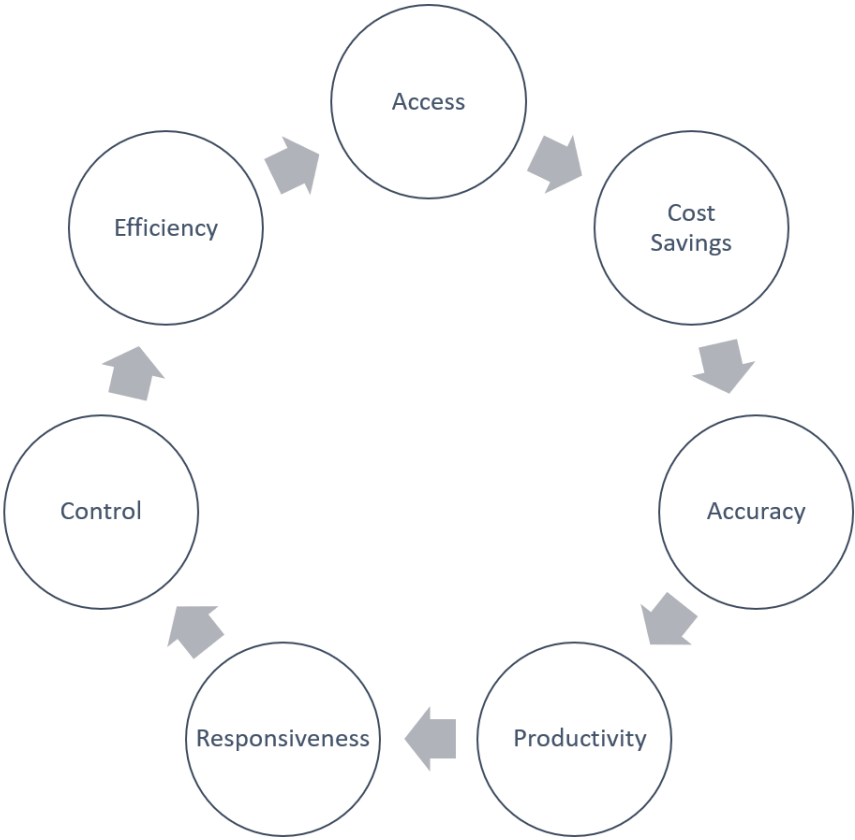


Figure 5: Benefits of Mobilizing the Enterprise

Despite all the inherent capabilities mentioned above, the adoption of mobile solutions has not been as vast as it was predicted. The most cited reasons for the slow pace of mobile enterprise adoption are security and privacy issues (Basole, 2005).

3.1.2 Mobile Enterprise Adoption Factors

Several researchers have focused on the adoption of technology rooted in theories of consumer behaviour and psychology to explain technology acceptance by users. However, it was found that these models do not describe organizational technology adoption factors (Basole, 2005). Legris and others introduced a framework that more accurately explained technology adoption at the organizational level (Legris, Ingham, & Colletette, 2003).

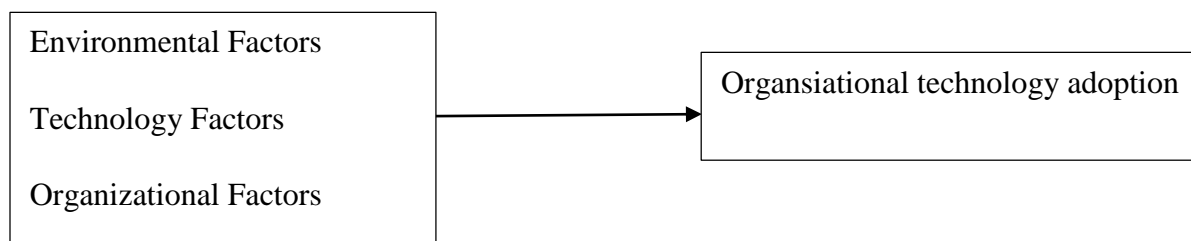


Figure 6: Critical Adoption Factors (Basole, 2005)

Individual Factors: Individual as end-user is one of the most important perspectives in any organizational technology adoption. Innovativeness of the individual, degree of skills, and perceived value of new technology and innovation are crucial aspects (Damanpour, 1991).

Organizational Factors: Researches proved that many organizational level factors play a significant role in technology adoption such as top management support, technology and infrastructure readiness, organizational culture, risk orientation, innovativeness of the organization, financial resources, and size of the firm (Damanpour, 1991, Basole, 2005).

Technological & Environmental Factors: Among all four categories, technological factors play the most crucial role. Environment-related factors are usually ignored (Damanpour, 1991).

3.2 ERP Implementation Critical Factors

There is a surplus of literature that focuses on identifying factors that contribute to ERP implementation success, for instance, studies on critical success factors (CSF) and critical failure factors (CFF). With recent technological development in the ERP industry, the need for identifying reasons for success and failure of ERP implementation in different contexts has increased. One main reason to implement ERP is to stay updated to the ever-changing business processes (Hong & Kim, 2002). To do so, leadership and top management commitment are the most critical factors for ERP implementation, as they can facilitate change in the organization (Al-Mashari, Al-Mudimigh, & Zairi, 2003). Factors like lack of data accuracy, lack of user involvement and communication failures can lead to a failed ERP implementation. Such critical factors should be tackled through open information policy (Al-Mashari, Al-Mudimigh, & Zairi, 2003).

Another significant factor is the need for staff education and training (Al-Mashari, Al-Mudimigh, & Zairi, 2003). The main goal of ERP training is a practical understanding of different business functions involved in ERP adaption (Al-Mashari, Al-Mudimigh, & Zairi, 2003). It should cover all aspects of the system about various business processes behind the system (Gupta, 2000). Other factors that can either make or break an ERP implementation include user satisfaction, organization budget, ERP software package quality and information quality and business process re-engineering (BPR).

Lastly, according to Zhang and colleagues, environmental variables can also play a massive role in an ERP implementation and should be taken into consideration by the organizations and vendors. These could be factors related to external, organizational, system, the user or IS operation environment (Zhang, Lee, Huang, Zhang, & Huang, 2005). The CFFs which cause the failure of an ERP system are identified in table 2.

Factors
Mis-organizational fit
Communication challenges
Lack of top Management Support
Change Management challenge
BPR and Customization challenges
Weak team and Project Management
Consultant challenges
Poor key user
Poor training

Table 2: (CFFs) identified in the literature (Kohansal, 2019)

3.3 ERP Benefits

ERP implementation can generate value-added benefits for businesses such as higher quality, reduced time-to-market, and improved communications, supporting decision making, shortened lead times, higher productivity, and lower costs. Since switching to integrated ERP systems is a massive change for businesses, it is essential to understand its benefits first.

These systems provide vast advantages to the whole enterprise (Elmonem, Nasr, & Geith, 2016). They help the enterprise to collect, record, integrate, manage and transfer data and information across all the internal and external functional units of the enterprise (Elmonem, Nasr, & Geith, 2016). They help break down information between inventory, production, planning, materials, engineering, finance, human recourses, sales, marketing, operation, and all other departments in the enterprise. They can unify all enterprise functions in different levels using a shared database (Hadidi, Assaf, & Alkhiami, 2017).

Shang and Seddon studied 34 ERP cases and 233 ERP-provider success stories and categorized ERP advantages into five levels as follows (Shang and Seddon, 2000):

- **Operational level** such as cost efficiency, time reduction, CRM enhancement, productivity and quality improvement (Al-Mashari, Al-Mudimigh, & Zairi, 2003).

- **Managerial level** such as capital and resource management improvement, decision-making improvement with better data-analysis, increased performance within the enterprise.
- **Strategic level** such as business innovation, cost leadership, product branding, supporting business alliance, supporting business growth and expansion.
- **Information technology level** such as business flexibility for future change in the IT section, IT cost cut-off, enhancement in IT Infrastructure capability and economical implementation of new applications.
- **Organizational level** such as facilitating organizational change and flatter structure, supporting business learning, empowerment and building mutual visions (Al-Mashari, Al-Mudimigh, & Zairi, 2003).

All these benefits and CSFs are summarized in table 3.

Dimensions	Benefit
Operational	Cost Reduction
	Cycle Time Reduction
	Productivity Improvement
	Quality Improvement
	Customer Services Improvement
Managerial	Better Resources Management
	Better Decision Making
	Better Performance Control
Strategic	Support Current and Future Business Growth Planning
	Support Business Alliance
	Build Business Innovation
	Build Cost Leadership
	Generate or Enhance Product Differentiation
	Build External Linkage
	Enable Worldwide Expansion
Enabling E-Business	
IT-infrastructure	Increased Business Flexibility
	IT Cost Reduction
	Increased IT Infrastructure Capability: Stable and Flexible
Organizational	Support Business Organizational Changes
	Facilitate Business Learning and Broaden Employee Skills
	Empowerment of Employees
	Change Culture with Common Visions
	Change Employee Behavior with Shifted Focus

Table 3: ERP Benefits by levels (Shang & Seddon, 2000)

3.3.1 ERP Consequences

Pavin and colleagues state that it is not fair to identify the outcomes of an ERP implementation as benefits (Pavin & Klein, 2015). In their paper, they used the word consequences, which include both positive and negative outcomes. Some consequences of ERP usage in firms mentioned by

them are listed in table 4. By using the word consequences, they meant both positive and negative impacts.

Consequences of ERP use	References
Productivity gains	Turban et al. (2001); Saccol et al. (2004).
Increased Organizational Effectiveness	Saccol et al. (2004); Velcu (2007); Ross (1999).
Increased Organizational Efficiency	Saccol et al. (2004); Gattiker & Goodhue (2005); Hsu & Chen (2004); Spathis & (2004), Zwicker & Souza (2003).
Improved communication	Hsu & Chen (2004).
Better relationship with suppliers	Turban, Mclean, Wetherbe (2001); Velcu (2007).
Better relationship with customers	Ross (1999); Velcu (2007).
Cost reductions	Spathis & Constantinides (2004), Poston & Grabski (2001); Velcu (2007).
Higher market value	Hitt, Wu & Zhou (2002).
Maintenance costs	Zwicker & Souza (2003).
Increased surveillance and control	Wood Jr. et al. (2003).
Increased standardization / bureaucratization	Wood Jr. et al. (2003).
Dependence on ERP vendor	Zwicker & Souza (2003).

Table 4: Consequences of ERP use in organizations (Pavin & Klein, 2015).

3.4 ERP Implementation challenges

Successful ERP implementation has two dimensions: improved organizational performance and user satisfaction (Zhang, Lee, Huang, Zhang, & Huang, 2005). However, it is reported that a high proportion of ERP projects face failure (Hong & Kim, 2002). Chang, Cheung, Cheng & Yeung (2008), reported the failure rate 60 to 90 % of ERP projects. According to Swan et al., conflicting interests between ERP customers and ERP vendors are the root of this high failure rate (Hong & Kim, 2002). This high failure rate is a convincing reason to search more about the success and failure factors of ERP implementation. Despite all the benefits of ERP, a vast number of companies have reported unsuccessful efforts. Several studies have shown that ERP implementation is complex, complicated, costly, and a time-consuming project (Al-Mashari, Al-Mudimigh, & Zairi,

2003, Kohansal , 2019). Its implementation involves not only the installation of a software package but also involves people, organization and technology (Kohansal , 2019). Al-Mudimigh et al. proposed ERP adoption and integration should occur at operational, tactical and strategic levels (Irani & Love, 2001).

Cost of an ERP project is not only the cost of the software license but also a budget of the implementation ERP system, hardware, implementation services and maintenance and training fees. The implementation of ERP systems is a costly process, which increases with the enterprise size.

ERP philosophy is process-based rather than function-based (Hong & Kim, 2002); therefore organizations for a successful ERP implementation should define a broad range organizational change strategy rather than just a software package installation (Hong & Kim, 2002) These initiatives for change can be mostly in a sociology-technology system, for instance, change in technology, task, people, structure and culture (Hong & Kim, 2002).

3.5 Cloud Computing

Cloud computing is a disruptive change in the business model, which has the potential to make an integrated value network (Suherman & Simatupang, 2017) Cloud computing paradigm is now a hit amongst businesses and an essential research topic within the field of IS (Mæland, Haddara, & Fagerstrom, 2014). It did not just disrupt the ERP companies but the whole software industry. This new paradigm is one of the most prominent computing technologies in business. Companies in different industries and size are willing to explore mobile-compatibility and their benefit in their business (Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011).CC adoption can be in a different form since this technology is multi-layered. Plenty number of web-based applications are available by cloud technology, known as Software As A Service (SaaS).

Instead of buying software, companies can rent the ERP software and typically pay monthly for an ERP cloud solution. Rambase is a cloud-based ERP, so it is necessary to have a thorough understanding of cloud computing.

Cloud computing is a computing model which takes place over the internet and provides scalability, reliability, availability, and low cost of computer reassures. In other words, “*cloud computing is a network-based service on demand, give access to a shared pool of resources*”

(Bahssas, AlBar, & Hoque, 2015).”*Cloud computing is a new paradigm in which resources are not physically present, instead service provider owns processing activities, memory and storage via the internet*” (Saini, Yousif, Saini, & Khandage, 2011). Cloud computing provides special services over the internet; these services are servers, storages, software. Cloud computing can be like a good as gas, water and electricity, easy to access and cheap (Saini, Yousif, Saini, & Khandage, 2011).

Kenneth and Jane Laudon(2011) described CC as “*Web-based applications that are stored on remote servers and accessed via the ‘cloud’ of the Internet using a standard web browser*” (Laudon & Laudon, 2011). CC reduce capital and physical expenses and operational costs and let the company focus on strategic projects (Lenart, 2011). One of the benefits of using cloud computing is that it needs no up-front cost since this service is providing by the cloud provider (Suherman & Simatupang, 2017). As a result, cloud technology leads to huge cost saving for companies. According to the United States National Institute of Standards and Technology, CC has five elements, including on-demand self-service, vast network access, location independency and, fast flexibility (Lenart, 2011). Lastly, cloud computing is a source of affordable automation (Suherman & Simatupang, 2017).

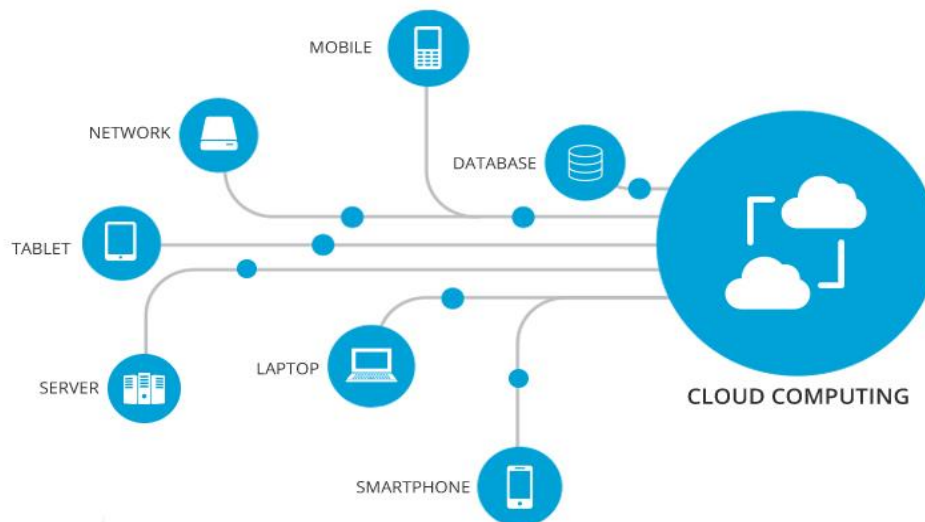


Figure 7: Demonstration of a cloud computing network.

3.5.1 Cloud ERP

Cloud computing technology made a swift shift in the ERP industry. With the entrance of cloud technology, ERP vendors started to implement their products based on cloud computing models and services (Bahssas, AlBar, & Hoque, 2015). ERP vendors moved to this platform and approach because of cloud computing improvements, benefits, and flexible features. “*The ERP market future in over the next ten years will flip to the cloud*” according to (Saedberg & Haddara, 2016) quoted from Columbus (2013). Another form of ERP, in contrast to traditional ERP, is cloud ERP. Modern ERP systems are built for use over the internet. Cloud-based software is becoming more and more commercial since they offer flexible soft wares (Navaneethakrishnan, 2013). Cloud-based services are divided into three main subsets, including Software as Service (SaaS), Platform as Service (PaaS) and Infrastructure as a Service (IaaS). Cloud ERP is grouped under SaaS. Cloud ERP hosting is done through two models IaaS and SaaS. “*IaaS defines as need of buying infrastructure over the cloud such as servers*” (Bahssas, AlBar, & Hoque, 2015). “*SaaS means buying or renting services over the cloud, such as soft wares*” (Bahssas, AlBar, & Hoque, 2015). By using SaaS, there is no need to download software; companies could only rent web-based software from an ERP provider (Bahssas, AlBar, & Hoque, 2015). For cloud ERP, a company simply needs a computer with a browser and internet access; therefore, there is no need for a physical installation on a server (HerbertNathan & Co, 2015).

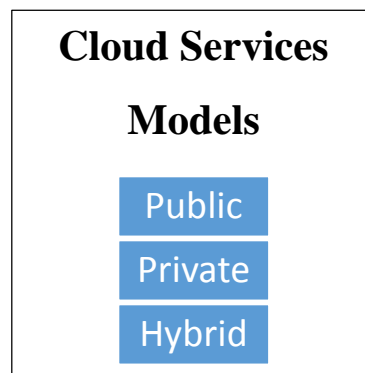
New ERP systems will reduce administrative cost, better access to the resources, reduce waste, reduce decision-making time and operational cost (Bahssas, AlBar, & Hoque, 2015).

According to literature, the cost of cloud-based ERP is lower than traditional ERP software packages (Navaneethakrishnan, 2013). Cloud-based services let companies benefit from many advantages, for instance, help enterprises to avoid infrastructure costs (Navaneethakrishnan, 2013) and a reduction in the cost of ERP implementation (Navaneethakrishnan, 2013). Another advantage of cloud-based ERP is elasticity (Navaneethakrishnan, 2013). ERP flexibility can bring many competitive advantages for the company. This flexibility let the companies switch to new technology or software. Resource sharing and allocation is not a challenging task anymore (Navaneethakrishnan, 2013). Back up, debugging, recovery in cloud ERP is effortless (Navaneethakrishnan, 2013). Last but not least, cloud-based ERP implementation is faster (Navaneethakrishnan, 2013). ERP cloud is delivered on-demand over the internet, with the

scalability nature. Scalability means if company or user needs more data storage capacity, can obtain it, and when less capacity is needed, company and user can reduce it again (HerbertNathan & Co, 2015).

3.5.2 Cloud Computing Deployment Models

Another typography for cloud services is based on the access type, which is public and private. In private systems, only specific users have access to specific features (Bahssas, AlBar, & Hoque, 2015). Private cloud is typically hosted for a single user (Saini, Yousif, Saini, & Khandage, 2011). A private cloud delivers “*better quality and service and security over the data*” (Saini, Yousif, Saini, & Khandage, 2011). Public cloud systems are accessed by different users and customers where they share open and direct access to software, hardware and database (Navaneethkrishnan, 2013)and (Bahssas, AlBar, & Hoque, 2015). Hybrid cloud is a mix of public and private clouds (Bahssas, AlBar, & Hoque, 2015). From this angle of view, RamBase is categorized in as private cloud-based ERP (table 5).



SaaS facilitated the adoption of ERP (Bahssas, AlBar, & Hoque, 2015) and “*is the most common effective CC delivery model*” (Lenart, 2011). Cloud ERP connect the company to a network with servers in different locations (Navaneethkrishnan, 2013). While ERP servers and hosts are centralized more often, ERP clients are usually spread to several locations (Al Bar, Mohamed, Akhtar, & Abuhashish, 2011).

Cloud ERP has many benefits for companies, which are less staff, mobility, natural developable and cost reduction (Bahssas, AlBar, & Hoque, 2015). With cloud ERP there is no need to install

complicated soft wares, all the information is accessible at anytime, anywhere with just opening a browser (Saini, Yousif, Saini, & Khandage, 2011). Modern ERP systems are built for use over the internet. Cloud ERP enhance tracking of incoming raw material and outgoing final products to extend the visibility and control inside and outside the enterprise (Navaneethakrishnan, 2013).

Feature	Public cloud	Private cloud
Multi-tenant	Yes	Maybe
Shared database	Yes	No
Shared application	Yes	Maybe
Shared maintenance/upgrades	Yes	Maybe
On-premises	No	No
Scalable	Yes	Yes
Rented by the month	Yes	Yes
Web-based access	Yes	Yes

Table 5: The features of a public and private cloud computing (HerbertNathan & Co, 2015).

3.5.3 Challenges of cloud-ERP

The main challenge of the cloud approach in comparison to conventional ERP approach is security and confidentiality (table 6). The data can be accessed in the public cloud. It is essential to move to public cloud rather than private ones since the public cloud has more flexibility and reduce cost in a considerable amount (Navaneethakrishnan, 2013). The reliability of the network and integration issues is another disadvantage of cloud ERP (Navaneethakrishnan, 2013). Companies are dependent more on the host for their operating related to ERP (Navaneethakrishnan, 2013). Governments' standards and regulations are not based on cloud approach (Navaneethakrishnan, 2013). The back-office procedures and customization in ERP cloud systems are complicated, but cloud-based ERP outperforms all other implementations (Navaneethakrishnan, 2013). As a conclusion, we can say the choice of cloud ERP is dependent on the size of the enterprise and the factors, which are mainly part of an organizational system (Navaneethakrishnan, 2013).

ERP software package	Cloud ERP
Require license	Handle by host
Implementation at the company site	Only client machines installed at the customer site
Training necessary	Training not necessary
Upgrading and debugging is difficult	Upgrading without effect on services
Time taking implementation	Rapid and easy implementation
Migration between providers is not possible.	Possibility to switch between different providers.
Very high level of security and confidentiality	security and confidentiality are challenging
System and data recovery are difficult	System and data recovery are possible

Table 6: Difference between Traditional vs cloud ERP (Navaneethkrishnan, 2013)

3.6 Mobile ERP

In the information era, information is a very essential and competitive tool for organizations. Current businesses have more dependency on Information Systems (IS) to manage their business processes (Omar,2015), and mobile computing is improving the modern business.

The business in today's world is very dynamic and requires fast solutions. Making business decisions is the need of each hour even when a manager is on vacation or away from the office. Mobile ERP can be the best practical option to adopt (Jangwal, 2018). The combination of mobile computing and high-speed wireless communication has brought a radical, innovative change to the computing industry. Now, all-time access to services is considered as a standard (Rocha et al., 2010). This technological infrastructure opens the door to a wide range of services and solutions: *“Mobile Computing systems entail end-user terminals that are easily movable in space, are operable independent of location, and typically have access to information resources and services. As in conventional information systems, users share data and are able to perform collaborative work, either synchronously or asynchronously, with other users”* (Krogstie et al., 2004).

Enterprises have started to move to the mobile strategy to meet their customers' needs. (Omar,2015). Knowing the importance of information management, companies must reach all the required data in real-time, and the solution is M-ERP (Saini, Yousif, Saini, & Khandage, 2011). As a result, ERP vendors are in a struggle to improve their products. M-ERP is an extension of ERP systems, and many company owners remain hesitant to implement it (Omar, 2015). Willis and Willis-Brown (2002), used the term Mobile ERP in their paper Extending the value of ERP and introduced mobile ERP as a future trend for ERP system (Willis, 2000).

ERP system plays a crucial role in any business, either it is a small, medium or a large organization. This changes obliged ERP vendors to add new functions and modules on their system. Therefore, ERP providers with new ERP system designs and business models aim to satisfy companies' need and reach to higher market share. ERP Mobile applications can provide businesses with better service remotely. The most significant feature of mobile ERP is to be on the move and mostly independent of time and location. It enhances real-time interaction between companies, employees, supply chain partners and customers. 4G broadband wireless technology and the more recent one 5G services are providing bandwidth to handle multiple functions simultaneously (Clemens, Cata, & Hackbarth, 2012).M-ERP has the potential to make the business remote available 24/7 on different devices. Mobile ERP and sharing database, let managers get the up to date information and make the decision-making process accurate. In other words, real-time data delivered to mobile devices anywhere enables managers to make high-quality decisions (Al Bar, Mohamed, Akhtar, & Abuhashish, 2011). M-ERP can change the business relations with customers and partners due to enhancement in exchange of real-time data (Bahssas, AlBar, & Hoque, 2015).

3.6.1 Successful Mobile ERP factors

A M-ERP needs to support information in different formats and browsers and various markup language, for instance, WML, XHTML, XML and HTML (Bahssas, AlBar, & Hoque, 2015). There are some necessary conditions needed for a successful M-ERP implementation: Firstly, organizational fit, which measures to what extend mobile application meet the core competence, structure, value and culture of the organization (Clemens, Cata, & Hackbarth, 2012). It is critical for successful ERP implementation when ERP fits into organization business processes (Hong &

Kim, 2002). Organization fit can cover data fit, process fit and user fit (Hong & Kim, 2002). Another complementary factor is viability. Being viable means that the new application is worth the effort and investment (Clemens, Cata, & Hackbarth, 2012). Portability and reachability are also key characteristics (Clemens, Cata, & Hackbarth, 2012).

3.6.2 Critical success and failure factors recognized from theory

Zhang and Lee (Zhang, Lee, Huang, 2005) have presented five environmental variables which must be understood while implementing or modifying the ERP. These variables categorize the whole business structure into five different environments. Each environment is essential but has a different priority while considering an ERP solution. Zhang and Lee have formulated the five crucial environmental variables. In this research, these critical factors are identified and categorized under the environment variables defined by Zhang and Lee. This structured approach can be used to conduct a critical factor analysis while developing or modifying an ERP solution. Following are the environmental variables and critical factors:

1. **External environment:** This variable includes the external factors influencing the organization. For example, legal, social, political, cultural, economic, educational, resource, and industry/trade considerations.

2. **Organizational environment:** This variable includes the organizational factors which are the part of organizational culture. For example, organizational goals, tasks, structure, and management style. The critical factors to be considered in this domain are as following:
 - Feeling the need for change in the business process and ERP (Hong & Kim, 2002)
 - Recognizing the impact on organizational performance
 - Meeting the organization budget
 - Fostering organizational goal achievement
 - Understanding of organizational culture (Hong & Kim, 2002): It is only 18 years that culture as an essential factor for ERP implementation is receiving attention by practitioners and scholars (Zhang, Lee, Huang, Zhang, & Huang, 2005). It is logical to consider organizational and national culture for ERP adoption/modification.

3. **User environment:** This variable includes the needs and expertise of users of the ERP. For example, characteristics of the user, expertise, user's organization, and user's task. The critical factors to be considered in this domain are as following:

- Based on literature review, leadership, management, and users commitment are among the most critical factors for ERP implementation, as they can facilitate change in the organization (Al-Mashari, Al-Mudimigh, & Zairi, 2003).
- Accuracy of the data
- Quality and frequency of communication in any ERP project are undoubtedly one of the most challenging and vital tasks (Al-Mashari, Al-Mudimigh, & Zairi, 2003): *“To avoid the various communication failures, an open information policy has to be maintained for the project”* (Al-Mashari, Al-Mudimigh, & Zairi, 2003)
- User involvement is the essence, especially for ERP modification projects.
- Need for education and training of staff which is costly and time taking. Inefficient training has been approved as one of the significant failures in ERP implementation.
- User satisfaction is the first check of success.

4. **Information system (IS)/ development system environment:** This variable includes the development methods and the management of information systems. For example, the development methods and techniques, design personnel and their characteristics, and the organization and management of IS development and maintenance. The critical factors to be considered in this domain are as following:

- Lack of communication, undoubtedly communication management in any ERP project, is one of the most challenging tasks (Al-Mashari, Al-Mudimigh, & Zairi, 2003).
- Acceptance by the system

5. **Information system operation environment:** This variable includes the necessary resources for information system operations. For example, characteristics of the user, expertise, user's organization, and user's task. The critical factors to be considered in this domain are as following:

- Business process engineering (BPR)

The external environmental variables influence the industry as a whole. These variables are hard to change or influence but can be predicted according to the situation. Although it is one of the important variables, it has more to do with forecasting and situational analysis. The information system environment and information system operation environment are the technical variables with a focus on the architecture of the solution. The information system is responsible for the flow of information, which is a vital part of an ERP. It is designed according to the needs and requirements of each firm. The process starts once the organizational and user needs have been identified.

In this research, the focus is on organizational and user variables (figure 8). The data is collected from users regarding the organization and its goals. The core purpose of data collection and analysis is to lay a foundation for the ultimate solution.

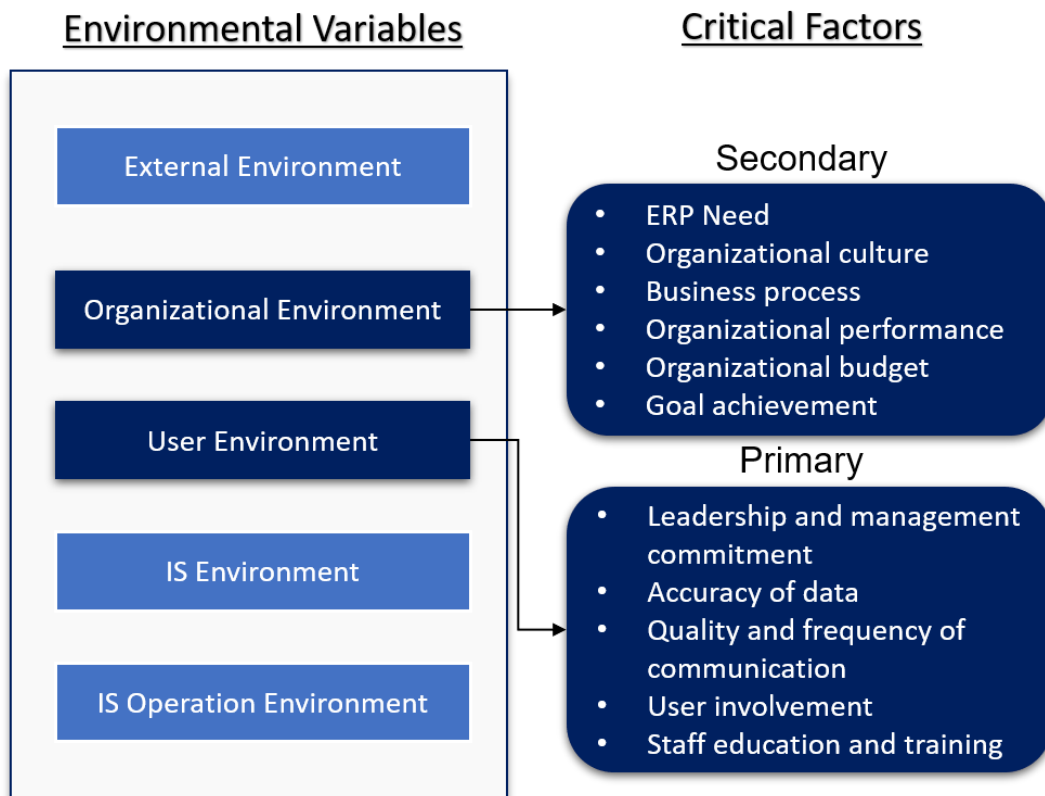


Figure 8: Environmental variables and the critical factors for the two variables under consideration.

The questionnaire was designed according to the critical factors which have to be considered while developing an ERP solution (figure 8). The collected data was then analyzed to identify the ERP needs of the firm directly from the users and decision-makers. Although a comprehensive analysis is required to finalize the solution, this research is intended to identify the starting framework on which the real solution can be developed.

Organizational environment	User environment
ERP Need	Leadership and Management commitment
Understanding of organizational culture	Accuracy of the data
Change in business process	Quality and frequency of communication
Organizational performance impact	User involvement
Organizational budget	Education and training of staff
Organizational goal achievement	

Table 7: Presenting the critical factors in the domain of organizational and user variables. (bold ones are focused during analysis)

The aim is to identify the generic M-ERP needs in the organizations, the changes it will bring to the organization, the impact it will have on the organizational performance, the budget for this feature, the change in goal achievement, the accuracy of data, the involvement of users and the training of the staff. At the same time, data collection management and user involvement were the priority. The respondents have hands-on experience with the software; therefore, they are in a better position to provide an unbiased expert opinion.

Chapter 4. Methodology

In this chapter, a description of the research design, the methodology, and research perspective is described. This study employs the protocol of a case study that involved both primary and secondary data collection through an open-ended questionnaire with the key customers of RamBase. The chapter will further explain the study design and details of data collection and analysis. This research is qualitative and exploratory. This type of research was conducted because there are no or few previous studies on the selected topic (Yin, 2017). There is previous research on the topic of ERP in the Norwegian context. Authors of this paper could not find any literature regarding Mobile ERP market in Norway. Therefore, the authors found it more useful to conduct a mapping study based on the previous research and to perform a qualitative analysis.

We have followed the steps recognized by Lawrence for qualitative research. Due to the fluid and nonlinear nature of qualitative research, Lawrence (W. Lawrence, 2014) characterized it as uncertain and flexible. “*Qualitative research is often characterized by uncertainty and flexibility*” (Pyett, 2003). The seven scientific steps which are identified by Lawrence and followed in this research are as follows:

1-Acknowledge self and context: Researchers initiate a study with a topic and a self-assessment where they assess the topic from a social and economic context (W. Lawrence, 2014). Numerous qualitative studies build on personal ideas, biography, or a specific problem in a company. The starting point of this research was the identification of a market need for mobile ERP. Although there are existing M-ERPs, very little research has been done to explore their utility.

2-Adopt a perspective: Researchers may review the theoretical paradigm or put their query in the current context (W. Lawrence, 2014). All the relevant available literature is explored to establish a pattern and identify important factors which have to be considered while working on an ERP solution.

3-6-Design a study, collect, analyze, and interpret data: These steps are mutual between both qualitative and quantitative methodology. We followed an iterative process by going back and forth multiple times to extract our findings (W. Lawrence, 2014). The study design, data collection and analysis are discussed later in the chapter.

7- Inform others: The style of reporting varies according to the approach (W. Lawrence, 2014). The final analysis will interpret the results found in this paper under the light of the conceptual framework.

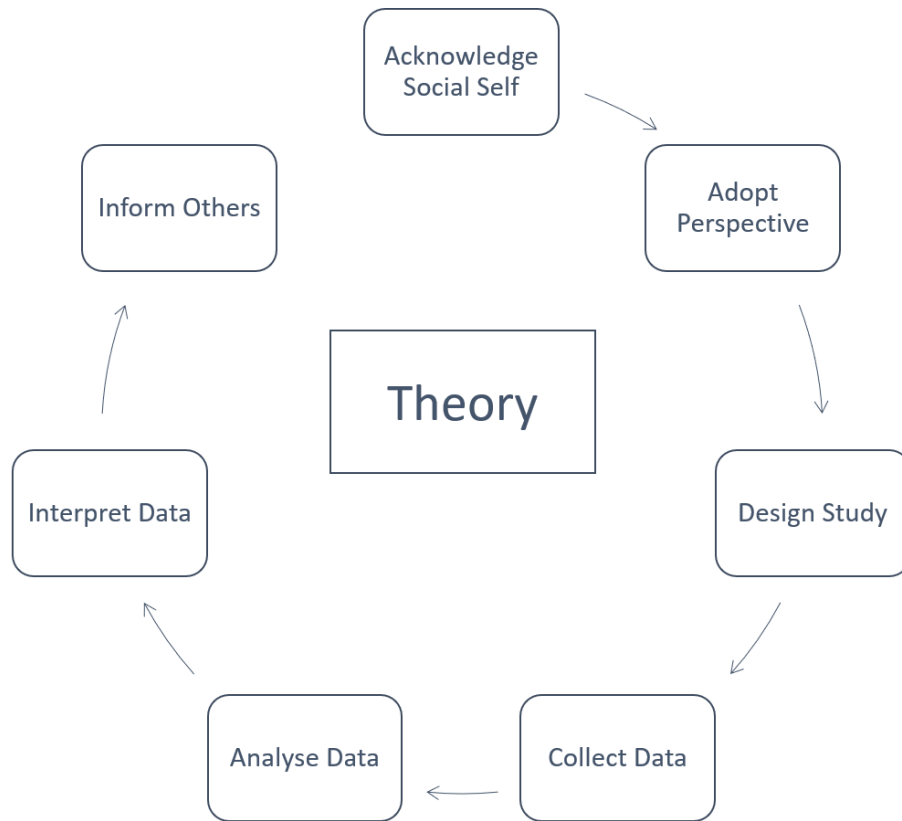


Figure 9: Steps in the Qualitative Research, extracted from (W. Lawrence, 2014)

This paper is a case study conducted in collaboration with RamBase regarding a plan to expand existing ERP to a mobile app. A case study is a research strategy and an empirical probe that investigates a phenomenon within its real-life context and in its natural setting (Zhang, Lee, Huang, Zhang, & Huang, 2005). This study is based on an in-depth investigation to explore the causes of underlying principles (Zhang, Lee, Huang, Zhang, & Huang, 2005).

According to Yin, “a case study is as an empirical method that investigates a contemporary phenomenon in depth and within its real-world context, especially when the boundaries between

phenomenon and context may not be evident “ (Yin, 2017). A case study research question develops a “how” or “why” question that would be the rationale for a case study (Yin, 2017).

Form of the research question	How, Why, What?
Requires control over behavioral events?	No
Focuses on contemporary events?	Yes

Table 8: Case Study Philosophy (Yin, 2017)

Authors of this research have done a case study to understand a real-world case and assume that such an understanding is likely to involve critical contextual conditions pertinent to this case. This research case is one Norwegian ERP provider company, aiming to release Mobile ERP with cloud computing technology. The data in this study was collected via a semi-structured questionnaire protocol.

The concept of mobile ERP is relatively new, and not enough research has been done in this regard; hence, a qualitative exploratory approach was needed for improved understanding of the nature and strengths of the topic. In this study, an open-ended online survey was conducted with customers and employees from community-based organizations with experience and interest in ERP. The purpose of this thesis was to explore the future possibilities of mobile ERP, which is a broad topic. Therefore, it was hard to establish important variables which derive the future market prospects of ERP (Morse 1991).

First, a literature review was conducted to establish a detailed understanding of the topic and develop a framework paradigm. The next stage was to collect data, and after that, the analysis of the data. The final step in this study was to conclude and analyze the results from the data and, finally, to present conclusions and suggestions for future research.

4.1 Research Design

The purpose of the study was to explore the domain of mobile ERP and its prospects for an ERP firm, RamBase. The study design was intended to collect data from primary and secondary sources.

Primary data was collected from the customers of RamBase by using a questionnaire. These customers are using RamBase cloud ERP system, hence are in a better position to respond to queries which are related to an additional feature of a current ERP system. The data was collected using an online survey focused on a focus group, i.e., company’s customers. The secondary data was collected via document review. This triangulation approach of data collection assured validation of our results.

The research was conducted as a descriptive, qualitative study based on a questionnaire sent out to RamBase customers. The goal was to obtain a broad view of how RamBase customers (ERP users) define available features and Mobile ERP modules. An online survey related to experiences with mobile ERP use, strengths and challenges and opinions on the implementation of mobile ERP was conducted. The questionnaire data were analyzed using descriptive statistics, thematic analysis, and content analytical techniques. Survey results were discussed during a consultation with fellow students to identify key considerations in the implementation of mobile ERP.

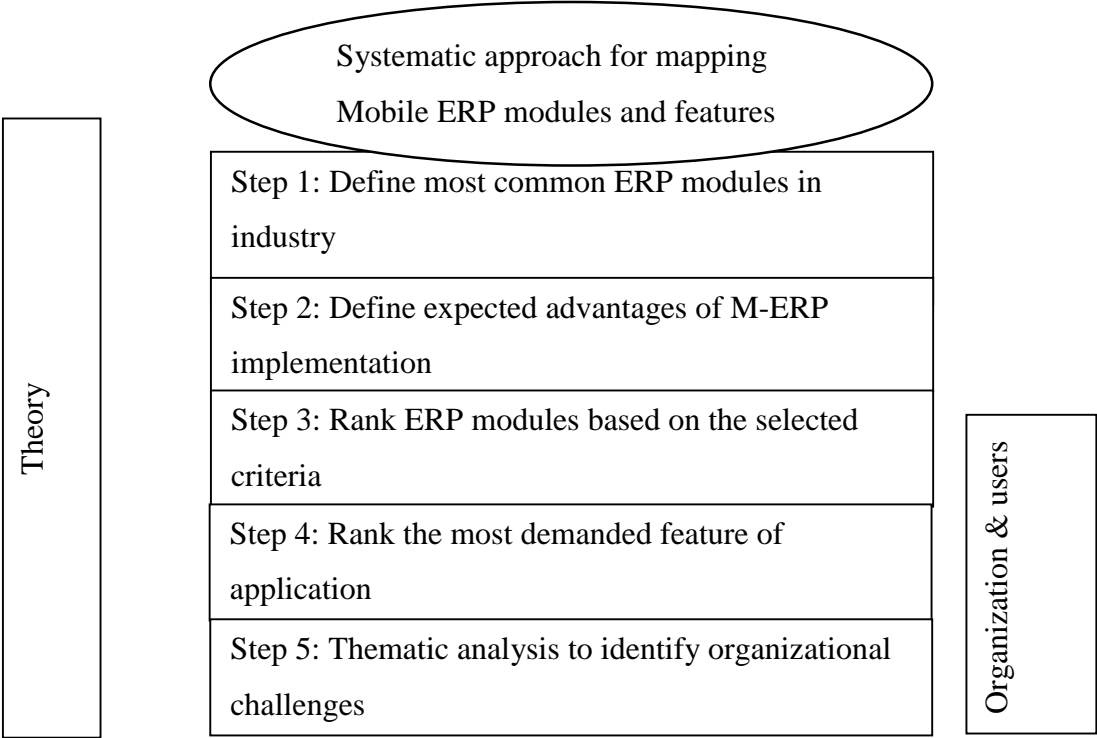


Figure 10: Research Methodology

4.2 Sampling Technique

Cases are not chosen randomly from a population but purposely in order to strengthen the theory (Ridder, 2016). Samples in case study research are small and cannot be compared to quantitative sampling. The sample size in qualitative research is different from quantitative research. Cases are chosen about the research question and research framework (Ridder, 2016). A purposive sampling for this thesis is applied. Purposive sampling is a method to select samples to provide a better understanding of the phenomenon (Ridder, 2016). “*This method is in contrast with random sampling*” (Ridder, 2016). Sampling in qualitative research is more concerned with the richness of information than the number of participants required (Kuzel, 1992), so that is reason in this research the focus is on the quality of data rather than the quantity.

4.2.1 Target Sample

All the Norwegian firms that were using RamBase cloud ERP system and had the potential to implement mobile ERP were included in the sample. The sample consisted of eighteen manufacturing firms in total. Eleven of the firms were conducting mechanical manufacturing, while the remaining seven were high-tech manufacturers. Nine firms were manufacturing equipment for the oil and gas sector. The equipment was used in drilling, exploring and extraction processes. Six of the firms were producing electronics mostly for industrial solutions. The remaining three firms were manufacturing consumer products, including car accessories, plumbing equipment, and projectors. Each firm has a business production strategy.

4.3 Literature review and document review

An in-depth review of the available literature was conducted to set an anchor for the designing of the survey questionnaire and later, for the analysis of the data. Secondary data from publicly available documents of the firms in the research sample has been collected. The documents which were reviewed include annual reports, balance sheets and websites. These documents were reviewed to develop insights regarding the key target market for RamBase.

4.4 Survey-based questionnaire design

An online questionnaire was designed to collect data regarding the core factors which affect the implementation of mobile ERP. It comprised three sections, which were developed with the supervisor and a fellow master student. The following nine elements defined by Holyk's were followed while designing the survey questionnaire (Holyk, G, 2008):

1. Determination of goals, objectives, and research questions
2. Definition of key concepts
3. Generation of hypotheses and proposed relationships
4. Choice of survey mode
5. Question construction
6. Sampling
7. Questionnaire administration and data collection
8. Data summarization and analysis
9. Conclusions and communication of results.

The questionnaire was in English and consisted of 10 questions in total. It started with a short introduction to the researchers and the purpose of the study. It consisted of both open-ended and closed-ended questions. According to Graber, open-ended questions allow the informants “*to answer with whatever information he or she considers relevant*”. In contrast, close-ended questions “*reduce the cognitive burden*” of the informants (Graber & Holyk, 2009) Both types of questions were asked to gather holistic feedback from the informants. The questions covered the topics related to introduction to the customer company, defining the current ERP implementation success, indicating the importance of critical success factors, and managing people issues in ERP implementations.

To find a solution to the proposed research question, we collected data from ERP users in Norway. A questionnaire was sent out to major firms which are using RamBase's ERP system. The questionnaire was formulated to collect data points for desired variables. The first section was designed to collect information regarding the firm and its current ERP practices. This section helped us to develop background information of the firm about their type, size, and ERP system (Omar and Gómez, 2017). The second section was designed to measure the attraction of the

customer towards the benefits brought into the firm by implementing mobile ERP. All the advantages of mobile ERP were analyzed from the literature review, and then the respondents were asked to rate their importance on a Likert scale (Al Bar, Mohamed et al. 2011). This session helped us to understand the importance of mobile ERP and its core value-addition for the firm and their tendency to achieve the benefits which a firm gets after implementing a mobile ERP. The third and last session was designed to measure the critical decision-making variables while considering the implementation of a mobile ERP from the users' point of view. In this session, open-ended questions regarding the essential considerations while adopting mobile ERP were asked. This session facilitated us to understand some of the factors which are crucial to the firm while adopting mobile ERP.

The questionnaire was kept as precise as possible due to a prediction of low response rate as our sample size was small, and most of the official routines were disturbed due to COVID-19 pandemic. It was a short and accurate questionnaire with ten questions in total. The questionnaire design can be seen in figure 11.

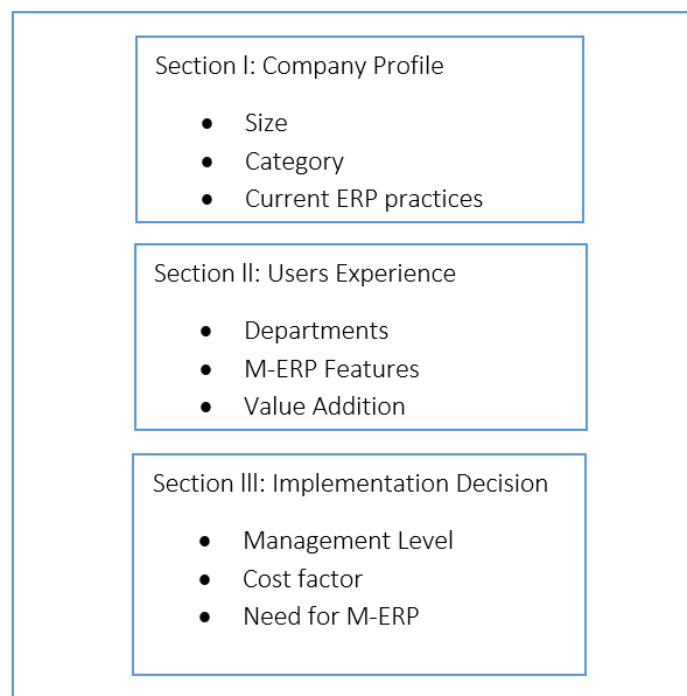


Figure 11: Questionnaire Design

The analysis was divided into two parts. In the first part, the survey data was used to establish background regarding the respondents and analyze the general trend of companies while adopting a mobile ERP. During this part, the decision-makers and users were involved to the maximum extent, which levelled the ground for further analysis. After analyzing the preference trend, an in-depth thematic analysis was conducted to codify the response and extract themes for user mindset. These themes were also compared with the developer's strategies.

Chapter 5. Data analysis and Findings

This chapter puts our research methodology and conceptual framework into practice for ERP adoption and implementation in the Norwegian enterprise sector. In doing so, we report and analyze the empirical data collected from a Norwegian ERP vendor, RamBase. We have analyzed our findings based on the literature review we have performed across the field. Our conceptual model underpins our findings. We further present recommendations for applicably adopting and implementing M-ERP systems in the Nordic industry.

5.1 Mobile ERP (M-ERP) interest over time

Figure 12 represents the interest regarding mobile ERP over the time of 16 years. The numbers on the y-axis represent search interest relative to the highest point, which is 100 on the chart for the world over 16 years. A value of 100 is representing the peak popularity for the term. All other values are relative to this peak popularity. A value of 50 means that the popularity at that time is half of the peak popularity. The regional chart is representing popularity relative to the countries (fig 1). The topic had peaked in popularity during Nov-Dec 2005. It started to attract an audience from the beginning of 2004 and kept increasing until it hit the peak during the last months of 2005. After that, there are no significant peaks to the curve. From the last decade, the average popularity is between 35% to 40%. During 2020, the average is close to 25%, which means that the topic of mobile ERP has one-fourth of the popularity it had in 2005.

It has the highest popularity in India, followed by Germany; however, there is a massive difference in percentage popularity between the first and second position. A higher percentage does not mean higher absolute count, but it represents a higher proportion of all the queries. It means that the mobile ERP topic is 88% more popular in India than Germany. As the percentage is calculated according to the proportion of overall searches within the same country, so a larger population or small population would not affect the results significantly

These findings suggest that mobile ERP is a relatively new topic, and limited research has been conducted in this domain. The term mobile ERP was first observed in the late 1990s but it caught attention when Willis (Willis & Willis- Brown, 2002) in his article extending the value of ERP he emphasized that mobile ERP is the future of ERP industry. Regarding the evolution of ERPs in the communication revolution and mobility, he stated: “*The plethora of hand-held/mobile and*

wireless devices are allowing the capture and retrieval of data anytime and anywhere that is so critical to maximizing the operation of ERP systems.” (Willis & Willis- Brown, 2002). Willis suggested that mobile ERP opens the door to solve the challenge of capturing data.

Despite the commendation of M-ERP by the researchers, we see that the interest in M-ERP has stayed the same in the last ten years.

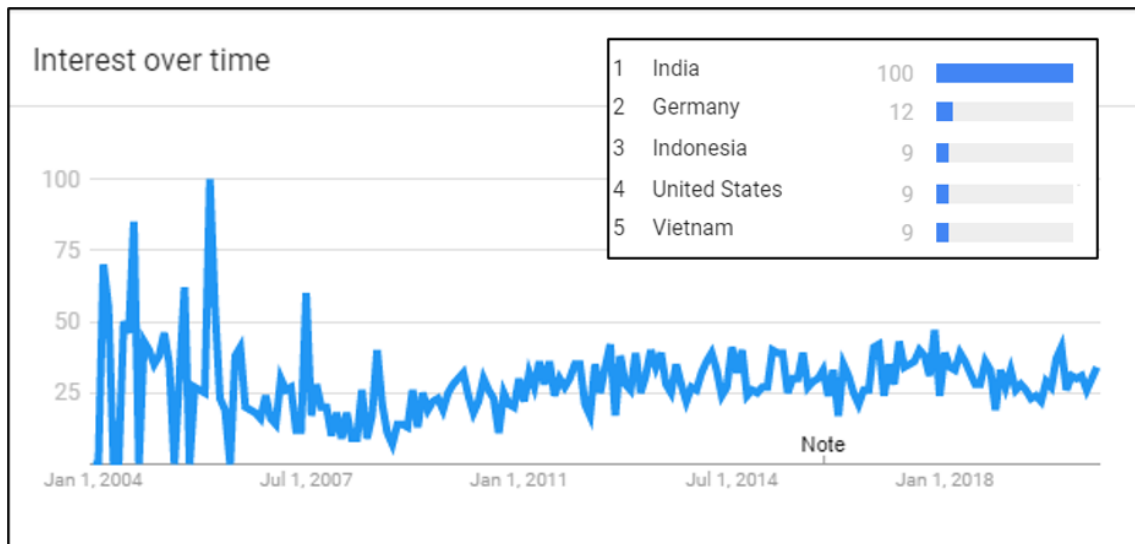


Figure 12: Mobile ERP trend over the last 16 years (source: Google trends)

5.2 Response rate and conditional alterations

We sent our questionnaire to the user’s company email address provided by RamBase. The participants were requested to respond within two weeks, but the deadline was set up for three weeks by keeping in view the abnormal disruptions in office environments due to Covid-19. The response rate for the questionnaires was 50%, which is splendid as a higher response rate from a small sample size is preferred over a low response rate from a large sample size (Evans 1991). There were no significant outliers. The audience included ERP users from multiple departments from nine companies. Respondents were serving at different positions, including executive, managerial, and officer. According to research ethics and disclaimer sent to respondents, the names of the companies are kept confidential.

5.3 Background of the firms

It is necessary to establish the background regarding the responding firms to help understand and interpret the results and evaluate their generalizability.

5.3.1 Size of respondent's firms

We segregated the respondent companies according to their sizes. The size of the company was decided according to its number of employees. A company having less than ten employees was considered as a micro company, a company having employees between 10 and 49 was considered as a small company, a company having employees between 50 and 249 were considered as a medium company and a company having employees more significant than 250 was defined as a large company.

In our sample, 66.7% of the users were from small-sized companies, i.e. the number of employees between 10 and 49 and 33.3% of employees are from medium-sized companies (figure 13). None of the respondents was from a micro or large company. As mentioned in methodology (5.1.2 target sample), the respondents were the users of RamBase ERP, and small-medium enterprises (SME) were their target market. The results cannot be generalized to large or micro-sized companies because each category operates differently.

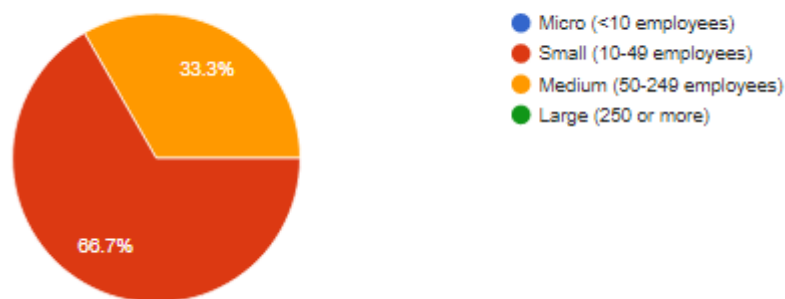


Figure 13: Percentage of respondents by company size.

5.3.2 Category of respondents' firms

The organizational environment which involves organizational goals, operational tasks, management style and structure is a crucial environmental variable while considering ERP implementation. It is necessary to segregate organizations according to the environmental variable. After dividing the sample into different company sizes, it was classified into the following industrial categories:

- Manufacturing
- Services
- Financial and Public Services

In our study sample, all the firms are operating in manufacturing category and using different business strategies like made to order (MTO), make to stock (MTS), assemble to order (ATO) and engineer to order (ETO). Their business strategies are different, but all of them fall in a broader category of manufacturing. In figure 14, it can be observed that 88.9% of the firms are categorized as manufacturing, while 11.1% recognized as development, assemble and sale, which can be defined as a sub-category for manufacturing. Therefore, the whole sample consists of manufacturing firms which generalizability limitations on the results. Business operation modules for departments like finance, sales, marketing, CRM, etc. are mostly standard throughout the industry. However, in the manufacturing industry, the production department and its close relatives like procurement, logistics, inventory, etc. vary substantially from similar departments in other industrial categories.

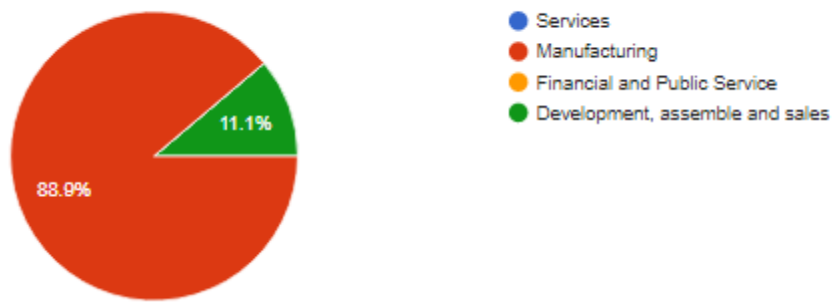


Figure 14: Industry category of respondent's company.

The products vary from heavy machinery to industrial projectors. As most of the firms are small to medium-sized, their production strategies are very innovative, hence require a customized ERP solution.

5.3.3 Existing ERP practices

Before considering an update, the existing ERP practices, knowledge, and processes must be evaluated. All the companies in the sample set are manufacturing firms and SMEs. Therefore, the majority of the modules which are currently being used, are standard. In figure 15, the respondents have specified which module they are using.

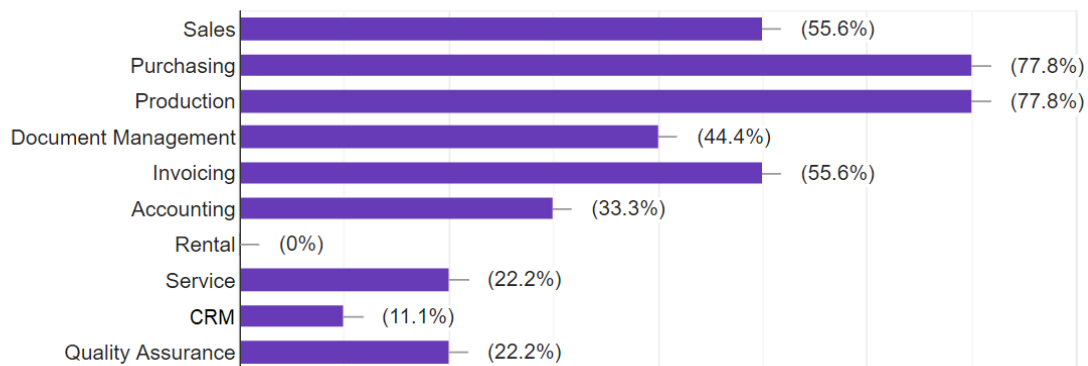


Figure 15: Percentage of respondents using the respective ERP module on a computer device.

There can be more than the ones described below because the respondents have only specified the ones that they are using. Majority of respondents are using production and purchasing ERP module, which is understandable due to the nature of the firms. The second most used modules are sales and invoicing which are necessary for any business. The remaining respondents are using accounting, document management, quality assurance and service.

Module	Percentage User
Purchasing	77.8
Production	77.8
Sales	55.6
Invoicing	55.6
Document Management	44.4
Accounting	33.3
Service	22.2
Quality Assurance	22.2
CRM	11.1
Rental	0

Table 9: Percentage users of a specific module (descending order)

The general mindset about manufacturing industries is that these firms produce and sell their final product, but two of our firms are not only selling but also providing their product as a service. This is the same model which most of the ERP & other software companies are utilizing. This model is known as software as a service (SaaS). The firms are using all the necessary modules required for a manufacturing firm. The percentage of users for each module can also give a bird’s eye view about the labor force distribution in the manufacturing industry. Majority of employees are connected to the core modules, i.e. production and purchasing, whereas a specific percentage of employees are connected to each of the operational module (table 9).

5.3.4 Mobile ERP usage

The technology trends are changing rapidly, which force the ERP developers to crack the innovation and integrate it into their systems as soon as possible (Bahssas, AlBar, & Hoque, 2015). RamBase has already developed a mobile ERP app with limited functionality and is currently in the beta testing phase. At present, only a few users have access to it. To establish a background regarding the current mobile ERP access, initially, the respondents have specified the ERP module which they are using (figure 15), and then they specified if that module can be accessed through a mobile device or not (figure 16).

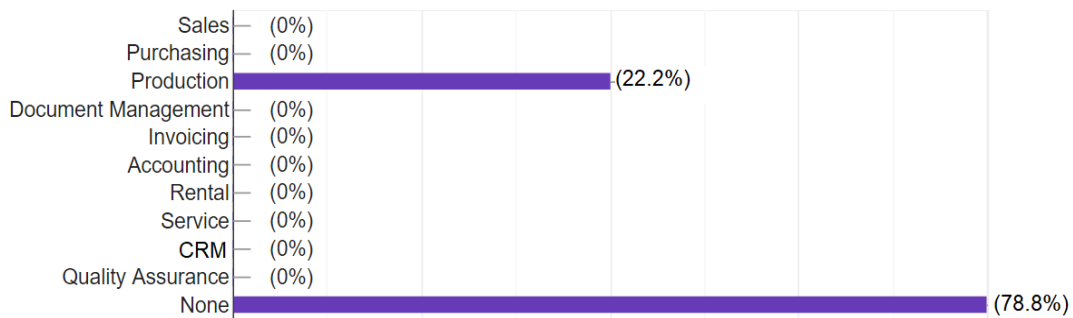


Figure 16: Percentage of respondents using the respective ERP module on the mobile device.

When the respondents were asked about the specific modules which can be accessed through a mobile device, only 22.2% of the users who are using the production module can access it through a mobile app (figure 16). The remaining 78.8% of the users who do not have mobile app access also include those who are unaware of mobile ERP app.

RamBase ERP is a cloud-based ERP. The desktop version of its ERP can be accessed through a mobile phone by using any browser, but for most of the activities, it is unfeasible due to excessive information on a small screen. This is one of the major challenges. The M-ERP must limit the information but still provide the right information at the right time. Currently, a very inadequate M-ERP module is available with access to only one department.

There is a full room for expansion in the field of enterprise mobility. Further analysis will evaluate the potential M-ERP modules and features based on the data collected by our questionnaire. The

results will be validated from relevant studies and theoretical framework. The inference will work as a preliminary report for RamBase for evaluating their business plan towards M-ERP.

5.4 Important M-ERP modules for users

The users have rated the utility (value-addition) of each ERP module if it can be accessed with a mobile phone. Most of the users were skeptical regarding the idea of M-ERP. Their concerns were the same as that of developers. Each user rated a specific module on the scale of 1 to 5. Three is the neutral response, 1 and 2 represent negative response whereas 4 and 5 represent a positive response. These findings are consistent with previous knowledge. Previous studies have reported organizational transformation challenges such as acceptability issues faced by employees and the need to change employee behavior to embrace such disruptive technological changes (Al-Mashari, Al-Mudimigh, & Zairi, 2003, Kohansal, 2019, Shang & Seddon, 2000).

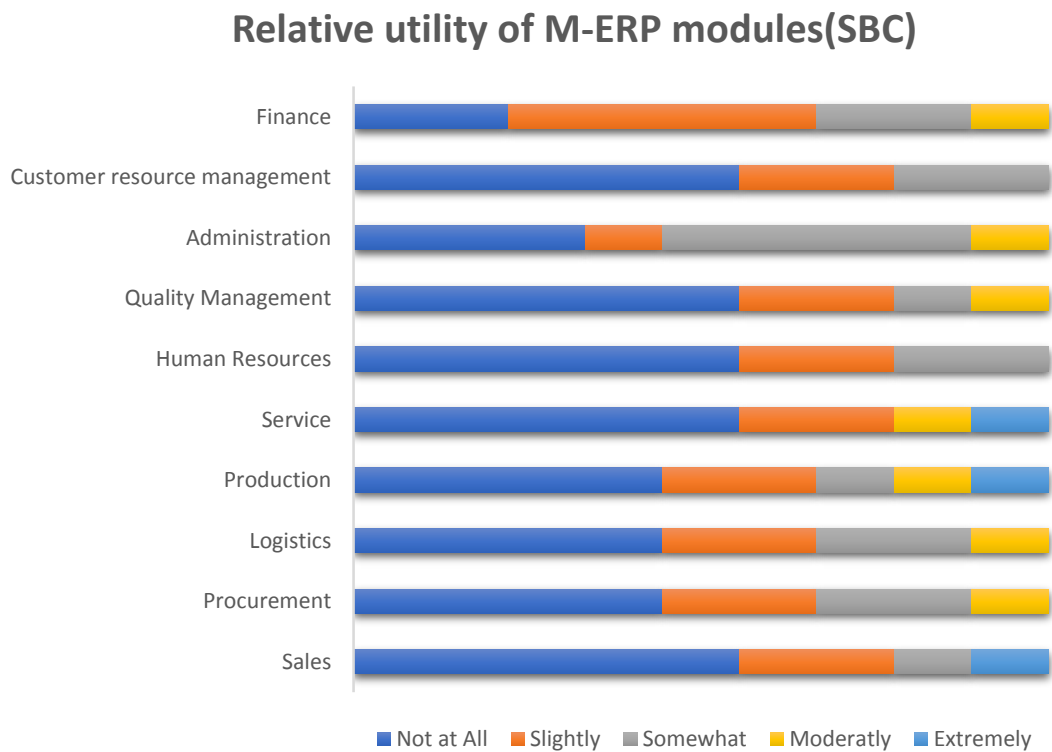


Figure 17: Value addition by specific M-ERP module for the users.

The stacked bar chart above depicts the user evaluation of each ERP module. The scale represents the amount of utility each module has for the firm from the users' perspective. The primary categorical variable is an ERP module which is ranked according to their utility (figure 17). The general trend for this variable is negative. Majority of the users believe that if the modules can be accessed through the mobile phone, it would not add much value to the firm or that respective department. The reasons described are in line with the challenges mentioned in the literature review. The users were also skeptical concerning the challenges which have already been resolved over time.

The navy-blue bar is representing zero value addition for the users if that module can be accessed through a mobile device and in most of the cases more than 50% respondents believe that it will be the case. There are multiple reasons for this pessimistic response. The respondents are not considering the option of a customized mobile app which will not have the same interface and options as a desktop ERP. The features and information will also be limited according to its usability and frequency of usage. This finding is supported by the themes established from the users' responses to open-ended questions in our questionnaire discussed in later analysis. The second reason is the expertise of each user. In the sample, the respondents are from different departments, and each user has ranked all modules. All the respondents have ranked the module which they are using to the best of their knowledge, but for the remaining modules, they have marked option 1 "Not at all". Therefore, when the results are compared, a minimal difference can be significant.

The three modules quality management, human resource and service all have the same amount of responses for option 1 "not at all" and option 2 "slightly" but the responses for option 3 "somehow", option 4 "moderately" and option 5 "extremely" change the picture. Out of remaining respondents, all have chosen option 3 "somewhat" for human resource, 50% has chosen option 3 "somewhat", and 50% has chosen option 4 "moderately" for module quality management and, 50% has chosen option 4 "moderately", and 50% has chosen "extremely" for the service module. According to this ranking, m-service module will be most beneficial compared to quality management and human resource.

Although 78% of the responses were the same for all three modules and only 22% varied still the opinion of these 22% respondents is significant because these are the users who have expertise in

these modules. The percentage of users having proficiency in each module varies substantially and can be observed in figure 15. During the analysis, each users’ responses were examined individually to establish this inference. There is no abnormal difference between any two modules. Only three of the total modules are marked as “extremely” by several respondents. These modules include production, service, and sales.

In theory, production is a continuous process of combining different inputs at different ratios to produce something that can be consumed, but there are hundreds of other factors which must be controlled to get desired results. Other modules like procurement, inventory and quality management are also interconnected with production. In a manufacturing firm, production is the core process. Resources flow in a defined procedure and are transformed under a controlled system to produce a valuable product according to the policies of the firm. Production is always an organized activity and has clear objectives. It operates under other organizational systems.

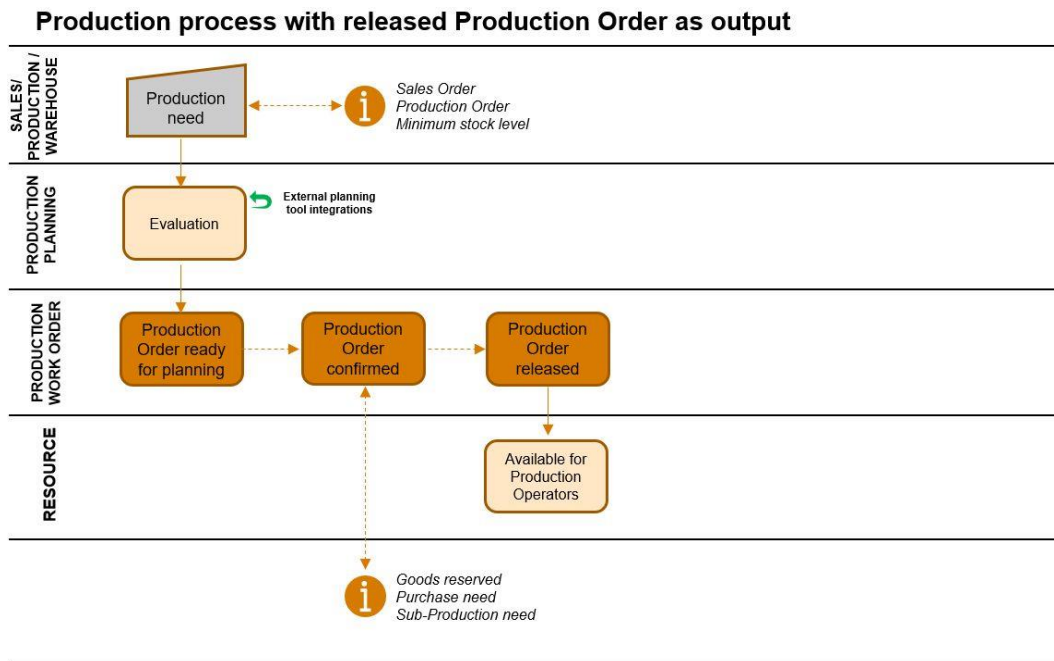


Figure 18: The planning process for production (source RamBase)

In figure 18, the planning process for the production is defined in BPMN form. The production process initiates after the production need is identified. ERP evaluates the production need, if the

order cannot be completed from stock, then the production planning is initiated, and relevant inputs are arranged. Once the planning process is finished, the order is confirmed, and the required goods are either reserved or purchased. As soon as everything is in line, the production order is released, and production can start. This whole process is as efficient as the information provided to the system. The key to a smooth and effective production process is the agility and accuracy of the information available to the right people at the right time, with the implementation of suitable M-ERP solution, the organizational efficiency, productivity, effectiveness, and control increases (Pavin and Klein 2015).

5.4.1 Central tendency and Variability

If the ERP modules are ranked according to the data collected from the users then the administration, finance and production modules are ranked on the top positions with means (2.33), (2.22) and (2.22) respectively (Table 10). The administration module has the highest median and mode of (3.00). Finance has a median and mode of (2.00). Production has a median of (2.00) and mode of (1.00).

Modules	Mean	Median	Mode	Std Deviation
Administration (management)	2.3333	3.00	3.00	1.1180
Finance	2.2222	2.00	2.00	0.9718
Production	2.2222	2.00	1.00	1.4814
Procurement	2.0000	2.00	1.00	1.1180
Logistics	2.0000	2.00	1.00	1.1180
Service	2.0000	1.00	1.00	1.5000
Sales	1.8889	1.00	1.00	1.3642
Quality Management	1.7778	1.00	1.00	1.0929
Human Resources	1.6667	1.00	1.00	0.8660
CRM	1.6667	1.00	1.00	0.8660

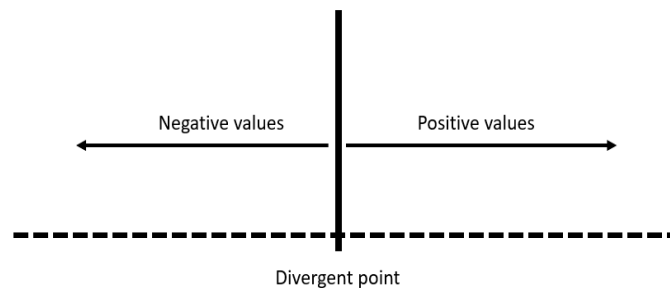
Table 10: The results of the central tendency and variability measures for the respective modules

Quality management, human resource and customer service management have scored the lowest with means (1.77), (1.66) and (1.66) respectively (Table 10). All three have a median and mode of (1.00).

According to these scores, the users believe that administration, finance, and production are the most suitable modules for mobile accessibility. These modules have a high level of acceptability among the users due to overall increased efficiency. However, on the other hand, production and finance modules require the highest amount of time in learning to use them (Omar and Gómez 2017). These results are more meaningful when the sample is kept in mind. If the industry is considered as a whole, the service module is preferred by developers as well as users (Murguia 2018).

5.4.2 M-ERP modules diverging chart

A simple variation in the stacked bar chart can make it easy to visualize the results. The positive responses are stacked on the right side of the neutral vertical baseline, whereas the negative responses can be stacked at the left side. The neutral vertical line will act as a divergent point



In the figure below, the vertical blue line is acting as a divergent having neutral response on both sides represented with grey bars. The responses on the left are negative points, whereas the responses on the right are positive points. All the responses are more inclined towards the negative side. Several reasons are briefly discussed above, whereas a detailed analysis is conducted later. (Figure 19)

Relative utility of M-ERP modules(DSCB)

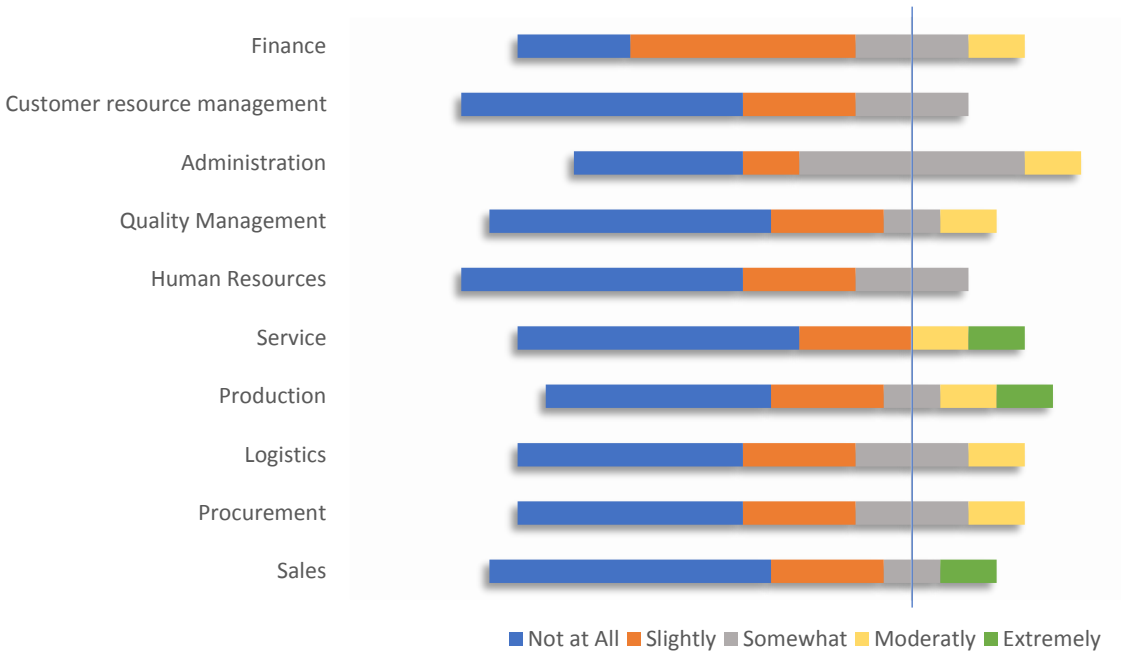


Figure 19: Value addition by specific M-ERP module for the users (DSBC).

Similar research was conducted by Al Bar and colleagues in 2011 (Al Bar, Mohamed, Akhtar, & Abuhashish, 2011). In his research, a series of interviews were conducted with the salesmen of different ERP service providers. Although the scope of his research was different, the data collected for one of his queries is exciting. When the salesmen were asked to score M-ERP modules according to the acceptability by the clients, all the modules scored a mean higher than (4.00). The final ranking was almost like the one shown in table 10. There were some variations due to different respondents in sample and inclusion of all business categories. This validates the argument that the average score depends on the relation of respondents to the product. All the responses from ERP salespeople were optimism biased (Sharot, 2011), whereas the responses from users were pessimism biased (Menon, Kyung, & Agrawal, 2009). The average scores are significantly apart, but the judgement regarding solution is in harmony with each other.

5.5 Important M-ERP features

In these times of exponential growth, a microsecond increase in the processor speed is worth every single penny. Businesses demand fast and accurate solutions. Out of all the direct and indirect benefits related to M-ERP, mobility is the epicenter of everything. This mobility allows real-time query of information regardless of location, reviewal and approval of workflow anytime and anywhere, traceability of information, increases surveillance and instantaneous record of data. These features ensure cost reduction, productivity gain, higher efficiency, and better surveillance (Pavin & Klein, 2015).

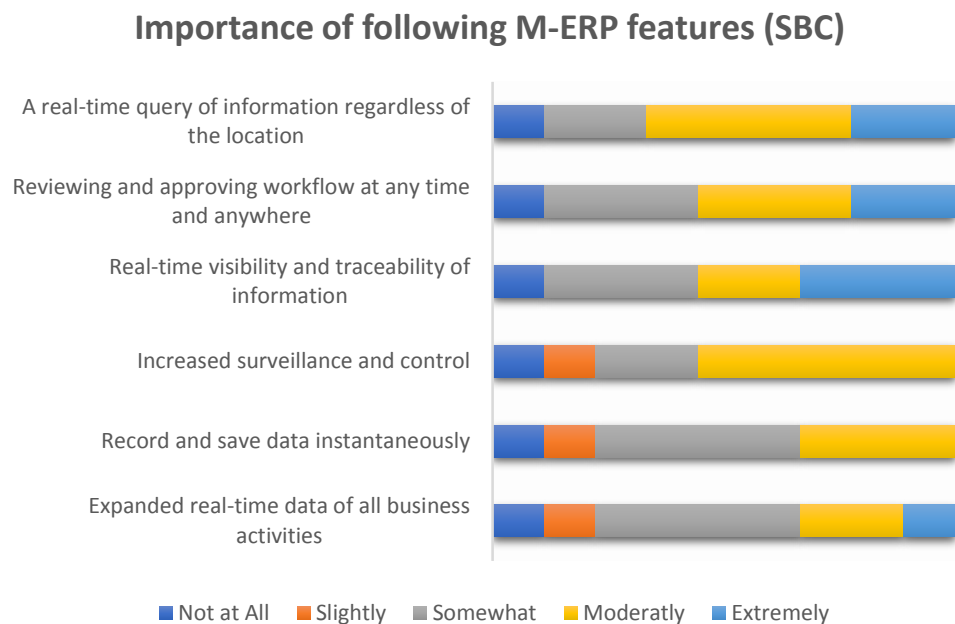


Figure 20: Outcomes of M-ERP implementation scored by users.

The usability of M-ERP cannot be evaluated merely by its modules. One must evaluate what it brings to the table. After reviewing articles, market offerings and M-ERP satisfaction surveys, the most common results in all of them were retrieved. After that, the users were requested to evaluate and score the importance of each outcome. The collected responses had a twofold function, firstly to examine how vital each outcome is for the user and secondly to develop a smooth transition from rating modules to evaluating outcomes after implementation. It can be seen in figure 20 that users have a positive trend while evaluating the features (outcomes of a particular feature).

When respondents were asked to evaluate M-ERP modules, they had suspicious behavior, whereas when they were asked to evaluate the features (outcomes) of M-ERP implementation, they were happy about it. This behavior shows that there is a hidden need, but the market is not aware of it. This issue has previously been highlighted, and a need to incline the market strategy towards technology push has been reported (Horbach, Rammer, & Rennings, 2012).

5.5.1 Central tendency and Variability

The features like the real-time query of information regardless of location, traceability of information, reviewable and approval of workflow anytime and anywhere, increase surveillance, expanded real-time data of all business activities, and instantaneous record of data have scored a median of (3.6667), (3.6667), (3.5556), (3.2222), (3.1111) and (3.0000) respectively (table 11). There is no abnormal variation in the responses as standard deviation is (1.1 ± 0.1) which is according to the rule of thumb that the ratio between minimum and maximum standard deviation should be 1:2 (Julious, 2005).

Features	Mean	Median	Mode	Std Dev
A real-time query of information regardless of the location	3.6667	4.00	4.00	1.2247
Real-time visibility and traceability of information	3.6667	4.00	3.00	1.3229
Reviewing and approving workflow at any time & anywhere	3.5556	4.00	3.00	1.2360
Increased surveillance and control	3.2222	4.00	4.00	1.0929
Expanded real-time data of all business activities	3.1111	3.00	3.00	1.1667
Record and save data instantaneously	3.0000	3.00	3.00	1.0000

Table 11: The results of the central tendency and variability measures for the particular M-ERP features.

5.5.2 M-ERP features diverging chart

According to the users, real-time query at anywhere and anytime is the most important feature. The user will be able to connect to the cloud database everywhere with his mobile device. Although it is a straightforward and highly useful feature, it has security, connectivity, and hardware

challenges from the technical side (4.2.4 challenges). The respondents believe that these features will be beneficial for the organization and the users (figure 21). While designing the solution, the importance of each feature must be kept in mind. It will ensure a smooth transition and user satisfaction.

Importance of following M-ERP features (DSBC)

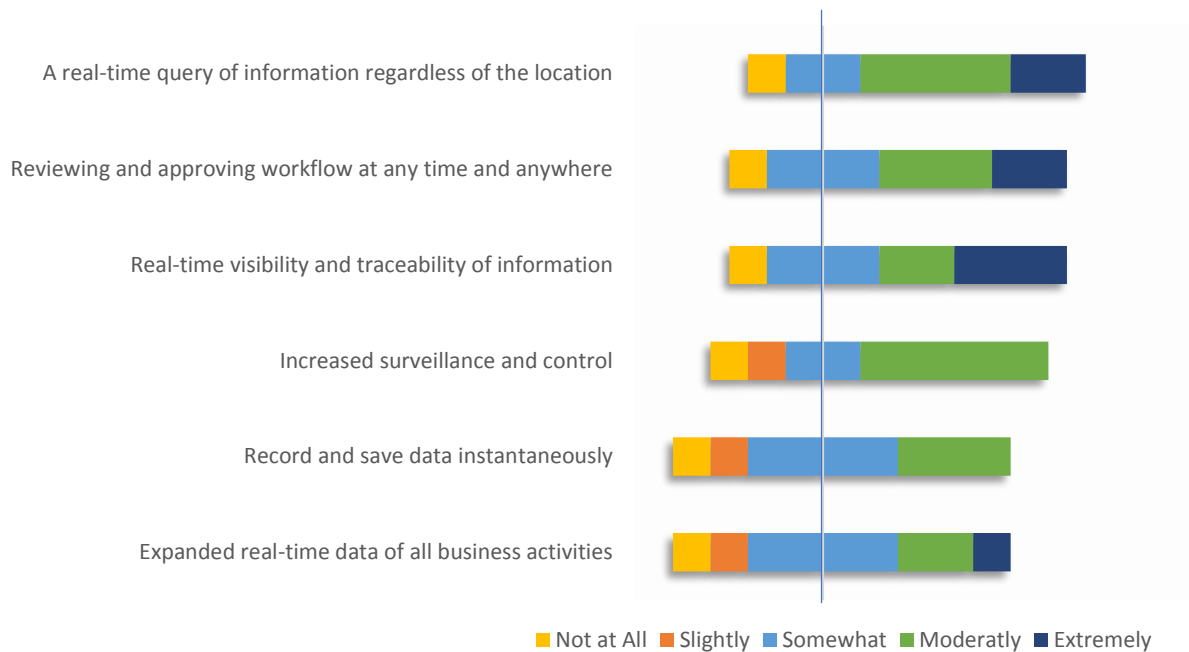


Figure 21: Outcomes of M-ERP implementation scored by users (DSBC).

Users believe that access to information regardless of location, and the traceability of information are most important. Whereas recording information instantaneously and real-time data of all business activities are less prioritized compared to other features. These two features also have more technical challenges like info to screen ratio, security, and compliance. The main requirement is to access ERP data remotely and the features to add, edit, remove, or change it.

If the modules and features identified by the users are combined, then a framework can be developed for the mobile ERP application. The users believe that administration, production and finance will be the most useful modules if accessed through a mobile device and the preferred features for these modules is the real-time access to the resources everywhere regardless of the location and primary functionality to manage workflow.

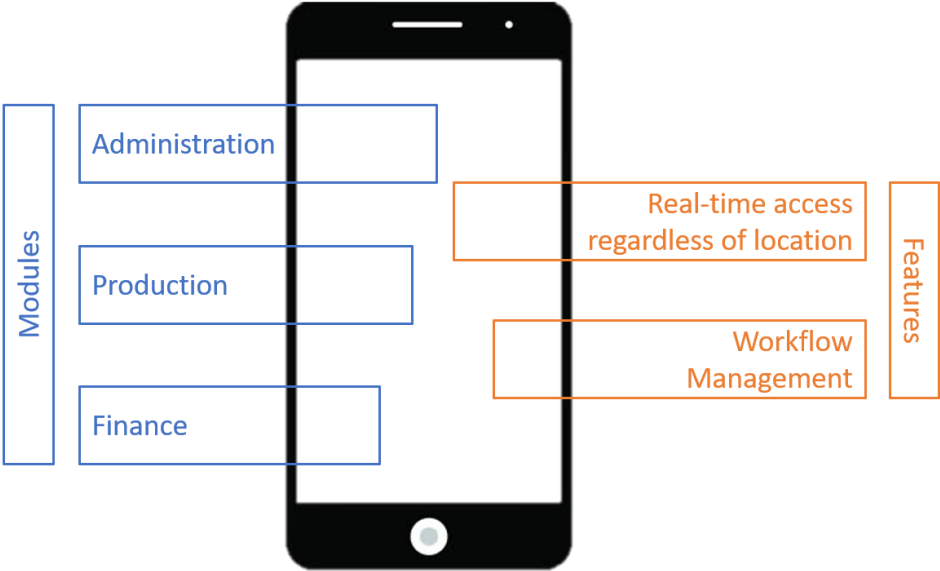


Figure 22: Solution framework according to the users.

The developers should focus on an application for the modules described in figure 22 while ensuring live access and workflow management. The compatibility with the existing system must be realized. Past user data can be used to design an individually customized solution. The challenges identified by the users are evaluated in the later analysis. The developers must ensure a satisfactory solution to each challenge.

5.6 The reason for variation in responses

If the means of responses when asked regarding M-ERP modules (table 10) and M-ERP features (table 11) are compared, then it is noticeable the means for the first one are below neutral value whereas the means for the second one are above neutral value. The reason behind the hesitation to score low when asked directly regarding value addition by M-ERP and score high when asked regarding the features was partially due to a misunderstanding regarding the solution. One user described this challenge as,

“I can see from the purchasing perspective, the processes which are done in the system requires a bigger view than a mobile application can give. Often several views on two screens are used to work better within the processes. On mobile, it is not feasible.”

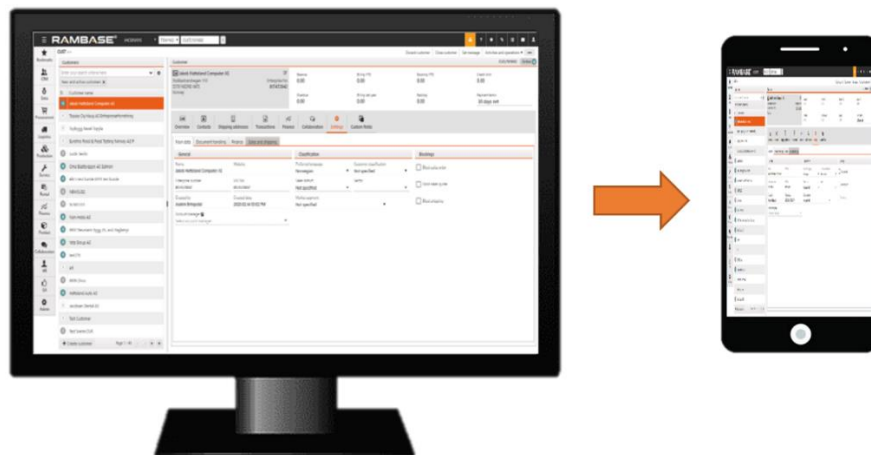


Figure 23: Users perception regarding M-ERP.

When users think about mobile ERP, they believe a similar graphical interface as on desktop (figure 23) which is not feasible. From the last decade, the trend is to develop a simple light application and use browser-based architecture instead of a three-tier architecture. A specific app for a module or a submodule with limited core functions sufficient to manage essential operations seems to be the best approach. These simple applications remove the complexities of the ERP

software and reduce the learning time. This solution minimizes the need for education and training staff, which is costly and time taking, and inefficient training has been approved as one of the debilitating factors in ERP implementation (Al-Mashari, Al-Mudimigh, & Zairi, 2003). Through simple and user-friendly apps, the users can check assigned tasks on their mobile phone and keep updating the status along with their work.

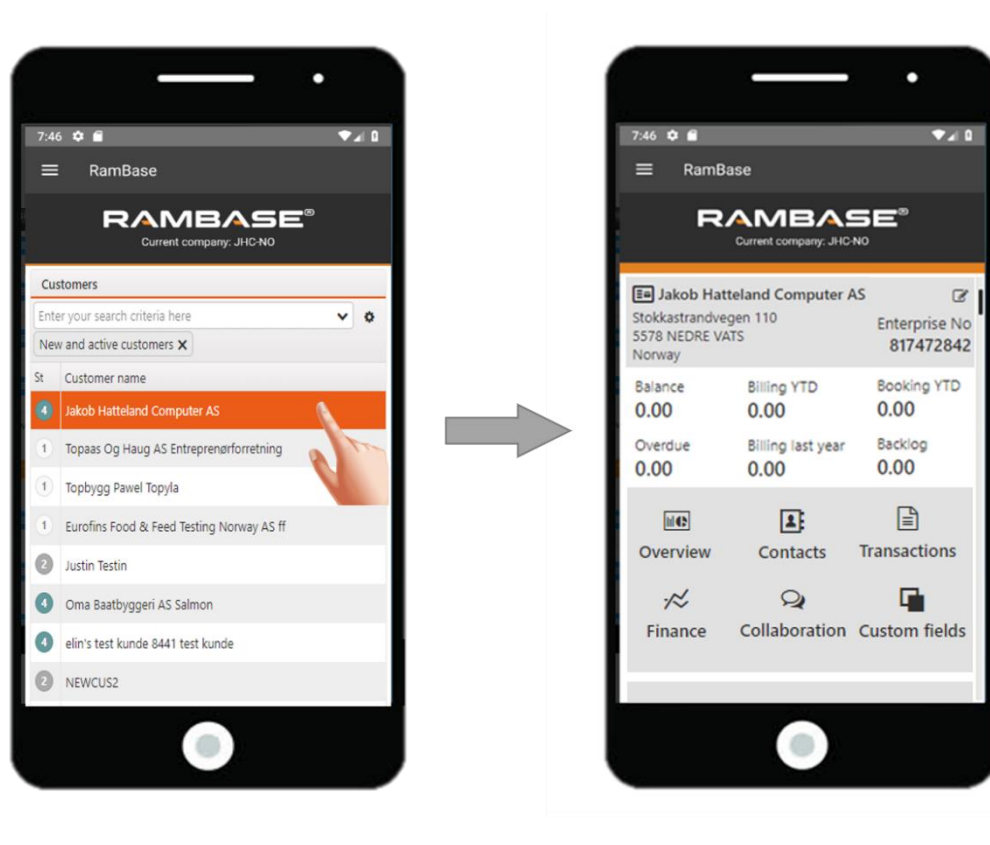


Figure 24: Prototype to depict information customization according to mobile screen resolution (not an actual app).

The mobile user interface can be customized to perfection if the insights regarding software usage are available. The features can be added or eliminated according to the frequency and nature of usage. In figure 24, a sample for the sales module is shown. A sample user interface is designed for the same customer management feature in figure 23. Merely changing the interface to mobile-friendly layout made the feature more usable, precise, and fast. The screen display size is kept comparable to market standard in present times. The purpose of a mobile ERP app is not to migrate

the whole system to mobile phones but to work in line with the existing system and further increase its efficiency. M-ERP cannot be an alternative to a computer-based ERP.

5.7 Impact of M-ERP on different levels of management

According to Maslow's hierarchy of needs, different level of management has different needs in an organization (figure 25). To fulfil these needs adequately, each group of people need a specific set of tools to assist them in the best possible way.



Figure 25: Maslow's Hierarchy of needs

The respondents were asked an open-ended question to specify which level of management or group of people will benefit the most if a mobile ERP is available for their tasks. The responses vary according to the experience and management level of each respondent, but the most recurring theme identified in the responses was the warehouse and production. Two of the respondents highlighted it as:

“I believe top management can benefit most but it will also be helpful for people working in the warehouses.”

“Warehouse and production will benefit from it.”

Production is also identified when respondents rated each module. The other noticeable thing is the level of management. The respondents believe that M-ERP will be helpful for top and middle management because they always need access to assorted information. The needs of top management are to develop and stretch to generate value. This process of self-actualization can be smoother with the right information at the right time.

“Management level I assume by being able to get easy access to miscellaneous status information.”

The users believe that there should be different functionality, interface, and information access for different employees. For managerial positions, all the keys information is required put for employees working in operations, production, and warehouse only the information for their tasks is required. This trend is not only identified by the users but can also be seen throughout the ERP industry. The ERP vendors prioritize the development of a small app designed for a specific purpose. It is easy to handle and requires limited training.

“for purchasing the mobile application could be used to see the stock level of a product or a component, a delivery, a demand, a date, a value but to do a more complicated the process would be more difficult.”

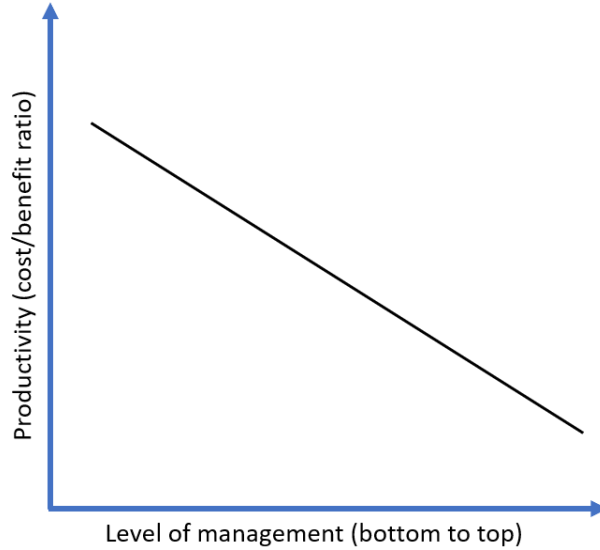


Figure 26: Relationship between productivity and M-ERP solution according to the hierarchy (linear relation for easy understanding)

According to the users, M-ERP is beneficial for top management if it has miscellaneous information about the whole department or organization. Conversely, with only several features, a simple mobile ERP app, can be highly productive (figure 26). Consider a simple daily business scenario in which the production team is advised about the production order, and the related documents are handed over. The production is started, and the production team realized a need for a new part. The technician will have no information regarding the stock and the time it will need to arrive. With a simple production M-ERP module, the current stock of all the materials can be accessed, and the new orders can be placed.

The users believe that the mobile app should allow tasks which are easy and productive. The complex tasks can be done on a regular computer. These small mobile apps need limited resources to develop and are highly productive. At the outset, a bottom to top approach will be more effective while developing the M-ERP solution.

5.8 Organizational budget

The operational strategies of firms vary according to their sizes. Small and medium-sized firms have a limited budget for operations. Investment on new technology or infrastructure is made if the marginal benefit is more than the marginal cost on a small to medium run. According to the survey conducted by workwise, for small to medium-sized businesses, the cost of ERP software and services can range from \$75,000 to \$750,000. It is a significant amount, but once the solution is implemented entirely, the software starts to pay for itself. This cost is estimated according to the initial implementation of the solution. Indeed, the implementation cost of M-ERP will be significantly less than the previously specified amount. It also depends on how the vendor wants to market the M-ERP product. If it is marketed as an add-on feature, then an additional amount must be specified for this feature, but if the product is marketed as a part of the primary solution, then the price will be included in the total cost. The vendors can also market the product as a freebie to create a competitive advantage among the competitors, which was the most common opinion among the respondents.

“It should be a freebie which can be used by people who want to use it.”

Although it was the most common opinion, it is a little biased to inquire about the views of a customer regarding the cost/price of a product. Most respondents gave their opinion without backing it up, but few of them explained their responses (limitations of a questionnaire). On the scale of 1 to 5, the clients believe that the cost fact has an importance of 4, especially in the setups of firms under study. The customer believes that the M-ERP is an additional optional feature.

“Very Important, with the today set up of the company in min. On the scale of 1-5, I will rate it as 4.”

Developers must identify the market segment which they want to target and the market strategy for the product before developing the solution. It is a competitive market which is sensitive to high prices. There is a market need, but the users have not identified it clearly so the strategy should work by market push.

When the companies commence, they explore all possible options for the ERP and choose the best one. Once the ERP is implemented, it is hard to move to a new system because it will take time and money. Companies usually stick with the same system until and unless there is a radical innovation in the industry, or the solution is outdated. Each firm has its criteria while selecting an ERP vendor. The key factors include price, performance, support, and compatibility. However, does the availability of a M-ERP application have any impact on the selection of an ERP vendor? This was the question asked to the managing department of the firm.

“No, it did not”

“It does not in our company (high-tech manufacturing)”

Majority of the respondents believe that the availability of mobile ERP application has little to no impact on the selection of an ERP vendor. Most of these respondents are from high-tech manufacturing firms specializing in the oil and gas industry. The respondents who believe that availability of M-ERP application does have some influence on the decision of choosing the right vendor are working in electronics and production/service industries.

5.9 Strengths and Limitations

This study has several major strengths. First, the topic of M-ERP is relatively new in the field of ERP, and this study is one of the few pioneer projects in this field. We have collected quality real-time data from actual customers of RamBase, which provides a comprehensive understanding of customers' mindset. Second, this study provides an in-depth starting framework for new start-ups in the field of M-ERP. Findings of this research will help RamBase and similar companies to have a better understanding of M-ERP design and assist their customers to raise the success rate of M-ERP implementation.

There are some limitations too. First, due to the short research time, delays due to Covid-19 pandemic and limited resources, we could not recruit more ERP vendors and customers; hence our results might not be generalizable. Second, we limited our key terms in the literature search to Enterprise Resource Planning systems (ERP) and Mobile ERP to narrow down the topic, Enterprise Systems (ES) and Information Systems (IS) as generic terms were not used, hence we might have missed some important studies.

The third limitation is that the solutions and recommendations are based on qualitative data; therefore, we could not focus on developing technical explanations. For a technical solution, the analytical data from the customers current ERP practices is required, which was not possible due to companies' privacy policies.

It is important to discuss the quality of our study. Below, we have discussed some validation parameters to address the quality aspect of this study.

Chapter 6. Validation of the study

This chapter is devoted to proving that this thesis has been done by using a precise methodology to provide a meaningful and reliable result. The theoretical lens of researcher, viewpoint and approaches to the phenomenon, the strategies that the researcher uses to collect or construct data, and the understandings that the researcher has about what might count as relevant or important data in answering the research question are all analytic processes that influence the data (Thorne, 2000). As shown in the previous chapter, this thesis applies descriptive and thematic analysis as a method. Hence, qualitative research, especially for analyzing and validity, depends on insights, and capabilities of the researcher (Pyett, 2003). We begin by reporting the strengths and limitations of our study, followed by discussing the various validation parameters.

6.1 Reliability and Validity

Our study is reliable and valid as it has captured primary data from real-time customers of an ERP vendor. The concept of reliability means “*dependability or consistency*” (Neuman, 2007). It is complementary to validity (Neuman, 2007), however, in some cases, they may mismatch with each other. For instance, as validity increases, reliability becomes more challenging to reach and vice versa. It is the “*easiest to attain when a measure is precise, concrete, and observable*” (Neuman, 2007). In addition, “*Validity means truthfulness*” (Neuman, 2007). In qualitative research, researchers are more interested in achieving authentic data and less concerned with matching an abstract construct to empirical data. A suggestion is to emphasize on the trustworthiness of the method, coherence of results, and transferability and application of results (Lincoln & Guba, 2000).

6.2 Adequacy of data

A robust methodology should reveal “*rigor and internal consistency in the chosen method*” (Sousa, 2014). In contrast to quantitative research, the number of interviewees or respondents cannot guarantee the quality of the data. To obtain adequate data in qualitative research, the purposeful sampling method is preferred. An appropriate sample helps to collect information from the

participants with the best knowledge about the research topic. (Sousa, 2014). Based on this perspective, we chose the sample, which is in the best position to answer the queries related to an extension of the existing system. Since the unit of analysis is not the individuals nor groups but user experience, the sample of participants in this research are selected considering this criterion.

6.3 Trustworthiness of the Method

Trustworthiness is a series of methods which imply that steps taken for a methodology are clear and rigid (Sousa, 2014). The criteria for trustworthiness in post-positivist qualitative research are internal validity, external validity, reliability, and objectivity (Morrow, 2005). Scholars such as Lincoln and Guba (2000) proposed a series of techniques that construct trustworthiness: *credibility, transferability, dependability, and confirmability* (Sousa, 2014). These measures are also called parallel criteria as they are similar to validity and reliability from post-positivist quantitative methods (Morrow, 2005). In this study, we follow post-positivism criteria.

6.4 Credibility

The credibility of the overall results is determined by the quality of the participant's response (Patton, 2014), and it is also defined as "*internal consistency*" (Morrow, 2005). The credibility of qualitative research is related to the credibility of the researcher, which is dependent on training, experience, track record, status, and presentation of self (Patton, 1999). In this study, we applied "*peer researchers*" as credibility technique to increase the research credibility. Two members of this research group held weekly debriefing sessions and once in a month session between the team and the supervising professor during the period of January-August 2020. These meetings provided an external approach to the research process (Morrow, 2005).

6.5 Transferability

The aim of this research is not to provide generalizable knowledge since this research is a case study. All in all, it is the readers' responsibility to note and decide how far they can transfer the

results and conclusions presented in this study. It makes sense to say factors considered by researchers in this study may be seen in other researchers' views.

6.6 Dependability

Dependability or stability of the data over time “ *means how a study is conducted should be consistent across time, researchers, and analysis techniques*” (Gasson, 2004). In other words, the research process should be repeatable as much as possible (Morrow, 2005). As a result of dependability, someone else can follow, audit, and critique the study (Polit & Beck, 2014). We have documented the research design and methodology used in this study (chapter 5) to allow readers outside the research to access and assess our work. We used the audit trail technique. This technique is a chronological detail of research activities and process while collecting data and analyzing data. Our students' advisor examined the audit trail.

6.7 Confirmability

According to Guba and Lincoln (1985), confirmability is established when credibility, transferability, and dependability are addressed.

To sum up, different techniques were used in this study to accomplish credibility, transferability, dependability, and confirmability.

Chapter 7. Conclusion

The purpose of this research was to investigate how to develop and implement M-ERP for the companies while contemplating on the crucial success and failure factors of this solution. This was investigated through a qualitative methodology, considering RamBase as our research case. After an in-depth literature review and research on mobile ERP, thirty critical factors for the successful implementation of mobile ERP application have been identified. Of these, fifteen are directly related to the organization and the users. Factors such as organizational culture, business process of the firm, organizational budget, performance requirements, the accuracy of data, communication, user involvement and training are the essential elements to be considered. Based on these elements, a questionnaire was designed to find a suitable user-friendly solution for the customers of RamBase. These users had years of experience with the RamBase cloud ERP, and hence identified the most useful M-ERP modules and essential features for those modules.

The critical ERP modules for SMEs, which have employees ranging from 10 to 249 and are operating in the manufacturing industry are administration, production, and finance. Previous studies have shown that access to the required modules through the mobile phone enhances the productivity and performance of the organization. The core features of these applications include the real-time query of information regardless of location, traceability of information and approval of workflow. The challenges identified by the users and validated by the literature include security, screen size, platform compatibility, training, and user interface.

Due to significant complexities in each ERP module, it is not feasible to start developing a mobile application for the whole module. A simple application with the key features of the module will have more usability than a complex whole module application. The limited useful features for simple applications can be identified from the insights data available for current ERP practices. Users can also specify the necessary functions as identified in one of the responses from the user working with purchasing.

Mobile ERP is useful for all categories of employees at the management level, but the required information for each user is different. For example, the manager of the production department will need the information about the whole department, whereas the field technician will need information for his task only. As the customized information and functionality requirements

increases, the application becomes complicated and expensive. Also, such requirements reduce the marginal benefit of the investment and increase the risk of loss if the product fails.

Small and medium enterprises have a limited budget for operations. These firms mostly adopt and work with essential operational tools. The respondents believe that M-ERP should be an extended feature to their existing ERP with limited to no extra cost for the firm. While deciding a vendor for ERP solution, the availability of a M-ERP application does not have a significant impact on the decision of the enterprise. However, based on our findings, offering the M-ERP feature will create a competitive advantage over other suppliers. Mobile ERP is a combination of the two most happening innovations around the world – enterprise mobility and ERP. On observing the global trend towards mobility, there is no room for doubt that M-ERP can bring profitability, productivity, efficiency, effectiveness and good customer relationships for businesses (SPEC INDIA, 2018) if the solution is designed according to the market need.

RamBase should identify the functionality of production, administration, and finance M-ERP modules according to the insights available from their customers. The initial applications should be small with specific functionality for a single group of people. This bottom to top approach will save time and money. The applications can quickly be revised and updated according to the user's experience. Once the application is fully functional, and the users are satisfied, the developers can move to a sophisticated version for the upper management. This stepwise approach will help evaluate the prospects for the M-ERP throughout the development period and ensure user satisfaction in the long run.

References

- Al Bar, A., Mohamed, E., Akhtar, M. K., & Abuhashish, F. (2011, August). A preliminary review of implementing Enterprise Mobile Application in ERP environment. *International Journal of Engineering & Technology*, 11(04), 77-82.
- Al-Mashari, M., Al-Mudimigh, A., & Zairi, M. (2003). Enterprise resource planning: A taxonomy of critical factors. *European Journal of Operational Research*, 352-364.
- Bahssas, D. M., AlBar, A. M., & Hoque, R. (2015). Enterprise resource planning (ERP) systems: design, trends and deployment. *The International Technology Management Review*, 5(2), 72-81.
- Basole, R. C. (2004). The value and impact of mobile information and communication technologies. *Proceedings of the IFAC Symposium on Analysis, Modeling & Evaluation of Human-Machine Systems*, 9, pp. 1-7.
- Basole, R. C. (2005). Mobilizing the enterprise: A conceptual model of transformational value and enterprise readiness. *26th ASEM National Conference Proceedings*, (pp. 364-371).
- Basole, R. C. (2008). Enterprise mobility: Researching a new paradigm. *Information Knowledge Systems Management*, 1-7.
- Bech, H. P. (2019). *ERP in the Cloud – From Norway with Love*. Retrieved from <https://tbkconsult.com/erp-in-the-cloud-from-norway-with-love/>
- Botta-Genoulaz, V., Millet, P., & Grabot, B. (2005). A survey on the recent research literature on ERP systems. *Computers in industry*, 56(6), 510-522.
- Căilean, D. A., & Sharifi, K. (2014). *Mobile ERP: A literature review on the concept of Mobile ERP systems*. Jönköping: Jönköping University.
- Clemens, B., Cata, T., & Hackbarth, G. (2012). Mobile device considerations for supply chain and ERP related systems. *Communications of the IBIMA*.
- Creswell, J. W., & Miller, D. L. (2000, Jun 24). Determining validity in qualitative inquiry. *Theory into practice*, 124-130. doi:10.1207/s15430421tip3903_2

- Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of management journal*, 555-590.
- Davenport, T. H., Harris, J. G., & Cantrell, S. (2004). Enterprise systems and ongoing process change. *Business process management journal*.
- Davenport, T., Harris, J. G., & Cantrell, S. (2004). Enterprise systems and ongoing process change. *Business process management journal*.
- Dospinescu, O., Fotache, D., & Munteanu, B. A. (2008). Mobile Enterprise Resource Planning: New Technology Horizons. *Communications of the IBIMA*, 91-97.
- Elmonem, M. A., Nasr, E. S., & Geith, M. H. (2016). Benefits and challenges of cloud ERP systems—A systematic literature review. *Future Computing and Informatics Journal*, 1-9.
- Esteves, J., & Pastor, J. (2001, 08 21). Enterprise resource planning systems research: an annotated bibliography. *Communications of the Association for Information Systems*, 7.
- EPIC Objectives*. Retrieved from <http://epic.agu.edu.tr/objectives/> (2020)
- Gasson, S. (2004). Rigor in grounded theory research: An interpretive perspective on generating theory from qualitative field studies. In *The handbook of information systems research* (pp. 79-102). IGI Global.
- Graber, D., & Holyk, G. (2009). 11 What explains torture coverage during war-time? A search for realistic answers. *Terrorism and Torture*, 221.
- Guba, E. G., & Lincoln, Y. S. (1994). *Competing paradigms in qualitative research*. Handbook of qualitative research.
- Gupta, A. (2000, April 1). Gupta, A. (2000). Enterprise resource planning: the emerging organizational value systems. *Industrial Management & Data Systems.*, 100(3), 114-118. doi: <https://doi.org/10.1108/02635570010286131>
- Haddara, M., & Zach, O. (2011). ERP Systems in SMEs: A Literature Review. *44th Hawaii International Conference on System Sciences* (pp. 0-10). IEEE.

- Hadidi, L., Assaf, S., & Alkhiami, A. (2017). A systematic approach for ERP implementation in the construction industry. *Journal of Civil Engineering and Management*, 594-603.
- (n.d.). *Hatteland; RamBase ERP solution*. Retrieved from https://www.easyfairs.com/events_216/logistics-distribution-2016_80334/logistics-distribution-2016_80335/exhibitors-products_80365/exhibitor-catalogue_80369/stand/586255/
- HerbertNathan & Co. (2015). *ERP cloud solutions in Scandinavia*.
- HerbertNathan & Co. (2015). *ERP cloud solutions in Scandinavia*.
- Hong, K.-K., & Kim, Y.-G. (2002). The critical success factors for ERP implementation: an organizational fit perspective. *Information & management*, 25-40.
- Horbach, J., Rammer, C., & Rennings, K. (2012). Determinants of eco-innovations by type of environmental impact—The role of regulatory push/pull, technology push and market pull. *Ecological economics*, 78, 112-122.
- Hurbean, L., & Fotache, D. (2014). ERP III: The promise of a new generation. *Conference on Informatics in Economy ASE*. Bucarest.
- Irani, Z., & Love, P. E. (2001). Information systems evaluation: past, present and future. *European Journal of Information Systems*, 10(4), 183-188. doi:10.1057/
- Jangwal, M. (2018, June 22). Why Should You Choose Mobile ERP Solutions. Retrieved from <https://erpsolutions.oodles.io/blog/why-choose-mobile-erp-solutions/>
- Judith, G., & Shaw, M. J. (2004). Success factors and impacts of mobile business applications: results from a mobile e-procurement study. *International Journal of Electronic Commerce*, 8(3), 19-41. doi:10.1080/10864415.2004.11044304
- Julious, S. A. (2005). Why do we use pooled variance analysis of variance? *Pharmaceutical Statistics*, 4(1), 3-5.
- Kelly, B. (2017, June 20). The Benefits of a Mobile ERP Platform. Retrieved from <https://www.acumatica.com/blog/the-benefits-of-a-mobile-erp-platform/>

- Klaus, H., Rosemann, M., & Gable, G. G. (2000). What is ERP?. *Information systems frontiers*, 2(2), 141-162.
- Kohansal, M. A. (2019). LESSONS FROM FAILURE ERP IMPLEMENTATIONS. *NOKOBIT conference*, 27. Narvik. Retrieved from <https://ojs.bibsys.no/index.php/Nokobit/article/view/659>
- Krogstie, J., Lyytinen, K., Opdahl, A. L., Pernici, B., Siau, K., & Smolander, K. (2004). Research areas and challenges for mobile information systems. *International Journal of Mobile Communications*, 2(3), 220-234.
- Kumar, K., & Van Hilleberg, J. (2000). ERP experiences and evolution. *Communications of the ACM*, 22-22.
- Laudon, K. C., & Laudon, J. P. (2011). *Essentials of management information systems*. Upper Saddle River: Pearson.
- Legris, P., Ingham, J., & Colletette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & management*, 191-204.
- Lenart, A. (2011). ERP in the Cloud—Benefits and Challenges. *EuroSymposium on systems analysis and design* (pp. 39-50). Berlin: Springer.
- Leung, K., & Antypas, J. (2001). Improving returns on m-commerce investments. *Journal of Business Strategy*, 12-13.
- Lincoln, Y. S., & Guba, E. G. (2000). *The only generalization is: There is no generalization. Case study method*.
- Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., & Ghalsasi, A. (2011). Cloud computing—The business perspective. *Decision support systems*, 51(1), 176-189.
- Mens, T., Guéhéneuc, Y.-G., Fernández-Ramil, J., & D'Hondt, M. (2010). Software Evolution. *IEEE International Conference on Software Maintenance*, (pp. 22-25).

- Menon, G., Kyung, E. J., & Agrawal, N. (2009). Biases in social comparisons: Optimism or pessimism? *Organizational Behavior and Human Decision Processes*, 108(1), 39-52.
- Monk, E., & Wagner, B. (2012). *Concepts in enterprise resource planning*. Cengage Learning.
- Moon, Y. B. (2007). Enterprise Resource Planning (ERP): *Management and Enterprise Development*.
- Morrow, S. L. (2005). Quality and trustworthiness in qualitative research in counseling psychology. *Journal of counseling psychology*, 250.
- Mæland, B., Haddara, M., & Fagerstrom, A. (2014). Perception of SaaS adoption in Norwegian Enterprises: Focus on ERP. *Norsk konferanse for organisasjoners bruk av IT*.
- Navaneethakrishnan, C. M. (2013, September 9). A comparative study of cloud based ERP systems with traditional ERP and analysis of cloud ERP implementation. *International Journal of Engineering and Computer Science*, 2(9), 2866-2869.
- Neuman, L. W. (2007). *Social research methods*. Pearson Education India.
- Olberg, T. (2019). *ERP systems in Norway*. Oslo: Devoteam Fornebu Consulting.
- Olhager, J., & Selldin, E. (2003). Enterprise resource planning survey of Swedish manufacturing firms. *European Journal of Operational Research*, 365-373.
- Omar, K. (2015). Towards improving the usability of mobile ERP. A model for devising adaptive mobile uis to improve the usability of mobile ERP. *INFORMATIK*.
- Omar, K., & Gómez, J. M. (2017). An investigation of the proliferation of mobile ERP apps and their usability. *8th International Conference on Information and Communication Systems (ICICS)* (pp. 352-357). IEEE.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. SAGE Publications.
- Patton, M. Q. (1999). Enhancing the Quality and Credibility of Qualitative Analysis. *Health services research*.
- Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*. Sage.

- Pavin, R. D., & Klein, A. Z. (2015). Organizational consequences of the adoption of mobile ERP systems: Case studies in Brazil. *Journal of Information Systems and Technology Management*, 219-232.
- Polit, D. F., & Beck, C. T. (2014). Essentials of nursing research: Appraising evidence for nursing practice. *Wolters Kluwer/Lippincott/Williams Wilkins Health*.
- Pyett, P. M. (2003). Validation of qualitative research in the “real world”. *Qualitative health research*, 1170-1179.
- RamBase. (2020). *RamBase Partner Proposition*. Retrieved from <https://www.RamBase.com/ways-to-work-with-RamBase/RamBase-partner-proposition/>
- Ridder, H.-G. (2016). *Case study research: Approaches, methods, contribution to theory* (Vol. 12). Hannover: Rainer Hampp Verlag.
- Rocha, B. P., Costa, D. N., Moreira, R. A., Rezende, C. G., Loureiro, A. A., & Boukerche, A. (2010). Adaptive security protocol selection for mobile computing. *Journal of Network and Computer Applications*, 33(5), 569-587.
- Ruivo, P., Oliveira, T., Johansson, B., & Neto, M. (2013). Differential effects on ERP post-adoption stages across Scandinavian and Iberian SMEs. *Journal of Global Information Management (JGIM)*, 1-20.
- Saedberg, A., & Haddara, M. (2016). AN EXPLORATION OF ADOPTION FACTORS FOR CLOUD ERP. *NOKOBIT*, 24. Bergen.
- Saini, D. K., Yousif, J. H., Saini, S. L., & Khandage, S. V. (2011). Cloud computing and enterprise resource planning systems. *Proceedings of the world Congress on Engineering*, 1, pp. 681-684. London.
- Sharot, T. (2011). The optimism bias. *Current biology*, 21(23), R941-R945.
- Smedsrud, M. T. (2015). *Benefits realization in Norwegian ERP-projects*. Stavanger: Master's thesis, University of Stavanger, Norway.

- Sousa, D. (2014, Mar 6). Validation in qualitative research: General aspects and specificities of the descriptive phenomenological method. *Qualitative Research in Psychology, 11*, 211-227. doi:10.1080/14780887.2013.853855
- SPEC INDIA. (2018, January 25). Why Is Mobile ERP Solutions An Indispensable Ingredient In the World Of Modern Business? Retrieved from <https://www.spec-india.com/blog/mobile-erp-solutions-indispensable-ingredient-world-modern-business>
- Suherman, A. G., & Simatupang, T. M. (2017). The network business model of cloud computing for. *International Journal of Value Chain Management, 22-39*.
- Sørensen, C. (2014). Enterprise Mobility.
- Sørensen, C., Al-Taitoona, A., Gibsone, D., & Kietzmann, J. (2008). Exploring enterprise mobility: Lessons from the field. *Information Knowledge Systems Management, 243-271*.
- Sørensen, H., Cedergreen, N., Christensen, A. M., Kamper, A., Kudsk, P., Mathiassen, S. K., & Streibig, J. C. (2008). A review of independent action compared to concentration addition as reference models for mixtures of compounds with different molecular target sites. *Environmental Toxicology and Chemistry: An International Journal, 1621-1632*.
- Thorne, S. (2000). Data analysis in qualitative research. *Evidence-based nursing, 68-70*.
- Tsang, E. W. (2013). Case study methodology: Causal explanation, contextualization, and theorizing. *Journal of international management, 195-202*.
- W. Lawrence, N. (2014). *Social Research Methods: Qualitative and Quantitative Approaches*. London: Pearson Education Limited.
- Yin, R. K. (2017). *Case study research and applications: Design and methods*. Sage publications.
- Zhang, Z., Lee, M. K., Huang, P., Zhang, L., & Huang, X. (2005). A framework of ERP systems implementation success in China: An empirical study. *International Journal of Production Economics, 56-80*.

Appendix I: Questionnaire and Email

M-ERP Questionnaire

This questionnaire is designed to measure the utility and future trends of a Mobile ERP system. The identity of all respondents will be kept confidential. The average response time is 6 minutes. Your response is highly appreciated.

Company Name: (Will be kept confidential) *

Short answer text
.....

What is the size of the enterprise? *

- Micro (<10 employees)
- Small (10-49 employees)
- Medium (50-249 employees)
- Large (250 or more)

What is the category of the enterprise? *

- Services
- Manufacturing
- Financial and Public Service
- Other...



Which of the following ERP features, you are using right now? Mark multiple features. *

- Sales
- Purchasing
- Production
- Document Management
- Invoicing
- Accounting
- Rental
- Service
- Customer Resource Management
- Quality Assurance
- Other...

Currently, which of the following ERP features you can access with a mobile app? Mark none or multiple features. *

- Sales
- Purchasing
- Production
- Document Management
- Invoicing
- Accounting
- Rental
- Service
- Customer Resource Management
- Quality Assurance
- None
- Other...

How much utility does each of the following ERP modules will add to the firm if it can be accessed through a mobile device?

Not at all = 1; Slightly= 2; Somewhat= 3; Moderately =4; and Extremely= 5.

Sales *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Procurement *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Logistics *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Production *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Service *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Human Resources *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Quality Management *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Administration *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Customer resource management *



	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Finance *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

On the scale of 1 to 5, How much value the following features will add to your enterprise?

Not at all = 1; Slightly= 2; Somewhat= 3; Moderately =4; and Extremely= 5.

Expanded real-time data of all business activities *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Record and save data instantaneously *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Increased surveillance and control *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Real-time visibility and traceability of information *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Reviewing and approving workflow at any time and anywhere *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

A real-time query of information regardless of the location *

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely

Respond to the following queries to the best of your knowledge.

Description (optional)

Which level of management/employees can benefit maximum from mobile access to the company's resources(ERP) and in what way? *

Long answer text

What is the importance of cost(expenses) while adopting a mobile ERP add-in feature? *

Long answer text

Does/Did the availability of a mobile ERP feature(app) play a role in deciding an ERP vendor? If so, to what extent? *

Long answer text

Please, indicate any further comments that could assist in achieving a better understanding of the user's expectations/requirements about mobile ERP.

Long answer text

Copy of Email

Dear _____,

We are two MBA students currently writing our master thesis titled " Mobile Enterprise Resource Planning Adoption and Implementation in Norwegian Organizations □ A Case Study of RamBase" with Erasmus+ partnership under the supervision of University of Stavanger and RamBase Cloud ERP.

We need your professional opinion and assessment regarding Rambase ERP software. On average, the questionnaire takes 6 minutes to respond and can be accessed through the following link. Please also forward it to your colleagues to maximize the significance of the results.

<https://forms.gle/x64PWSRueT3aHQXC77809t>

Your response is highly appreciated and will help us to structure our thesis. Thank you so much in advance.

External supervisor: Thorvald Gundersen

Professional Service Manager

Rambase

M: +4747909810

E: thorvald.gundersen@hatteland.com

Note: All the collected data will be kept confidential and can only be shared with permission of respondents.

Regards

Junaid Touqeer & Reyhane Keyvanzad

Appendix II: EPIC project participation



Erasmus+



Diploma



We hereby certify that the student

Juanid Tougeer



has successfully participated in the EPIC project on

Rambase



On behalf of the EPIC partners,

Jens Myrup Pedersen

Jens Myrup Pedersen

Project coordinator - Aalborg University





Erasmus+



Diploma

We hereby certify that the student

Reyhane Keyvanzad

has successfully participated in the EPIC project on

Rambase

On behalf of the EPIC partners,

Jens Myrup Pedersen
Jens Myrup Pedersen

Project coordinator - Aalborg University



About EPIC

EPIC (Improving employability through internationalization and collaboration) is an Erasmus+ Strategic Partnership, focusing on increasing employability through internationalization and collaboration between industry and academia. It is funded by the Erasmus+ Program of the European Union, key action Strategic Partnerships.

EPIC is organized between 8 universities and 2 companies, and offers students the possibility to carry out project work in collaboration between students from different universities based in different countries. It combines virtual collaboration with one or two seminars of physical mobility, where the students meet and work together.

In the projects, the students are working together in order to solve real-world problems, in most cases in collaboration with companies.

The projects are carried out during the spring semester, and the students receive both offline and online training in topics such as team work and group dynamics, project planning and management, entrepreneurship and innovation, virtual collaboration, communication, and presentation techniques.

More information about EPIC can be found on the webpage epic.agu.edu.tr.



Erasmus+

Certificate of attendance

It is hereby confirmed that the following person has attended an activity within the framework of our project

EPIC: Improving Employability through Internationalisation and Collaboration (KA203-2017-011).

Name of the participant	Juanid Touqeer
Date of birth dd-mm-yyyy	16-01-1997
Purpose of the activity	Project Planning Seminar 2020
Place	Hamburg
Start and end date	10-02-2020 to 14-02-2020
Travel dates, if any	09-02-2020 and 15-02-2020

Date: 22-03-2020

Jens Myrup Pedersen, Aalborg University, Project Coordinator

Koojana Kuladinithi, Hamburg University of Technology, Local Coordinator



Erasmus+

Certificate of attendance

It is hereby confirmed that the following person has attended an activity within the framework of our project

EPIC: Improving Employability through Internationalisation and Collaboration (KA203-2017-011).

Name of the participant	Reyhane Keyvanzad
Date of birth dd-mm-yyyy	27-10-1991
Purpose of the activity	Project Planning Seminar 2020
Place	Hamburg
Start and end date	10-02-2020 to 14-02-2020
Travel dates, if any	09-02-2020 and 15-02-2020

Date: 22-03-2020

Jens Myrup Pedersen, Aalborg University, Project Coordinator

Koojana Kuladinithi, Hamburg University of Technology, Local Coordinator