Internal mobile applications
Information integration with ERP systems

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Abstract

The evolvement of technology within the business world has transformed both organizations and people involved. As the business world is rapidly changing it requires organizations to adapt to new trends to be able to compete and to gain competitive advantage. The widely developed and used mobile business-to-customer applications have generated the realization that the technology can be used by organizations for their mobile employees to gain competitive advantage. Therefore, we have investigated the functionality of information integration between mobile applications and ERP systems for mobile employees, and the benefits and challenges it has.

The research is an exploratory investigation about how the new trend within mobility is to be seen within the business world. With the use of an inductive and qualitative research approach, we started with no previous theories to get an understanding of the subject.

In the use of mobile business-to-employee applications, the most important information integration is the one between ERP systems and mobile applications since it is the organizational information that is needed for the mobile workers. The result of the research is that it is more common with a single, one-way integration in terms of either input or output between ERP systems and mobile applications. The more advanced two-way integration exists and is increasing in the area of internal use of mobile applications for organizations. Additionally, there are a lot of benefits to gain from when working with mobile applications for organizations, for example to increase the productivity of mobile employees. There are also challenges that need to be discussed before deciding to invest in enterprise mobility, for example security aspects.
# Table of Contents

1 **Introduction** .............................................................................................................. 1
   1.1 Problem ................................................................................................................. 4
   1.2 Purpose .................................................................................................................. 4
   1.3 Definitions .............................................................................................................. 4
   1.4 Time plan .............................................................................................................. 5
   1.5 Disposition ........................................................................................................... 5

2 **Frame of reference** .................................................................................................... 6
   2.1 Information integration ........................................................................................... 6
       2.1.1 Functionality of information integration ......................................................... 7
       2.1.2 Information integration and Enterprise Resource Planning systems .......... 7
   2.2 Enterprise mobility ................................................................................................. 8
       2.2.1 How stationary systems can be mobile ......................................................... 9
       2.2.2 Mobile distributed work ................................................................................ 9
       2.2.3 Mobile application as a support tool ............................................................. 10
       2.2.4 Mobile work process .................................................................................... 10
       2.2.5 Mobility strategy ........................................................................................... 11
       2.2.6 Challenges of using mobile applications ....................................................... 13

3 **Research design** ....................................................................................................... 16
   3.1 Research philosophy ............................................................................................. 16
   3.2 Research approach ................................................................................................. 17
   3.3 Research strategy .................................................................................................. 17
       3.3.1 Company description .................................................................................... 17
   3.4 Research method ................................................................................................... 18
       3.4.1 Data collection ............................................................................................... 18
           3.4.1.1 Literature review ..................................................................................... 18
           3.4.1.2 Interviews ............................................................................................... 19
   3.5 Time aspect ............................................................................................................ 21
   3.6 Analysis method ..................................................................................................... 21
   3.7 Research credibility ................................................................................................. 21

4 **Results and analysis** ................................................................................................. 23
   4.1 Analysis .................................................................................................................. 34
       4.1.1 Information integration .................................................................................. 34
       4.1.2 Benefits and challenges of internal mobile applications ............................ 36

5 **Conclusion** ................................................................................................................ 39

6 **Discussion** ................................................................................................................ 41
   6.1 Contribution ........................................................................................................... 41
   6.2 Further research ..................................................................................................... 42

**List of references** ......................................................................................................... 43
Figures
Figure 1.1 Variety of mobile working styles (Cisco, 2007)................................. 2
Figure 2.1 Integrated systems - ERP (Motiwalla & Thompson, 2012)........... 8
Figure 2.2 Accessing the corporate resources (Barnes, 2004) ....................... 9
Figure 2.3 General mobile work process (Gruhn & Köhler, 2007)............. 11
Figure 2.4 Mobile Impact on Productivity: 2010 vs. 2011 (Ahmad, 2011) ... 11
Figure 2.5 The mobility matrix (Ahmad, 2011) ............................................. 12
Figure 2.6 Barriers to increased use of mobile applications (Rysavy, 2011) 15

Tables
Table 3.1 Interviews ......................................................................................... 20
Table 4.1 Interview responses ........................................................................... 23

Appendix
Appendix 1: Gantt chart .................................................................................... 47
Appendix 2: Swedish interview questions ......................................................... 48
Appendix 2: English interview questions ......................................................... 49
1 Introduction

The introduction part will present the background of the topic which will be the groundwork for the focus of the report presented as a problem statement and research question.

Informatics is a terminology that has been used widely across countries, and contains the study of information, information technology (IT) and information system (IS) (Beynon-Davis, 2002). Informatics have grown fast and evolved rapidly (Andersson & Eliason, 2000), and both IS and IT are tools for communication and gathering of information, to afterwards allocate and make use of the information. IS is associated with the communication between people and IT to enable it through technical components, such as hardware, software, data and communication tools (Beynon-Davis, 2002).

There has been an increasing trend towards mobile communications in the last decades which makes it possible for people to be more portable than ever (Barnes, 2004; Wiberg & Ljungberg, 2001). The number of mobile devices has now surpassed personal computers in sales which mean that there are more mobile persons and mobile devices in the world than ever before (IBM, 2011a). This trend leads to fundamental changes in people’s social lives where they demand accurate information at their fingertips (IBM, 2011b). People have gotten used to this way of communicating and finding information that they now have a need for it in their working environment as well (IBM, 2011c). Because of this change in people’s social life, they now expect more mobility in their working environment and thereby the mobile work has increased (Malmquist, 2012; Andersson & Eliason, 2000; Sørensen, 2011).

Based on Hawking, Foster and Stein (2004), we have accumulated three different types of mobile applications:

- **Business-to-customer**: used to provide service to a company’s customers mostly used in sales and information purposes.
- **Business-to-business**: used to serve other businesses or partners, for example with ordering or to get information.
- **Business-to-employee**: used to connect mobile workers to the company’s information.

The one that will be considered in this research is business-to-employee applications.

With the mobility trend, people are more independent of place which leads to new ways of working in organizations (Wiber & Ljungberg, 2001). New organizational structures have emerged from this trend, including virtual organizations. From National Science Foundation’s website (2011), virtual organizations are defined as “a group of individuals whose members and resources may be dispersed geographically, but who function as a coherent unit through the use of cyber infrastructure”. Another aspect of virtual organization is the mobile business which is defined by Paavilainen (2001, p. 1) as “the exchange of goods, services and information using mobile technology”. This means that organizations no longer have to be constrained by time and place (ISACA, 2001). Virtual organizations support the mobile changes and the potentials toward higher levels of innovation and creativity (ISACA, 2001). A part of the virtual organizations is the mobile worker which refers to an employee that works out of office in various ways. Mobile worker can be defines as “those who work at least 10 hours per week away from home and from their main place of work” (Cisco, 2007, p. 6).
According to Cisco (2007) there are different categories of mobile workers, which are shown in figure 1.1:

1. On-site movers: work at one location but move around within that location.
2. Yo-yos: occasionally work away from a fixed location.
3. Pendulums: work at two different locations.
4. Nomads: work in a number of different locations and move around them.
5. Carriers: work while they move.

The different mobile workers illustrated in figure 1.1 shows how the mobile workers are divided according to their location at the office, home or other locations beyond the home and office. ‘On-site movers’ are closer to the employer’s premises since they are situated in one physical location and only move around in that location. ‘Carriers’ are the most mobile workers because they work neither home or at an office, but instead they work constantly on the move. When we refer to mobile workers, we will relate to all categories of mobile workers, from on-site movers to carriers.

![Diagram of mobile working styles](image-url)
Cisco (2007, p. 8) states that “mobility within the global workforce is booming” and within two years there will be 878 million mobile workers worldwide. The estimated amount of connected devices is 50 million by 2020 (Malmquist, 2012). 84% of today’s decision makers believe that the need for mobility has increased in the last year in their organizations (Telework exchange, 2009). The literature review shows that mobile workers and mobility continue to increase in importance for organizations today and that it is an upcoming trend (Severinsson & Wilhelmsson, 2011; Ventana research, 2011; Barnes, 2004; Ahmad, 2011).

The mobility trend can be explained by five main drivers (Cisco, 2007):

1. People like to communicate on the go.
2. Mobility increases productivity and competitiveness.
3. Devices, technology and services have been developed.
4. Mobile technology supports personal communication.
5. Digital information and content are increasingly pervasive.

These drivers reflect the situations in which organizations operate in today’s business world and the way people and employees are communicating with their surroundings. It shows the way the business world is changing and it stresses the importance of being able to deliver information to employees all the time, independent of where they are located.

According to Telework Exchange (2009), there are a lot of benefits for companies to gain from when dealing with mobile workers:

1. Reduced travel expenses.
2. The ability to accomplish work where ever needed.
3. The ability to hire and retain key employees without having to relocate them.
4. The ability to work with global teams.
5. Faster response.

The drivers combined with these five benefits express the importance of why organizations should become mobile. The benefits show that there is a lot of value to gain from being mobile. The benefits are not only limited to financial profits but also the benefit of being more flexible and faster to customers’ needs. Another aspect is the one of being able to obtain employees with the right skills and knowledge which is an important focus of today’s organizations. These are important benefits for any organization in today’s marketplace because it can bring valuable competitive advantage.

In order for companies in fast changing markets to act quickly to trends, they need IT-solutions for their processes (Severinsson & Wilhelmsson, 2011). Mobile technologies have the potential to transform processes within a company that were not possible before. It can help to support the structure of work and make work processes automatic. Wireless network and mobile devices can help to integrate mobile employees into the corporate infrastructure (Barnes, 2004). Barnes (2004, p. 2) states that, “mobile devices and data connection can provide important links to company networks and systems that are keys to the effective performance of work”. A mission that companies can strive for with mobile technologies is that everything that you can do with a computer you should also be able to do with a mobile phone independent of time and place (24solutions, 2012).
1.1 Problem

With the trend in mobile communication and the constantly growing numbers of mobile workers and mobile devices, there is a rising opportunity recognized that companies can take advantage of (Cisco, 2007; WorldAtWork, 2011; Telework Exchange, 2009). Companies need to consider how they can use mobile system internally to connect employees to their Enterprise Resource Planning (ERP) systems to improve business-to-employee relationships when employees are out-of-office. There has been an increasing amount of research regarding the use of mobile communication concerning the business-to-business and business-to-customer aspect (Sørensen, 2011; Hawking et al., 2004). However, the research field of mobile business-to-employees applications is not well studied and the maturity level of research is low (Hawking et al., 2004).

The benefits of mobility with the focus on business-to-employee have not been acknowledged in a broad context and companies need to be enlightened about this opportunity (Hawking et al., 2004). To our best knowledge, there has not been any previous research conducted regarding the information integration functionality between mobile applications and ERP systems for mobile employees.

1.2 Purpose

The aim with this research is to investigate the functionality of information integration between mobile applications and enterprise resource planning (ERP) systems within organizations for their mobile employees. The research also highlights the benefits and challenges the functionality of information integration can create for mobile employees. This leads us to the following research questions:

RQ1: How is the functionality of information integration between mobile applications and Enterprise Resource Planning systems used within organizations by their mobile employees?

RQ2: What are the potential benefits and challenges of the internal use of mobile applications perceived by mobile employees?

1.3 Definitions

In order for the reader to get an understanding of the concepts, we have clarified the definitions of the concepts used in the research.

**Mobile employees** are people who are employed by an organization and are conducting their work when they are outside their offices for example at home, in the field, at customer meeting or during travelling and so forth (Cisco, 2007).

**Mobile application** will be referred to the use of software tools in the form of a mobile application that are used on mobile devices (IT Business Edge, 2012).

**Mobility industry** will be referred to the companies that consist of employees that make use of, or planning to make use of mobile applications when performing work outside office.
**Enterprise Resource Planning (ERP)** system is referred to organizations’ use of internal software application package that helps organizations to achieve information integration and relate information to their business operations. ERP systems give automated support for organizational functionalities (Kumar & Hillegersberg, 2000).

**Information integration** is a term used when information systems (IS) are integrated to seamlessly share information among other systems (Motiwalla & Thompson, 2012). We view the functionality from the user’s perspective associated with their work duties, as well as how they can manipulate data through the mobile application. The focus in our research is on the information integration functionality in terms of input and output of information between mobile applications and ERP systems.

### 1.4 Time plan

The time plan viewed in appendix 1 was planned and structured in the initial phase of the research. This plan helped us to keep track of our writing and see if we were on track or not. The starting date was the 1st of December 2011 and the research elapsed until the 7th of June 2012. During that time we worked with some tasks that only had one duration day, for example the interviews, but some tasks were bigger and required more time to be accomplished, for example the literature review and transcribing. We agreed to use time gaps wisely and not waste any time because we knew that we needed it in the end.

### 1.5 Disposition

In this section we present the structure and content of the research, as well as a short description of every chapter. The research is structured in the following order:

**Chapter 1, Introduction:** the introduction part will present the background of the research topic. The focus of the research is presented as a problem statement and research questions.

**Chapter 2, Frame of reference:** the frame of reference part will present what the literature have said about the research subject and how these will position themselves within the subject matter.

**Chapter 3, Method:** this section is a description of how the research study is executed and we present the different methods used to conduct our research about the subject.

**Chapter 4, Analysis:** in this part we will present the results from the gathered data and analyze the findings.

**Chapter 5, Conclusion:** this is where we state specific key points and summarize the results from the analysis in terms of the answers of the research questions.

**Chapter 6, Discussion:** in this part we discuss lessons learned and limitations of the research, as well as discussing future research and implications.
2 Frame of reference

In this section we present previous research and facts about what has been said about the subject.

2.1 Information integration

Information is data interpreted into a meaningful context. Information is available in different forms such as texts, pictures, numbers and sounds. Organizations are made up of data and collects and interpret information every day in various ways (Beynon-Davies, 2002).

Motiwalla and Thompson (2012) argue that today’s fast changing business environment has evolved in competitive markets where businesses are global, dynamic and cross-functional. Companies need to be agile and flexible within their market and business operations to be able to follow the business world’s development. Information systems have been useful in supporting both business operations and employees efficiently. Since the markets are fast changing, organizations will require the same from their information systems. This results in the need for integrated data, applications and resources across the organizations, between both tangible and intangible resources. To be able to compete efficiently, organizations demands cross-functional information integration among functional business departments to have efficient collaboration within the organization. Many organizations have used several separated systems that serves the needs for a single department, also called silos, which are functional units isolated from other functional units within the same organization. Sometimes, the departments are forced to remove some system functionality to gain the overall benefits of having one system that integrates the information across them all (Motiwalla & Thompson, 2012). IBM (2004) argues that technologies combining database management systems, web services, replication, federated systems and warehousing functions into a common platform, including programming interfaces and data models, are a collection of components that is called information integration. The information integration technology provides access to different types of data that can be transferred into the format that support simplified access to the organizational information (IBM, 2004). The main idea behind the information integration is that data should be added once and then reused across the whole organization (Motiwalla & Thompson, 2012). IBM (2004) have identified five different types of integration, they can all be used together or separately. However, the information integration is considered to be the core of the varied integration types. The five different types are;

1. User interaction: users work at a customized interface that is virtually available at any device, these results is then integrated into numerous business systems.
2. Process integration: companies can change its business operations by observations, modeling and automation of people and different systems, both internally and externally.
3. Application connectivity: applications can be connected so that they can share and information for improved use at enterprise level.
4. Build to integrate: users can build and install integration-ready applications, so it is possible to integrate new solutions with existing business resources.
5. Information integration: different forms of organizational information can be shared across the organization. Integration allows consistent search, transfor-
Many of today’s integration types need a mixture of both applications and information integration, and it is important to make the right combination that contribute to every individual business needs (IBM, 2004).

2.1.1 Functionality of information integration

Information systems are mainly concerned with information, where the system exchanges information with its environment in terms of input and output (Curtis & Cobham, 2008; Beynon-Davies, 2009). Input refers to the information it gains from its environment. Output from a system is information that is supplied back to its environment (Beynon-Davies, 2009). The input and output functionality can either transmit information simultaneously or separately. When information is transmitted simultaneously it is called full-duplex and means that input and output information can be transmitted at the same time. If input and output is transmitted separately it is called simplex integration as the information can only be transmitted in one direction, either output or input (Dye, McDonald & Rufi, 2008; Curtis & Cobham, 2008).

2.1.2 Information integration and Enterprise Resource Planning systems

Motiwalla and Thompson (2012) mention that Enterprise Resource Planning (ERP) systems are vital information systems in today’s organizations and are extensive software applications that are functioning as support for important business operations. The main aim with ERP systems is to make information flow dynamically and immediately to increase the usefulness and value of the information (Motiwalla & Thompson, 2012). ERP systems are a software package that can be customized to best fit the intended customer’s business operations, and organizations can possess a great advantage by using ERP systems correctly (Peppard & Ward, 2002). Within ERP systems data are updated in real-time and flows freely among the computer applications. These applications’ aims are to provide support and links between customers and suppliers and organizational business operations. In figure 2.1, the applications within an ERP system are shown. The ERP system is integrated with Graphical User Interface (GUI) tools to further on work together with the internet to be able to interact with clients, employees, vendors and users. As the arrows shows there are linkages between all components within the business operations performance, stating that there are interaction among all of them and that they are no standalone units. It is shown that the ERP systems contribute and support a business’s operational performance with many varied factors and thereby to its success. Along with additional computer applications, security services are normally implemented by organizations to distribute access and control of the ERP system (Motiwalla & Thompson, 2012). When companies are about to select the applications for implementation, there are several considerations needed to take into account, although, there are some applications that are argued to be necessary for all kinds of companies e.g. ERP, Automatic Teller Machine (ATM) etc. Even though ERP packages are installed for an organization’s core business it can be necessary to implement some further functional applications to achieve company success (Peppard & Ward, 2002).
2.2 Enterprise mobility

The definition from Allwords’s website (2012) is suitable in this context where it is stated that “in mobile computing, mobility refers to characteristics of device to handle information access, communication and business transactions while in state of motion”. Influenced by the definition by Allwords (2012), we refer mobility as the state of being mobile and the ability to work independent of time and location.

Sørensen (2011, p. 1) defines enterprise mobility as “the application of diverse mobile information technologies in the context of work”. Next year, the estimation of mobile workers are 1.1 billion which represents 35 percentage of the total workforce. The key priority for decision makers is to provide mobile access of the enterprise systems.

Sørensen (2011) emphasizes capabilities that enterprise mobility might bring to companies. One of the capabilities is connectivity which means that mobile organizational structures and easily available low-priced devices provide organizations with connectivity. Connectivity is an important part of today’s organizations which constitutes of activities and resources that are simultaneously interconnected and frequently distributed. Mobile phones and other technologies have improved the ways organizations are connected to an extent not previously realized. Another capability of enterprise mobility is the subject of portability. Portability has led us to the easily transported laptops and mobile phones. Making these devices portable, interconnected and embedded is an important technological achievement and subsequently offers a vital change in the way enterprises can be mobile (Sørensen, 2011).
2.2.1 How stationary systems can be mobile

Andersson and Eliason (2000) have investigated how stationary systems can be transformed to mobile systems as a result of the society’s fast changing environment where people are becoming more and more mobile, both professionally and personally. The authors’ aim is to explore the aspects necessary to consider during development of mobile Information Technology (IT). Their empirical findings are further used for the development of a prototype of a mobile application. The focus of their report is on how web-based applications can frame a mobile application that fulfills the requirements that the users have, and how the mobile system development process differs from the stationary development process (Andersson & Eliason, 2000).

2.2.2 Mobile distributed work

Barnes (2004) states how the business world has changed from an office-environment to a more flexible business world that increasingly relies on the internet and the evolution of networking and mobility. Organizations have the ability to transform business operations both internally and externally. Barnes (2004) relates his concepts and framework into varied case studies where he explores them in the sense of wireless company support and in a business-to-employee situation. The framework provides understanding of how mobile work could be distributed within companies, and how the development within the area has evolved. Through figure 2.2 it is shown that the mobile devices, in this case a smart phone, provides access to the corporate resources and makes the employees not dependent to a physical location during work. The components within the corporate resource area are enterprise resource planning systems (ERP), customer relationship management (CRM), supply chain management (SCM), and Web and Groupware. These are all different types of software that support varied parts of the business’s operational performance. The resources at hand vary between businesses, but those mentioned within the picture are those commonly used and referred to as organizational software resources within today’s business world.

Figure 2.2 Accessing the corporate resources (Barnes, 2004)
2.2.3 Mobile application as a support tool

Schilit, Thimer and Welch (1993) argue that mobile systems differ towards original non-mobile systems in the way that they are dynamic, flexible and easy to customize according to users’ needs. The authors mean that the ability to adapt gives opportunities to business since it enable applications to become suitable to every user situation (Schilit et.al., 1993). Today’s information systems consist of supporting software applications that are needed for business operations (Motiwalla & Thompson, 2012). Because of society’s transformation towards the use of both stationary and mobile systems, it is necessary to have systems that are independent of their environment and flexible, to be able to use mobile applications (Schilit et.al., 1993).

Severinsson and Wilhelmsson (2011) have developed a theory of how mobile applications can be used to support and develop internal business processes. During their study, the authors found that there is a shift within the trend of mobile applications, from external offerings to customers to internal use by employees. The authors have conducted a case study with a company called MobileMart. They found that the company’s interest and use of mobile applications by employees have increased over the last years. Their focus with the case study is on how mobile applications can strengthen organizational operations when employees are out-of-office (Severinsson & Wilhelmsson, 2011).

2.2.4 Mobile work process

Gruhn and Köhler (2007) have studied the research field of mobile workers and developed a generic process model for the majority of mobile workers. The general mobile work process model viewed in figure 2.3 demonstrates the influencing factors and their relationships for mobile work processes. This model is industry independent which means that it can be applied to all industries (Gruhn & Köhler, 2007). The study assumes that there is a company that requires the execution of defined mobile task, a group of mobile workers, a headquarter that manages mobile workers and tasks, and that a task-centered work process is in place.

The general mobile work process displayed in figure 2.3 is a set of sequential steps that mobile workers go through in their work. The company creates a task that is sent to the headquarter that coordinates the mobile workers. The headquarter then send the task to the appropriate mobile worker. The mobile worker receives the task, moves to the right location, executes the task and reports the result to the headquarter. The headquarter then receives the report and passes it forward to the company where proceeding processes can be started.
2.2.5 Mobility strategy

According to Ahmad (2011), the attention of making enterprise applications mobile is rising, and nowadays companies spend more money in this area, with the mission to realize the benefits of increased productivity.

Figure 2.4 illustrates the increasing importance that mobile technologies will have in businesses in the next two years. Smartphones and tablets are contributing a lot when it comes to companies’ productivity while laptops are decreasing in importance. As the figure shows, there is a big difference between 2010 and 2011, which indicates that this critical role is rapidly changing in companies today.
In his report about devising a mobility strategy, Ahmad (2011) developed a methodology that will help companies get value from enterprise mobility. The methodology involves three phases;

1. Firstly, the company needs to create a mobility road map where they position their mobility profile. This outlines what the company needs to enhance their mobile work force and also their capacity to enable mobility within the business processes.

2. The second step is to develop a strategic enterprise mobility framework which means that the company must ensure that architecture alignment, integrated systems, business process integration and continuous integration are working to support the mobility strategy.

3. Lastly, the company needs to do an in-depth self-assessment to fully understand what is needed when deploying enterprise mobility. An important challenge to address is the competencies that are needed.

Ahmad (2011, p. 6) means that by following this methodology, it will help CIOs to implement “an enterprise mobility strategy that delivers improved productivity, reduced capital and operating expenditures, and increase strategic agility to maintain a competitive advantage”. In order for companies to fully understand where they stand when it comes to mobility, the author has developed a model called “the mobility matrix” (see figure 2.5). This model will function as a starting point for companies to initiate a discussion about mobility. The horizontal axis of the matrix represents the degree to which an organization needs to support mobile users. On the vertical axis, the model illustrates the capacity for process enablement, or process re-engineering, that business mobility could enable. According to Ahmad (2011), process re-engineering is one place where enterprise mobility can make a big difference. It gives companies the opportunity to sharpening a competitive edge. To start the discussion about mobility in a company, Ahmad (2011) has outlined a number of questions that can help organizations locate themselves in the mobility matrix. This is important in order to be able to determine the requirements to enable business processes to be mobile and to support a mobile workforce. Examples of questions are “how dependent is the organization’s fulfillment on mobile access to applications and data?” and “what proportion of your workforce is mobile?”. The companies’ answers can be in a low or high scale and according to the answers they can position themselves in the mobility matrix (see figure 2.5) (Ahmad, 2011).

![Figure 2.5 The mobility matrix (Ahmad, 2011)](image-url)
Once the company knows their mobility profile in the mobility matrix and truly understands their current situation, the next step is to recognize an enterprise mobility framework that will help the company address the requirements and challenges. When an organization develops the framework, there are certain areas that should be addressed (Ahmad, 2011):

- The company should first take a user-centric view of enterprise mobility which means that the company must understand user requirements, and their roles and expectations.
- The next area concerns the devices and particularly smartphones and tablets. The company must address how device variety should be supported, if employees are allowed to access the company’s network with personal devices or if the company should offer phones and tablets.
- Another area to take into consideration is the one about network and how that should be managed.
- The company must also determine a security strategy that includes policies, technology and people. What security policies and mechanisms need to be in place?
- Another key area is operational excellence which addresses how IT will support the employees in terms of governance, mobility services, change management, operations management and facilitation adoption?
- Finally, the company needs to discuss what applications to mobilize. IT costs and risks for discussed applications should be weighted with regard to the value it can bring to the company.

Generally, the discussion of the enterprise mobility framework is outlined within two main strategic areas; architectural alignment and integration between the systems. Last, but not least, Ahmad (2011, p. 13) points that “a drive to marry mobility with business process integration and continuous innovation”. According to the author, enterprise mobility will improve productivity, saving costs and increase strategic agility and this type of initiative is what companies need in today’s competing marketplace. Companies should strive for being always on, always connected and to continuously make resources, people and information available (Ahmad, 2011).

2.2.6 Challenges of using mobile applications

There are some challenges that companies must take into consideration when discussing mobility. Sørensen (2011) is discussing the challenges in a historical point of view where he argues that things are not what they used to be:

- Societies are not what they used to be. From agriculture to manufacturing to service society has led us to the global society which we are currently living in. The globalization has led to market demands and technological development as the most important concern.
- Organizations are not what they used to be. Companies in the last centuries have been characterized by paradoxes and competing requirements. Nowadays, companies are dealing with the paradoxes by combining planned interventions and emerging decisions.
Work is not what it used to be. Organizational pressures and opportunities have changed the way people conduct their work. Employees are no longer working from 9 to 5 at the same employer for their whole life, but instead employees work in complex arrangements with different employers and changing projects, co-workers and places. Today, companies demand advanced management of information and ways to communicate and most of the employees rely on information technology.

Technology is not what it is used to be. Starting with the mainframe which helped companies with administrative processes to personal computers which improved companies’ productivity and to today’s enterprise mobility which relies on a technological revolution based on minimizing the devices and keeping them online in personal, local and global networks all the time. This type of technology challenges the assumptions of how work is arranged and understood. These new evolving ways of conducting work is challenging for companies and it takes a lot of effort to keep up with the trends.

Ventana research (2011) has investigated the challenges of mobile business intelligence, and how this has emerged according to the mobile economy that we live in today. They argue that today’s society expects things to be working mobile and that there are many employees who personally buy mobile device to simplify their work. Even though, companies do realize the increased need for use of mobile devices to retain their market position, and it is necessary to follow this trend to be able to continue with successful business operations (Ventana research, 2011). Employees are increasingly using mobile devices to reach out to sources that they previously accessed through a more inconvenient desktop-based tool. This new way of working is rapidly changing the nature of work and employees want their work capabilities to be similar to their personal experience. This puts a lot of demands on the traditional ways of working for the IT departments. IT departments will have to discuss how to support the new generation of users and the new platform it will generate, but at the same time continuing to manage the existing systems. This means that they will need to integrate a wider range of data types in larger amounts and provide greater bandwidth to employees who have high expectations on the access and response time of information. Organizations will need security policies that protect the organizational data, because with mobility the data can be accessed wirelessly by a large number of devices, no matter where they are located and the devices are easily stolen. Additionally, the IT department will have to support new operating systems and probably multiple operating systems depending on what platform the company chooses to work with. All this is contributing to a big challenge for the IT department and a mindset that accepts mobility, recognizes its potentials and dedication of resources to enable that is needed (Ventana research, 2011).

Rysavy (2011) claims that mobile applications are becoming strategic tools for companies that are trying to make employees more productive, to better serve customers’ needs and to gain competitive advantage in today’s markets. However, it is very challenging for companies to become mobile and in Rysavy’s report (2011) he lists some important obstacles for companies in the mobile era (see Figure 2.6). Figure 2.6 indicates that the two most important hindrances are device management and security. Device management is the controlling of software installation, software updates, and lost devices. Security is for example concerned with data loss or leak of sensitive data (Rysavy, 2011).
Ahmad (2011) also brings up challenges when it comes to achieving enterprise mobility. The challenge of managing mobile devices is that the devices themselves are not sufficient, but the more advanced device management that includes deeper integration into the networks and back-end systems are the biggest challenge for companies when it comes to device management. Another challenge when it comes to the devices are that they must be securely backed up and operating systems must be updated continuously. Moreover, there is a challenge of the security with the users and their access to information. User access should be based on roles, business needs and policies aligned with the mobility strategy. The connection medium used must be properly encrypted (Ahmad, 2011). The main challenge according to Ahmad (2011, p. 17) is that “things get very complicated as users become more mobile and connect to corporate resources from unknown and uncontrolled outside environments”. The mission for companies is to deliver secure user access while not hinder employees from doing their job (Ahmad, 2011).
3 Research design

This section is a description of how the research study is executed and we will present the different methods that we used to conduct our research about the subject.

Every research project involves the use of research theory. The design of the research project is an important part in any research and it raises the question about concepts and principles within the chosen research design (Saunders, Lewis & Thornhill, 2007).

3.1 Research philosophy

The research philosophy contains assumptions about how we view the research area and how we conducted the research. This research has a realistic philosophical approach which means that objects exist independent of human consciousness, and that knowledge is socially formed. In common with an interpretivistic approach, a realistic view holds that natural and social sciences are different but it also argues similar to a positivistic approach, that social entities must be studied objective and scientifically (Flowers, 2009). Realism in business research is aiming at understanding the reality of an economic system in which people operate inter-dependently. The research enquires the way organizational forms and practices emerge over time and how they might change social actors and how such forms can be criticized and changed. An example of a realism research is the one by Douglas, Gray and Teijlingen (2010). When studying an imperfection and complex phenomena, it is not appropriate to search for one answer to prove a theory. Instead, by developing a number of answers we will cover several contexts and perceptions of different participants (Flowers, 2009). We take the view that researching from different angles will contribute to a better understanding of a phenomena because reality can exist on multiple levels of understanding.

The realistic philosophy consists of different parts such as: ontology, epistemology, and axiology (Saunders et al., 2007):

- **Ontology** is concerned with how we view the nature of reality and the assumptions we have about the way the world functions. In other words, ontology is a description of the concepts and relationships that can exist (Gruber, 1992). In a realistic point of view, we view the nature of reality as objective, which means that objects exist independently of human thoughts and beliefs but they are interpreted through social conditions (Saunders et al., 2007).

- **According to Steup (2005), epistemology** concerns the creation and distribution of knowledge in a field of study. Epistemology is reviewing the questions about what constitutes valuable knowledge, its sources, structures and limits (Steup, 2005). In the subject of epistemology, realism reasons that observable phenomena provide valid and valuable data and facts.

- **Axiology** is the way we view the roles of values in research and the judgment about value. With a realistic philosophy, this report is value laden and we are aware of that our views, cultures and experiences will affect the research (Saunders et al., 2007).
3.2 Research approach

The purpose of this research is to find out what is happening within the research area, how organizations are using information integration between ERP systems and mobile applications for their mobile employees, and subsequently to seek new insights within the subject of mobility. To assess this phenomenon, we used an exploratory research that allowed us to gather understanding about the problem. We started with a broad focus which became narrower as the research progressed.

There are two major directions when it comes to research approach; deductive approach and inductive approach (Saunders et al., 2007). The deductive approach works from the more general to the specific and is sometimes referred to as a top-down approach where a theory becomes tested (Burney 2008; Saunders et al., 2009). This means that the researcher develops a theory or hypothesis in the beginning of the project and then tests the hypothesis throughout the research (Saunders et al., 2007). The inductive approach works from specific to a broader aspect where generalization and theories can be defined (Burney, 2008). The inductive approach is sometimes referred to as a bottom-up approach where the researcher collects data and afterwards develops theories as a result of the data analysis (Burney, 2008; Saunders et al., 2007). The nature of the research purpose leads the research to an inductive approach to be able to gain understanding and to make sense of the phenomenon.

3.3 Research strategy

A case study strategy gives an in-depth understanding of a particular phenomenon and enables us to have a holistic approach of the research subject (Fisher, 2007). Case study emphasizes the complex real-world context in which the phenomenon occurs. This research strategy lets us use multiple cases to create theoretical theory inductively. The theory-building process is based on the repeating cycling of case data, emerging theory and existing theory (Eisenhardt & Graebner, 2007). According to Darke, Shanks and Broadbent (1998, p. 273), “case study is the most widely used qualitative research method in information technology-related innovations and organizational contexts”. At first the context of the phenomenon was not apparent but as the research proceeded, we got a better understanding of the case. We are using a case study strategy consisting of multiple views to look at the case from different angles to be able to get a broad knowledge in the research field. Case study suits this research because according to Eisenhardt (1989) the case study research strategy is especially appropriate in new topic areas.

3.3.1 Company description

During the research we have worked with an IT consultancy firm situated in nine countries, including Sweden where several offices are located. The company has approximately 1400 employees. They provide their customers with IT services within many areas, but one of their main focuses is in mobility. Their mobility mission is to transform their customers’ IT solutions into mobile solutions. Our contact person who is the ‘Enterprise Mobility Manager’ is placed at the Gothenburg office. The participated consultants are experts in the mobility field whom are located in various places around Sweden. They all have experiences from different types of organizations since they both work in private and public sectors.
3.4  Research method

Qualitative data is non-numeric compared to quantitative data that is based on numbers and statistics. Researches using inductive approach are more likely to use qualitative data (Saunders et al., 2007). A realistic research mainly uses qualitative techniques such as interviews and case studies. A qualitative method has a nature of identifying emerging theories from the gathered data which is an alternative expression for an inductive approach (Sobh & Perry, 2005). We wanted to get an understanding of how the functionally of information integration between mobile applications and ERP systems are handled in companies and with the inductive approach it enabled us to have a broad view in the beginning that we narrowed down to the result of a theory.

3.4.1  Data collection

During our initial phase of the research we made a standardized e-mail that we sent to several organizations that we found during our literature search, and found out if they were interested in, and could be part of our research. The reason for this was to gain access to be able to collect data and to get in contact with gatekeepers who could make that data available for us. When sending the e-mails, we contacted people who we considered having the authority for the information we wanted. Regarding our choice of participants we made the assumption to rely on the Subject Matter Experts’ (SME) experiences and assumptions about the subject. We interviewed the ‘Enterprise Mobility Manager’ for the unstructured interview and came to the agreement to start cooperate. This gave us the privilege to get physical access and gather data from their consultants and customers regarding our research.

We have gathered both primary and secondary data, which is argued to be a common combination of data gathering techniques (Saunders et al., 2007). Primary data is new data collected specifically for the research project, for example interviews, focus groups, observation, and questionnaires. Secondary data is data that has been collected before for some other purpose than your research, for example books, journals, financial reports etc.

3.4.1.1  Literature review

The literature review, which is a secondary data collection method, is about reviewing the most relevant research which in our case is the mobility field. This helped us to realize the research gap and to avoid repeating research that has already been done. It is important to find a research gap to highlight emerging areas within today’s business world according to the main area of the research, i.e. informatics. From the literature review, we defined and refined our research problem and purpose. We started out with searching for secondary data about the subject to realize what has been written before regarding the research field of mobility. We searched in books, articles and scientific journals that could give us a better view of the research topic. During our search for secondary data we used Google Scholar and Jönköping University’s database JULIA to find information. The terms we searched for were mobile application, business-to-employee, Enterprise Resource Planning (ERP) systems and information integration.
3.4.1.2 Interviews

The use of inductive research emphasizes the importance of using small sample of subjects (Saunders et al., 2009). The primary data collection method that we used in the research is interviews. The population within our research field of mobility is employees working with mobile applications in their mobile work. We have done a judgmental sampling, which means that we used our own judgment when selecting the appropriate sample. In order to answer our research question, we needed to ask people with the right knowledge and who are working in the right field.

Non-standardized interviews are qualitative research interviews such as semi-structured and unstructured interviews. The aim with non-standardized interviews is to explore a general area in depth and to seek meaning in a phenomenon (Saunders et al., 2007). The primary data collection technique used in this report is non-standardized interviews and more precisely, one unstructured and six semi-structured interviews.

- Unstructured interviews are in depth and informal interviews, normally used when one or some aspects of a subject of interest are intended to be explored.
- The semi-structured interviews are another form of non-standardized interview where the interviewer covers a number of specified questions and themes, but these may vary from interview to interview depending on the respondent (Saunders et al., 2009).

A major advantage for using primary data in our research is that the data is collected for our specific purpose and thereby it is more consistent with our objective. As there is not a lot of research available in the subject made it more suitable to collect primary data (Hawking, Foster & Stein, 2004). The primary data is collected from a company located in Gothenburg which is putting a lot of emphasize on mobility. We have interviewed seven consultants in that company, whom are all SMEs working within varied branches in the mobility field.

We made one unstructured interview with few pre-defined questions in the very beginning of the project where we interviewed the ‘Enterprise Mobility Manager’. He was the one most suitable as our contact person with the company, since he is responsible for the company’s major focus on how to enable their customers to work more mobile. We found the company and their ‘Enterprise Mobility Manager’ as we searched on the internet. We came across the company’s description about their major focus within the mobility field and their view on the subject which matched our research within the mobility field. Still, it is important to state that we had a clear understanding of the area we wanted to explore. The SMEs participating in our research were names received from the ‘Enterprise Mobility Manager’. This was done after he sent the SMEs our research purpose as well as asking them if they could and wanted to participate in the research. If they approved to be a part of the research we sent them an email and attached our interview questions which gave them the ability to realize if they could answer the questions or not. It also gave them the opportunity to go through their answers before the interview.

The semi-structured interviews have been the basis of our data collection and from them we have been able to collect the vast majority of our data. The unstructured interview gave us a broad insight into mobility and how it works in the working environment. During our unstructured interview, we had a few open-ended, predetermined questions about the research field in order to stick to the point and get related answers. Because of
the different physical locations, the semi-structured interviews with the SMEs were held through electronic media such as mobile phones or VoIP (Voice-over-Internet Protocol e.g. Skype) phones. The unstructured and one semi-structured interview were held face-to-face. All interviews were recorded so that we could write down the answers afterwards. The respondents were informed about the recording of the interviews. They were also informed about their rights to view, change and delete the information that we transcribed in text before anyone besides the authors saw the information provided during the interviews. The semi-structured interviews are all based on the same questions but varied in the interview’s length between 38-90 minutes (see table 3.1). The SMEs contributed with different insights into the research field, dependent on their experiences and job positions. By using mainly semi-structured interviews with SMEs for data collection, it gave us a qualitative and in-depth understanding of the mobility field. This technique is the most suitable when dealing with exploratory research (Saunders et al., 2007). The interview questions from the semi-structured interviews can be found in appendix 2.

To make an accurate analysis of the collected data, all answers received were merged and transcribed before analysis and interpretation of data. To obtain highest quality of the data gathered, we transcribed the recorded interviews into text format and sent them to the SMEs for control reading. In the transcriptions we made clear distinctions between who said what, and to what question the responded information belonged. As we wanted to have trustworthy and accurate information for the analysis, the SMEs were given the opportunity to make corrections, add, or delete information if something they previously said was not correct.

In table 3.1 it is shown what type of position the interviewed SMEs have, what type of interview it was, at what date they were interviewed as well as how long each of the interviews took.

<table>
<thead>
<tr>
<th>Interview number</th>
<th>Interview type</th>
<th>Work position</th>
<th>Date of interview</th>
<th>Time of interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Semi-structured</td>
<td>Business developer</td>
<td>2012-02-27</td>
<td>38 minutes</td>
</tr>
<tr>
<td>2</td>
<td>Semi-structured</td>
<td>Change Management and Management Consultant</td>
<td>2012-02-27</td>
<td>53 minutes</td>
</tr>
<tr>
<td>3</td>
<td>Semi-structured</td>
<td>Business Unit Manager and Business Developer</td>
<td>2012-03-07</td>
<td>74 minutes</td>
</tr>
<tr>
<td>4</td>
<td>Semi-structured</td>
<td>Product Manager</td>
<td>2012-03-08</td>
<td>75 minutes</td>
</tr>
<tr>
<td>5</td>
<td>Semi-structured</td>
<td>Business Unit Manager</td>
<td>2012-03-26</td>
<td>78 minutes</td>
</tr>
<tr>
<td>6</td>
<td>Semi-structured</td>
<td>Project Manager Mobility</td>
<td>2012-04-02</td>
<td>60 minutes</td>
</tr>
<tr>
<td>7</td>
<td>Unstructured</td>
<td>Enterprise Mobility Manager</td>
<td>2012-02-10</td>
<td>90 minutes</td>
</tr>
<tr>
<td></td>
<td>Semi-structured</td>
<td>Enterprise Mobility Manager</td>
<td>2012-04-13</td>
<td>50 minutes</td>
</tr>
</tbody>
</table>
3.5 Time aspect

Cross-sectional research is used for collecting data in a short amount of time for relevant variables. This means that we investigated how the information integration between mobile applications and ERP systems were at the time of research. The reason for this is because the information integration between mobile applications and companies’ ERP systems were unexploited and the trend in mobile communication was rising which made this a highly interesting subject (Barnes, 2004; Wiberg & Ljungberg, 2001; Hawking et al., 2004).

3.6 Analysis method

When using a qualitative analysis approach, we explore the data collected and subsequently attempt to find patterns and themes to concentrate on (Saunders et al., 2009). The analysis process is an ongoing process that begins already during the literature review since we are reading and interpreting the information that exists within the subject area. The data in realism research is almost always qualitative data about meanings (Sobh & Perry, 2005). During our analysis we have followed three steps outlined by Saunders et al. (2004 & 2009), when analyzing the data from the interviews and frame of reference:

1. **Summarizing**: from the transcript evolved from the interviews, the first step was to produce a summary of the key points that emerged from the interviews. The summary was developed from long statements to briefer statements in which the central message has been rephrased in a few words. The purpose of this was to become familiar with major themes of the interview data.

2. **Categorization**: As qualitative data provide a complex and non-standardized nature the second step was to reduce the data into the recognized categories. This involves both recognizing categories of the collected data and to attach these categories to meaningful groups of data. We categorized the data in relation to the interview questions asked, for example information integration, benefits, and challenges. The purpose of this is to be able to look at small units of data and to grasp a better understanding instead of looking at the unclear and large amount of data. It is important to point out that we were not interested in every detail of all the perceptions of the interviewees, but only the data that is relevant to the research purpose. When reducing the data, one has to have the related theories and framework in mind to be able to allocate data into larger groups.

3. **Structuring**: the third step involved identifying key terms and patterns in the categorized data. We also drew the relationships between the data gathered and the frame of reference. The purpose of this is to search for meanings from the data gathered and subsequently develop theories. The frame of reference and interviewees’ quotations are frequently used to strengthen and support our conclusions and arguments.

3.7 Research credibility

**Reliability** refers to if our research will yield consistent findings. Problems when dealing with qualitative research techniques like semi-structured interviews are that it is hard to confirm the reliability of the analysis of the qualitative data because it is the perceptions of the authors whom are analyzing the data that will make the difference whether the data will be accurate or not (Saunders et al., 2009). One part of the treats to
this research’s reliability is the subject or participant bias. This is common when using interviews when the respondent might not answer with the truth but instead feels forced to give a certain answer. To decrease these risks we offered the respondents to be anonymous, the respondents were also given some time in advance to look at the questions we were supposed to ask them during the interview so they could think through possible answers. Another aspect to consider is the one of observer error where we as interviewers might ask a question in a certain way. Subsequently we gave the respondents the opportunity to choose the time for the interview so that they could perform the utmost during the interview and when they thought it was appropriate. This option was available to provide the interviewees with a neutral time so that the respondents were not in the middle of something or looking forward to something else. Finally, there is a risk for us as interviewers to be biased and interpret the respondents’ answers. We will control this by adhere to the questions and ask the questions in the same tone to keep a consistency of the collection as Saunders et al. (2009) have suggested. We have chosen to not translate the whole interview transcriptions from Swedish to English, due to the risk of changing the respondent’s actual meaning with their responses. However, there is use of certain translated quotations within the analysis, when the quotations can be translated without changing meanings.

Validity is concerned with whether data collection methods and findings are about what they profess to be about. Since there are several risks that affect validity, we have taken many of them into account during our validity assessments. There is always a risk that participants will drop out of research or that they might not have the right knowledge for the research (Saunders et al., 2009). However, we prevented this by sending our interview questions in advance to make sure that the respondent had the right expertise. This was done by asking them to go through the questions before the interview and consider if they were able to give accurate answers to the questions provided. None of the intended participants resisted participation within the study, nor did they have difficulties to respond to our questions since all of them work within the mobility field in varied ways. We controlled the quality of the data gathered from the interviews by writing down what the respondent said. Afterwards we sent it to the corresponding respondent so they could verify their answers and add or delete information they thought were useful or irrelevant.

According to Saunders et al. (2009), generalizability is the extent to which the findings are applicable to the population as a whole. There are risks concerned with generalizability when dealing with qualitative research techniques such as non-standardized interviews. The fact that non-standardized interviews are mostly based on a small and unrepresentative number of cases makes it a risky to generalize the findings to other settings. To our defense we have used a number of cases from different industries including different knowledge and experiences. Generalizability with qualitative research also questions the significance to theoretical propositions. It is important to relate the research to existing theory to prove that your research will have a theoretical significance to the research field. We will manage this by relating our finding to the frame of reference to support our findings with what has been previously researched. This allowed us to investigate existing theories to the setting we are examining.
4 Results and analysis

In this part we will begin with presenting the results and further on analyze the findings from data gathered. During our analysis we have assigned numbers to each of the interviewees according to the chronological order of the interviews. In the analysis part, we will refer to the numbers and related interviewees found in table 3.1.

During our research we made semi-structured interviews and therefore we needed to shorten the interviewees’ answers, and as previously mentioned we have coded the interviewees and replaced their names with number one to seven. In the table below we present a short summary of all the interviewees’ responses to all questions that we asked during the interviews.

Table 4.1 Interview responses

<table>
<thead>
<tr>
<th>Question</th>
<th>Interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2: Management and Change management Consultant.</td>
</tr>
<tr>
<td></td>
<td>3: Consultant manager, Consultant mainly as Project Manager but also as Business developer, since the 90’s.</td>
</tr>
<tr>
<td></td>
<td>4: Product Manager, member of the management group in the same company where he is product manager.</td>
</tr>
<tr>
<td></td>
<td>5: Business Unit Manager.</td>
</tr>
<tr>
<td></td>
<td>6: Project Manager, seven years in the security alarm business.</td>
</tr>
<tr>
<td></td>
<td>7: Enterprise Mobility Manager, Mobile strategist since 2005.</td>
</tr>
<tr>
<td>2. How do you perceive the usage of mobile applications in accordance with mobile work?</td>
<td>1: There is a demand for more applications. There is an interest for it and companies would not invest in an alternative as e.g. iPhone if they not think that there are good things to get out from it. That they can minimize time, work more effectively and to access systems that you want to access wherever you are. As companies expand their wireless networks, it enables to work outside offices and companies want to follow this evolution.</td>
</tr>
<tr>
<td></td>
<td>2: We are at the starting point now, some companies evolves rapidly, some standby and waits. Mobility really means that you get more independent of time and place. And for that it is maybe needed to start thinking in a whole new way. It is about to have access to whatever needed independent of where you are located, where most value can be delivered, is usually where it starts.</td>
</tr>
<tr>
<td></td>
<td>3: It is a rather immature solutions or implementations of</td>
</tr>
</tbody>
</table>
platforms. They have the will and thoughts, but have not come so far. Many companies have started to use mobile solutions for some parts of their organizations, simple and vital communication demands have been implemented. Although when it comes to more advanced solutions where you integrate with the internal ERP systems via mobile solutions, companies have not come that far. I think that many have the utility for it and that they are interested in getting it. There are complex decisions needed to consider before determining to fully invest in mobility, and the mindset of mobile solutions is generally immature.

4: The need is bigger and different depending on the industry. Within the service industry there is a giant need. There are many application areas where the need is significantly and there are big needs to cover the paper-based and manually handled duties. The market has not come close to what it can, I am totally sure that we have just seen the beginning. There need to be a difference between consumer applications that you can download easily and then there are special applications that are integrated with complex back-office systems that are not easily distributed and that require an interaction between customer and distributor. That is where I think that we have just seen the beginning.

5: Many want mobility, it is a growing area. Some should have it, there is a benefit in it, but not all realize it on their own. It is important to know that mobility is more than to have a webpage suitable for mobile phones, it is needed to be able to work offline even if you have network coverage or not.

6: The company has for many years used locked PDA’s that are integrated to their CRM system. The 'bring-your-own device' strategy is what we are currently working on in that project.

7: It increases people’s productivity since they can choose when to work. This types of products and the fact that we are more reachable increases the demand from customers. People expect to get faster response than before. Organizations need to handle this, you expect people to be reachable, as well as to be able to connect to internet wherever needed and to access the already digital information independent of time and place. People want to interact with people in other ways. It is all about to replace the old way of work. Companies want to have unique customized access to their digital information. If you should use mobility, you must think in new ways to work. Today, unexpected industries get interested in digitalization of processes, and
they mainly view it from an internal perspective, to become better and more productive.

1: I think it will be more mobile workers. If a user receives a smart phone and realizes what possibilities it has, it creates a need for the same possibilities at work as in social life. The habits of using mobile devices create a pressure on employers. I think that this will affect all work places and that they need to think of how they can work more where they are, smarter and how to minimize wasted time.

2: This development will continue in a tremendous speed, most of the work duties that are performed on a computer today will be performed on mobile devices. I think that everyone will have to follow this development, whether they want it or not. When you are not dependent of your stationery computer anymore, we can start thinking in new ways and we can have totally different work processes in all types of business. E.g. global companies that have many travelling employees will reduce the travelling and replace it with mobile work processes.

3: There we have come rather far. I think that it has evolved fast in a rather short time. This has created new technologies and new programming languages. From the beginning it was just very simple applications, but as time has passed, it shows that more advanced applications and system solutions are developed.

4: Mobile applications have become more powerful, I think that it will be more common with application-houses that specialize in developing standard solutions for large backbone systems, like ERP systems. I think that we will see an explosion of product ranges. I think that there will be companies that specialize in service applications towards well-known standard systems and stand-alone that is connected to the standard system.

5: We are not there, yet, it will be the future. There will be more and more solutions, and I think that the quality will vary since it is based on what companies argue to be effective or not, and if they have experiences of this type of development. Many companies state that they should work with it and that mobile applications can enable them to work better, but it is often a matter of development issues.

6: The use of smart phones will increase the demand for it. So far, most applications have been for consumers. The mobile applications have become more business oriented and have evolved to more advanced solutions. My opinion is that we are just seeing the beginning. This trend will be
in all branches, everywhere. There are not many things that we are not able to digitalize with today’s technology.

7: Companies can go by consumers into the business world. ‘Bring-your-own device’ is a type of trend where people connect their own private devices to solve their work. I think that the trend in mobility will change, from a personal perspective that drives changes that will be expected in companies as well. People want the same abilities professionally as private. Smart companies want smart employees, and smart employees want smart solutions. I think that the trend is here, we have just seen the beginning and people will change their processes, technologies, their way of work, the management as well as their physical environments to handle it.

<table>
<thead>
<tr>
<th>4. Is there any usage of mobile applications in accordance with mobile work at the company you work? (business-to-employee)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: A case management system that many workers within the service department in the municipality use. It can be people within all different kind of positions.</td>
</tr>
<tr>
<td>2: Yes they do, in smaller or larger extent. It is a development process for many. Many desire a kind of mobile strategy, i.e. how can we use mobile technology in our company.</td>
</tr>
<tr>
<td>3: No, not in any larger extent, we use the e-mail but not the actual ERP system. The applications we have developed are used within e.g. the security branch and hospitals where you need to be online all the time to be able to answer messages fast and easy.</td>
</tr>
<tr>
<td>4:</td>
</tr>
<tr>
<td>5: We have a project where we develop both the platform and applications, for both Android and iPhone, which is aimed for our consultants. It should distribute information but we hope to integrate it with time reporting in the future.</td>
</tr>
<tr>
<td>6: Not within sales department, but the assembling fitters are using PDAs.</td>
</tr>
<tr>
<td>7: We have certain tools that we use to solve problems, but they are more of personal characteristics, personal productivity and time and place. Things we have bought off-the-shelf.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4a. Are there any advantages with the use of mobile applications?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: I think it is all about to be able to work more freely, smarter and to be able to be effective and perform duties when it is needed.</td>
</tr>
<tr>
<td>2: Firstly, the old system thinking where we use huge systems with databases containing many more functionalities</td>
</tr>
</tbody>
</table>
than you actually need. Also, in the mobile world, the reasoning is different you need to pay a lot more attention towards usability. It is much easier to work with this than it has been before. Simplicity is the key. We will do things differently, or new things in a new way. Many things will happen and I think it is a positive development that you do not need all parts you thought you needed. Travelling will be reduced and replaced with mobile work processes.

3: Yes of course it does, there are many advantages. One thing is that you always carry your mobile phone. Another thing is the mobility and flexibility. I do not need to be at the office or at the customer to access the needed information. It is also beneficial that everything is simplified as much as possible in mobile devices, all is done as simple as possible. Just the necessary parts are contained in applications. This enables the ability to faster and cheaper application development.

4: There are plenty on benefits dependent on business area. But all of them minimize times, unnecessary administration, failures and the number of times that the same thing is needed to be inserted into a system. It is not expensive to develop applications. It gets so easy to do your work duties, so suddenly you do it at the right time as well.

5: For our company, there are of course advantages, the information sharing but also the time reporting. If you are with a customer it is beneficial to have access to the right information as well as inserting it directly. To be a consultant, working mobile, and having access to the needed information for your duties is the important aspects.

6: Definitely, for us, it is the ability to keep track of those who are out working in the field. The handling of information is incredibly much easier to handle. The benefits with mobile applications are the key for us to be able to digitalize our sales processes. I think you will increase the usability of the professional mobility solutions to a new higher level. That will generate more effective workers since your employees will work when they can work, which employers normally think is a great advantage.

7: The big advantage is about getting the freedom of choices. Independent of time and place, you can select when and where to work. People are starting to work more actively, you use certain tools at a more personal level. You interact with each other and it is easier to exchange documents. You have platforms for working and exchanging documents.
### 4b. Are there any disadvantages with the use of mobile applications?

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<tr>
<td><strong>1:</strong></td>
<td>One is that employees are never free from work, you can work the whole day and night. Sometimes it is not suitable since you want to focus on something else, and you cannot do everything on a smartphones as everything gets too small. The habits of using mobile devices create a pressure on employers.</td>
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<td><strong>2:</strong></td>
<td>Security is important since you handle sensitive information. You do not have the same security in mobile applications as in original systems. Everyone is not feeling secure with using mobile applications. But there are more benefits than disadvantages. The screen size, navigation, etc. will be improved and more suitable for using. Users can feel that some functionality are lacking, simplicity are one of the keys since the mobile applications cannot be as complex as original systems.</td>
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<td><strong>3:</strong></td>
<td>Security is needed if you use mobile applications and mobile platforms. The security need to be balanced, it cannot stop the usability or be too complex, but not too simple so information will leak out. When you work from everywhere the security risks rises, but it should not stop the mobile working. An advantage previously mentioned can also be a disadvantage that you are expected to always be available.</td>
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<td><strong>4:</strong></td>
<td>A disadvantage is that you should develop applications towards different or within the same operating systems but varied release versions, which is a maintenance problem. The security as well, if you make an appropriate application I do not see any disadvantages for the users.</td>
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<td><strong>5:</strong></td>
<td>I have difficulties to see any disadvantages. But you cannot control people how much you like and demand them to use the phone in a certain way. Instead, you should develop secure and simplified applications. Although, there are a very small number of applications that will damage the devices.</td>
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<td><strong>6:</strong></td>
<td>I do not see any disadvantages with using mobile applications as long as you have control over the security. You need to have control of how the sensitive information is spread since you can access it whenever. Make sure to not waste resources like e.g. time and money, but develop solutions that the users want to use. Many companies’ problem is that users bring their own devices. The ‘bring-your-own device’ strategy is a great trend that many companies’ IT departments cannot handle today. It is hard for employers to control what employees do at their phone at home.</td>
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<tr>
<td><strong>7:</strong></td>
<td>Some people never stop working since they are available</td>
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at all hours. Some people work way too much and some too little, which can create disagreements among people. Normally the main focus is on technology and development, but I think that in this case there is a challenge for society as well. Some are stressed by new things and functions and for management it is hard to see if people actually work or not. Mobility is not suitable for some people, and for them it can get stressful. This development is harder socially than technologically.

5. Are the mobile applications integrated with the company’s ERP system?

1: Well, it is a case management system that they have in within service, both IT and property-related service and so on.

2: Yes, it has to be otherwise it is meaningless since that is where the interesting information is located. Step one is very simple, to access information. Step two is to add new information that is updated towards the ERP system.

3: No, this specific solution is not integrated with the ERP system.

4: It increases more and more, but still not rather common since we are just in the beginning. We see that the demand is increasing. The modern ERP systems are using Web services so it is not very expensive to integrate them, but the actual integration work can be a bit costly.

5: Yes it is. Mainly with the ERP system and the sales department will have the CRM system. The Consultants will use the same integration with digital channels that have been used, but we will simplify them.

6: The PDAs are integrated with the CRM system.

7: 20-30% in this project is to build a channel towards the application. But it is the integration behind that is a big cost driver. I think that much is about integration and the visualization is the simple part.

5a. Is it possible to make inputs through the mobile applications? In what way?

1: Yes, they can report and check status and so on.

2:

3: Yes, definitely.

4: That is the aim, you write towards a website since it is not a local application or database. In all other cases it is real-time towards the ERP system, here the customer can add what he/she needs help with and then press send, and a service order in Dynamics AX are created including all the information inserted.
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<th>5b. Is it possible to get output through the mobile applications? In what way?</th>
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<tr>
<td><strong>5:</strong> Yes.</td>
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<td><strong>6:</strong> Yes in phase two the sales department will be able to make input in the system e.g. add customers.</td>
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<td><strong>7:</strong> I have mostly built applications where you can read information.</td>
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<th>5c. How does the integration work, functionally?</th>
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<td><strong>1:</strong> Yes, they can report cases there.</td>
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<td><strong>2:</strong></td>
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<td><strong>3:</strong> No, not today. Today it requires that someone manually sends a message to you. In the future it is possible to consider this type of system integrations.</td>
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<td><strong>4:</strong> Yes, it adds and updates the information.</td>
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<td><strong>5:</strong> No, not really since it spread information, but you can browse and find information.</td>
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<tr>
<td><strong>6:</strong> Yes, but they can just view what they personally have done, their private information.</td>
</tr>
<tr>
<td><strong>7:</strong> We only read information from the systems. Just consumption of data by a new channel. The data are located at other places and we need to integrate it.</td>
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| 1: I think it is rather simple applications that work against a website, but I do not know so much about it. |
| 2: Here you have come a long way. They perceive that it saves time, it is more effective and that they achieve what they want to achieve faster. |
| 3: In the companies I have been, you have not gotten so far. There are rather simple integrations but not any deeper two-way integration, just very simple. |
| **4:** Yes it is web services, and I am convinced that it will be appreciated since the aim is that it should be very simple for every individual person. |
| **5:** Well there are no problems with it. All ERP systems have their functions and then you connect it to web services. |
| **6:** It is standardized so it should be working very simple. We presuppose that it will work since we have experiences from the PDAs, and they work very well. There will be a back-office function where information are compiled and distributed towards the smart phones. But the integration with the mobile application and the ERP system, the CRM |
module, will be developed during the autumn this year.

7: Integrations are used to do, but for different purposes. We do not build integrations from the application or the phones. We do a system that is placed behind. Some industries have standards, but there are no general standards. Normally you do web services, but it needs to be secure Web services and channels.

1:

2: I think it is about simplicity, simplicity, simplicity. The simpler, the easier it is for people to adapt to the changes. Some pay a lot of attention on interfaces, which is very important. Since you will learn how to deliver relevant solutions instead of system solutions. The security needs to, and will, be solved but we not very good at handling and structuring information. Everyone needs to improve in that, in the mobile world as well.

3: The iPhone platform are stable, you know what it looks like, but when it comes to Android it is not as stable and the phones have very varied characteristics which require more complex application and system development. There are definitely improvement opportunities. You need to integrate it with the existing systems. You need to consider the security and how to protect the information. I think you can improve how people perceive it and how they can use it as working tools.

4: mobile applications will be even more powerful with double processing units and more memory, more advanced connections, better screens and so on. I think that these mobile applications will become a new mini-computer or a real computer. I think that the new and more special applications are those with a well-planned interface which will improve the usability of applications. Consider the distribution among users and the security. Some companies need to be informed of how they can use it for their employees or their nearest stakeholders instead of the old systems. Dependent on their infrastructure, it can be rather costly.

5: First of all you need to start using it. There are many companies who do not work with mobility yet.

6: Coverage and connectivity, and interfaces as well as usability. Also, there will be a challenge of handling how to deal with stressful employees because they are never free from work with mobile applications.

7: Of course it does, all the possibilities are left. We have not understood what is optimal, and I do not think that we
ever will fully understand the technological, socially or usability aspects. There are more requirements on the usability experience, especially on ERP systems that are rather complex and unique. It is not as simple to just move it to the mobile phone. You need to start thinking in a new way to be able to get the right effect and to make people wanting to use it. I think you have to minimize functions and simplify it in the mobile application. Mobility creates a management challenge since it can be hard to control employees’ activities out of office.

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<tr>
<th>1:</th>
<th>I think that most people in the municipality will have a smart phone and not the simple regular phones. You want to be able to access very many functions of the ERP systems through the mobile phones. I also believe that most of the things that people do with a computer they want to have in their smart phones. One thing is that all managers have an iPhone today and they all think that it works well. This will make them request it to their colleagues and think that it would be good for them as well.</th>
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<td>2:</td>
<td>Everything will become more effective, and there will be a totally new way of working. I think that the PC will disappear and that everything will be mobile. Payments will be done through the mobile and there will not be any money or credit cards, everything will be changed and handled through mobile devices. It is hard to imagine how far we will become within five years. The schools will be those that will be affected the most, and you will not be dependent on classrooms, offices or classes, you need to start thinking totally new. We will still need to have social contact with people but it does not need to be at offices, it could be other places and these could be virtually. The combination of the physical and virtual will increase and I think that more and more companies will not have their own systems since the ERP systems are a catastrophe when it comes to updates, you do not have this problem with applications.</td>
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<td>3:</td>
<td>I think that the integrations will become cheap and secure. I do not think that it will remove offices totally, but it will decrease it, and you will not need an office environment as we have today. I think that in the future you are not connected to any physical location or time, you can choose when to work, when to be connected and where you want to work.</td>
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<td>4:</td>
<td>The more mature the markets gets, the more it requires of the suppliers. This means that the more innovative and informative we are, the more demands we create. I think</td>
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7. How will mobile applications in association with mobile work look in the future? Why?
that the applications can be leading tomorrow. Due to the connectivity you can have access to vital information wherever you are and I think that this include companies and their ERP systems as well. The service industry has major benefits to gain from it since it opens a new world. During the last three years it has exploded, but I think that we are just in the beginning of the process.

5: I think that we will become more mobile. I think that all work and projects will be more about becoming mobile. Everything will be changed and better coverage and connectivity will be developed. This will affect the everyday life and when the security has reached an appropriate level as well it will get really usable.

6: I think it will be incredible many different applications in all different kinds of industries. Currently it is quite expensive to develop but successively when more companies are adopting this, it will be more standardized applications. The penetration of smartphones and tablets will continue to grow. We only see the beginning of this. It will exist in all types of positions and situations. There will be applications for everything. I even think it will be more important with a good application than with a website.

7: In five years it will be completely normal to use mobile applications for employees. It will demand more complex development work with the applications. We will be more mobile than stationary in the future. I think the solutions will be more concrete and clear. Also, the applications will not cover a large number of functions, but instead only focus on a type of process. I think that the big ERP system providers will be better at developing own solutions, but right now it is still in the initial stage.

A few questions have not been specifically answered by the interviewees, this is based on that some of them lead and manage projects within mobility, but they do not personally determine exactly how the mobile technology are designed and developed. They determine what is required by the mobile application’s implementation. It is also shown that the interviewees’ responded in varied ways since they all have different experiences as well as positions within their mobility projects and therefore varied views of their projects. Their responses also varies due to that they all meet different people during their mobility projects e.g. one interviewee meet and discuss mobility with top management, another interviewee develops the applications with the customers internal IT department and the next interviewee is a project manager.
4.1 Analysis

As our research has proceeded we found that today’s society is changing towards a society where people are becoming more flexible and mobile which is also argued by Sørensen (2011), Andersson and Eliason (2000), and Barnes (2004). Figure 2.4 outlined by Ahmad (2011), shows that mobile devices are playing an increasingly critical role in business productivity compared to stationary devices. This leads to the demand of being mobile both professionally and private. People request the same offerings and functionalities of mobile applications when they are at work, as they do on their spare time. We also found that employees are expected to be reachable all the time and the organizations need to handle this in some way. This change puts a lot of pressure on organizations to enable their employees to be mobile and work independently of time and location. These arguments are supported by the authors of IBM (2011c) and all the interviewees. It is important for organizations to follow this upcoming trend since it can bring a competitive advantage. It requires a transformation of organizational structures and according to interviewee 7 “the trend is here and it’s only the beginning of mobility, and organizations will start changing their processes, technologies, and their way of work and their leadership and also their physical environment to handle it”. It is not only the employees that are having this demand. The organizations are demanding the ability to provide their employees with mobile applications to enable them to work more efficient and in a mobile work process as previously illustrated in figure 2.1 by Gruhn and Köhler (2007). This leads to personal effectiveness when suitable and needed for the employees, which also is strengthened by Cisco (2007) and interviewee 1, 3 and 7.

It is shown that today’s organizations have seen a shift in how they are managing mobile applications, from business-to-customer and business-to-business focused to managing mobile business-to-employees applications. This shift is clearly stated in interview 6 who said “so far most of the applications have been for consumers; games, entertainment, news thus mostly reading and having fun, to be more and more business oriented focused, reaching from the very simple payment solutions to the more advanced solutions where we digitalize whole sales processes etc. in a form of an mobile application”. The reason for this change is that companies have started to realize the major benefits and value that mobile business-to-employees applications can bring to the company. The mobile business-to-employee applications are explained by Barnes (2004), moreover he also illustrates the corporate resources that can be mobile in figure 2.2. The demand for these types of mobile applications has increased and will exist in all different kinds of industries which is confirmed by Barnes (2004) and interviewee 1, 3, 4, 5, 6 and 7.

4.1.1 Information integration

From the data gathered in our research it was clearly shown that companies’ internal information integration for employees is a necessary factor within the field of mobility. In a mobile business-to-employee perspective, there is a need for organizational information which leads to that the information integration between the mobile applications and the organizations’ ERP systems is vital (interview 2 & 4). As interviewee 2 puts it, “the mobile applications must be integrated with the ERP systems, otherwise it’s meaningless because it is in the ERP systems where the necessary information is located”. The more advanced type of information integration, so called full-duplex integration, between mobile applications and ERP systems is not very common today, but it is rapidly increasing because the demand for seamless mobile information internally in a
company is rising. The organizations that do provide mobile applications for their employees mostly do so by offering basic communication and information applications like mail, calendar etc. However, as our data gathering evolved we realized that the trend now is going towards advanced mobile applications solutions that integrate critical information to mobile applications from the organizations’ ERP systems like figure 2.2 by Barnes (2004) illustrated. The first step of information integrations across the organization is to provide employees with information from the ERP system through mobile applications, a so-called output to the mobile applications. The second step in the development is to enable the employee to insert information from the mobile applications into the ERP system, which is called input (Interview 2). Moreover, even though there are some companies who have done investments in mobility there are many further possibilities left and there are even more for those who have still not implemented these kinds of solutions.

Some organizations have just started to realize the importance of mobile business-to-employee applications and the benefits it can bring. Moreover, some of these organizations have started to develop their own mobile applications and strategies. It is easier for organizations that are already mobile in some of their processes to become more mobile since they have more experience and knowledge about the mobility area (interview 2). We emphasize the importance of using a mobility strategy for organizations because in order to follow the trend in mobility, it is necessary to have a plan that discusses where the organization want to be when it comes to mobility. This is also stressed by Ahmad (2011) that thinks that a mobility strategy can help companies get value from enterprise mobility. We reflect that many organizations do not have a mobility strategy because they simply do not realize that they can use mobile solutions to gain value. The mobility matrix developed by Ahmad (2011) shown in figure 2.6 and the related process to create a mobility strategy are good tools for helping organizations to get value from enterprise mobility with a supporting strategy. It is a new phenomenon to use mobile applications for employees in an organization and this is supported by all the interviewees. The strategy must address the previously discussed challenges and improvements such as how to handle mobile employees, if the method of ‘bring-your-own-device’ should be applied or if the organization should provide employees with devices, what platforms to use, how security should be managed and so on. These various factors need to be considered from the specific organization’s perspective and initiated according to the characteristics of the organization. If an organization implements a mobility strategy, it can gain tremendous advantages against competitors thus it supports the organizations in performing work duties wherever and whenever needed.

We have realized that the mobility trend is growing and many organizations are willing to change to become more mobile but to actually change is a big step for organizations. We have reached the understanding that organizations have many questions that need to be answered before they can decide whether to invest in mobility or not. The questions that need to be considered is what type of platform, what type of device strategy to use, how to integrate the information and if the mobile application should be working both online and offline. What type of device strategy is a very important decision to take and it is shown in figure 2.2 that device management is of top concern by managers (Rysavy, 2011). Device management gives organizations an option to either provide the employees with mobile devices that they have for work, or the company allow the employees to use their private mobile devices at work as well. Ahmad (2011) also describes that management of mobile devices is a critical question for organizations and
he emphasizes the importance of how mobile devices should be distributed. The so-called, ‘bring-your-own-device’ strategy, have become a very popular strategy within the mobility considerations where employees bring their own private mobile device for work purpose. Even though the ‘bring-your-own-device’ strategy saves money for the organizations, we have realized that this kind of strategy takes a lot of efforts for the organizations. Planning for the development and how to synchronize and authorize all these varied kinds of devices that the employees may have are hard for organizations. Also, to pay attention to how the information should be distributed among the employees and their devices are decisions that need to be considered. It was clearly stated during interview 3, 6 and 7 that these aspects are needed to have in mind when considering mobility investments.

When discussing mobility investments, organizations need to consider whether they have the right necessities for being mobile. These can be network coverage, bandwidth to handle large amounts of data, and so on. However, interviewee 1 argues that many of today’s organizations already have the prerequisites needed to implement mobile solutions, they just need to realize it. We have recognized that the system functionality is easier in mobile applications compared to ERP systems, thus solely the needed functions are available in mobile applications. This enables users to easier learn how to use the mobile applications for their work duties which is supported by interviewee 2 and 7. When considering the functionality’s simplicity it is also important for organizations to discuss how the interface should be designed, to be able to provide the user with an easy-to-use interface of the mobile applications. There must also be effort paid to inform users of why these implementations are needed and inform about possible policies that the organization must initiate for the mobile solutions. We also encourage having an understanding of the internal business processes since the mobile applications should be suitable for the specific processes that it aims at supporting. The mobile solutions should be relative to the employee’s work duties, combines with the simplest functionality and a usable interface. We have reached the understanding that these factors leads to an employee that is convinced about how mobile applications can contribute to his/her daily work performance. Since the security is one of the major considerations for most organizations as seen in figure 2.7 by Rysavy (2011) and described by Ahmad (2011), it is one of the aspects that must be discussed by organizations as well. Organizations must balance the security risk of being mobile with the value it can bring. To further on handling the security aspects there need to be clear structures of the information so that the information later on can be distributed appropriately among the mobile applications and the employees. Neither the security nor the technology is a reason not to make mobility investments, and with the right people it is not hard to solve. This is also argued by interviewee 5 and 7.

4.1.2 Benefits and challenges of internal mobile applications
We found out that the benefits expressed from the interviews of having mobile business-to-employees application for organizations are related to what we previously have mentioned in the introduction researched by Cisco (2007). Internal use of mobile applications enables employees to work more freely and increases productivity and competitiveness. It gives employees the option to choose when and at what time they want to work since work is not a physical place but an activity that can be executed at the office or at other locations. It is not only the employees that benefit from the flexibility that mobile applications provide, but also the organizations which get more out of their em-
ployees. The mobile applications today are well developed and having a solid structure and mobile phones are improved with better and faster memory. This means that the prerequisites for organizations to be mobile exist in both the software and hardware. Mobile applications are simplified solutions compared to the complex nature of computer-based organizational systems. In an organization, mobile applications focus on one or a small number of processes and functions which makes it easier for employees to use and handle information (Interview 1, 3, 6 & 7). The processes can be linked to figure 2.1 demonstrated by Motiwalla & Thompson (2012) where only some of the modules in an ERP system are integrated to the mobile applications, for example the HRM module. Moreover, since the mobile applications are simpler they are easier and faster to develop which also make them cheaper (interview 3 & 4). As interviewee 2, expresses it; “the old system thinking that we still live in with big old systems with databases and a lot of functions that you do not really need. In the mobile world, you have to think differently, then you have to focus more on usability” or interviewee 7, who says that “Mobile applications are not comprehensive as the systems but instead they support some parts of a certain process. This means that they are more niched and solve a certain process”.

On one hand, there are a lot of benefits to gain from when having mobile business-to-employee applications but on the other hand, there are a lot of challenges to discuss before deciding to invest in mobility (Ventana research, 2011; Rysavy, 2011; Ahmad, 2011). Organizations need to consider the intangible aspects of mobility, and moreover discuss how to handle the employees and their new way of mobile working. A challenge with having a mobile work force is that employees are never free from work which can affect their private lives. In order for employees to be able to handle the flexible way of mobile working, they need to set limits for their daily work. Also, the mindset of the organization must be set about how they should think when it comes to mobility. The mobile process can bring new ways of thinking and to perform work. It is important not to make an existing process mobile but to think differently in the way of performing the process. Another challenge is the way of leading and managing in a mobile organization where managers need to be more focused on goals and be able to visualize results.

As organizations make use of business-to-employee applications, they have to focus on the usability of the mobile applications and put a lot of effort in making it easy for the user to use the application. Another disadvantage is the security aspect of being mobile because employees are handling critical information and mobile applications are not as secure as computer-based systems. The security aspect was discussed in figure 2.7 where it is clearly one of the top challenges that organizations are worried about (Rysavy, 2011). The security should however not be a hinder for the usability of the mobile applications, in other words the security should not be too complex for the user to effectively use it. In the end, the most important part when integrating a mobile application for employees is that they actually use the applications, otherwise the investment in mobility is useless. The challenges of mobility provide insights into how the company can create opportunities of the challenges in the future, if they make appropriate use of them and make them suitable for their own situation.

We have realized that the challenges will be properly managed in the future and there will be more mobile worker and mobile applications integrated with ERP systems. More companies will implement these kinds of solutions and most of the work duties performed on a computer will be mobile (interview 1 & 2). We do not at this point in time
possess all the knowledge of what is optimal when it comes to mobility within organization. However, we argue that there will be a change in how organizations work in the sense that more business processes will be handled by employees using mobile applications. This leads to that employees will not be dependent on a physical place and the use of virtual meeting points will increase. The mobile applications for employees will be more standardized when more organizations are using it which will make the whole implementation process cheaper. The security of the mobile application will be improved since organizations are demanding secure transactions of their critical data. Once the applications are secure enough, the organizations will be more willing to integrate their ERP systems with mobile applications.
5 Conclusion

In this section we provide the reader with a short summary of what has been recognized in the research.

The purpose of this research was to investigate the functionality of information integration between mobile applications and ERP systems by answering the research questions:

RQ1: “How is the functionality of information integration between mobile applications and Enterprise Resource Planning systems used within organizations by their mobile employees?”

We have recognized that the need for internal mobile applications is increasing and more organizations want to utilize mobile solutions for their employees. In the use of mobile business-to-employee applications, the most important information integration is the one between ERP systems and mobile applications since it is the organizational information that is needed for the mobile workers. We have come to the conclusion that it is more common with one way integration, a so called simplex integration. This means that the application can only transfer either input or output. The full-duplex integration between internal mobile applications and ERP systems, where input and output can be transferred simultaneously is not very common today but will be used more in organizations in the future.

RQ2: “What are the potential benefits and challenges of the internal use of mobile applications perceived by mobile employees?”

The research also highlights the benefits and challenges of information integration. The major benefits recognized are:

- Mobile workers can work independently of time and place. The reason for this is that mobile workers can access information through mobile applications whenever and wherever they are.
- Increase the mobile employees’ productivity and effectiveness. This is a consequence of enabling mobile employees to work independently of time and place because employees can be more time effective for example during business travels or when working at home. The employees can individually decide when they are the most productive.
- Easier access to information for mobile employees. Employees can constantly connect to organizational information through mobile applications which is an important benefit in today’s fast changing information society.

The challenges for organizations are:

- Manage the security aspects. This is one of the main challenges for organizations since the internal mobile applications normally include sensitive organizational information. It is of importance for organizations that this information does not leak.
- To manage new organizational structures and employees’ work. Mobile organizations are challenged with new internal structures which need to be managed properly. It is a big challenge for managers to control their mobile employees since they do not meet at the office every day.
- To make it easy for the user to use the application. Internal mobile applications are normally simplified solutions compared to ERP systems and they usually only include a single process. Hence it is important to understand what functionality the employees really need and to design the interface appropriately.
6 Discussion

Here we state lessons learned, discuss future research and share implications of the research to the research field and practitioners.

As our research has evolved there have been several lessons learned, mainly within the research field, but also about conducting research itself. We found it very tough to be a pioneer in a new research field since the research maturity level is low. It requires a lot of efforts to support your research since there are no similar research available for comparison. We have also learnt a lot about working in a team and make appropriate use of our individual experiences and skills. It was very rewarding to work in a close cooperation with a company and we got a lot of good and reliable information from various experts. A lesson learned when working with a company is that they will not always have time for you which mean that you have to schedule your time appropriately. The Gantt chart was strictly scheduled which enabled us to follow the plan more or less seamlessly. However, we have learnt that no matter how well you plan your time, it is impossible to strictly keep the schedule since unexpected things will always occur.

Limitations: A challenge with this research was that the mobility field within research was new which meant that we had a hard time finding an appropriate frame of reference to support our research. Due to the fact that we used a qualitative research it made it tough to interpret the data gathered in a non-biased way because it is based on our own assumptions and interpretations. Furthermore, the fact that we had a small number of interviews in Swedish and translated the research into English is also a validity problem which we are aware of and tried to control as much as possible.

6.1 Contribution

Implications for research: To our best knowledge, there was no similar research conducted within the research field which gave us the opportunity to contribute to the research field. By reading this research, other researchers can be enlightened about the mobility field which can raise their curiousness about researching within the same field. The research will certainly reveal new opportunities for further research with another standpoint.

Implications for practice: By investigating the functionality of information integration we have realized that there are a lot of benefits and challenges that organizations must be aware of when considering being mobile. This research is important for organizations that are deploying or willing to deploy mobile workers, independent of what industry they are operating in. The major strength with this research is that it will contribute to the awareness of the need for implementing mobile business-to-employee applications that are integrated with ERP systems for organizations. Since we have realized that enterprise mobility is a trend in today’s business world we are confident that it is a perfect timing for this kind of research.
6.2 Further research

There is a need for further research within the mobility area since it is an emerging subject within the business world where companies have started to realize the opportunities mobile applications for employees can bring. Suggested examples for further researches are:

- “What technology is needed when integrating mobile applications with ERP systems used within organizations by their mobile employees”
- “How can the potential benefits and challenges of the internal use of mobile applications be managed”

Also, it is of curiosity to investigate mobility globally to be able to compare the subject between different countries and cultures. We also suggest that other research methods should be used when investigating mobility, such as quantitative data collections techniques and analyses.
List of references


Interviewees


Interviewee 5. Business Unit manager. (2012-03-26).


## Appendix 1: Gantt chart

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Appendix 2: Swedish interview questions

1. Kan du presentera dig och vad du arbetar med?

2. Hur uppfattar du användandet av mobila applikationer i samband med mobilt arbete?

3. Vad är din uppfattning när det gäller utvecklingen av mobila applikationer i samband mobilt arbete?

4. Används mobila applikationer internt för mobilt arbete på företaget där du jobbar? (Business-to-employee)
   a. Finns det fördelar med användandet av mobila applikationer?
   b. Finns det nackdelar med användandet av mobila applikationer?

5. Är de mobila applikationerna integrerade med företagets affärssystem?
   a. Finns det möjlighet för input genom de mobila applikationerna?
      i. På vilket sätt?
   b. Finns det möjlighet för output genom de mobila applikationerna?
      i. På vilket sätt?
   c. Hur fungerar integrationen?

6. Finns det möjligheter att förbättra användandet av mobila applikationer för mobilt arbete?
   a. På vilket sätt?

7. Hur kommer mobila applikationer i samband med mobilt arbete att se ut i framtiden?
   a. Varför?
Appendix 2: English interview questions

1. Can you present yourself and what you work with?

2. How do you perceive the usage of mobile applications in accordance with mobile work?

3. How do you perceive the development of mobile applications in association with mobile work?

4. Is there any usage of mobile applications in accordance with mobile work at the company you work? (business-to-employee)
   a. Are there any advantages with the use of mobile applications?
   b. Are there any disadvantages with the use of mobile applications?

5. Are the mobile applications integrated with the company’s ERP system?
   a. Is it possible to make inputs through the mobile applications?
      i. In what way?
   b. Is it possible to get output through the mobile applications?
      i. In what way?
   c. How does the integration work, functionally?

6. Are there any opportunities to make improvements with the use of mobile applications within mobile work?
   a. How?

7. How will mobile applications in association with mobile work look in the future?
   a. Why?