HAAGA-HELIA
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Developing reporting to tax authorities. Case: construction industry

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Bachelor's Thesis

Degree Programme in International Business

2013

HAAGA-HELIA
University of Applied Sciences

Abstract

26.11.2013

International Business

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Title of report Developing reporting to tax authorities. Case: construction industry	**Number of pages and appendices** 54 + 3
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Many companies nowadays have a common bottleneck: they are struggling with redundant paperwork and a lack of information. Companies in the construction industry are not an exception. Moreover, the construction industry is highly regulated, which leads to extensive reporting to the government. This research-oriented thesis aims to map the current situation in the construction industry in the wake of new supplementary reporting to tax authorities and to suggest potential solutions for a more effective approach to collecting the required data.

The thesis was carried out by means of qualitative research. The research took place in southern Finland in 2013. It included interviews and observations in two construction companies based on a theoretical analysis of business process reengineering and mobile technologies.

In the latter chapters of the thesis the current processes in the construction companies along with future developments in the case companies associated with the new requiremetns of the Finnish tax authorities can be found. The new requirements themselves are illustrated as a case background before data analysis and results.

In this research, it became apparent that mobile technologies are not widely used in the construction sector. High costs and some legal issues were considered by respondents as the main reasons for not applying mobile solutions. Nevertheless, mobile scenarios were developed in order to show an alternative proposition in business process reengineering. Business process reengineering, however, was observed in one of the construction companies and was held to be successful by this company.

Keywords
construction industry, new requirements, tax number, business process reengineering, mobile technologies, mobile devices, mobile phones

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1 Introduction

One of the important functions of a government is to create regulating aspects of their economies in order to establish public goods and services available for all citizens of that economy. Simultaneously, some people within this economy attempt to modify their activities in order to avoid those regulations. As a result, an informal economy is born which usually harms the entire society.

The main element of informal or shadow economy is undeclared work in labour-intensive sectors such as construction sector which relates to cash wages that employees and business do not report in order to avoid taxes (European Commission 2012). The consequences of these evasions are predominately a decrease in tax revenues and distortion of fair competition among firms. Since undeclared work has a negative impact on economic activity, governments try to develop measures to ban it.

Finnish economy is not an exception. According to statistical data, the size of shadow economy in Finland is 13.7 % of GDP (Schneider 2012). Thus, the Finnish government or more specifically the Ministry of Employment and the Economy took responsibility for taking measures in preventing non-observed economic activity.

The first step of the Ministry was issuing a resolution on a programme aimed at preventing grey economy on 19 January 2012. The programme consists of 22 projects governed by a number of ministries and authorities (Ministry of Employment and the Economy 14 Nov 2012).

The Ministry of Employment and the Economy has undertaken several measures, including reforming the Act on the Contractor's Obligations and Liability when Work is Contracted Out. The Act concerns merely construction sector that also suffers from non-observed activity.

According to the changes proposed for the Act, a subcontractor is to report accounts and certificates to the main contractor in the future. At the same time, the Act is to be

expanded by introduction of a tax number retainable for all construction workers. For construction companies, contractors, and subcontractors, these changes would mean additional data to be sent to the tax authorities.

The new requirements imply developing new ways of gathering and summarising information by construction companies. Thus, construction companies must rethink their existing work flows in this area and redesign them in order to achieve an effective reporting. The concept of business process reengineering introduced in the theoretical part of this thesis will describe the idea behind redesigning. The analysis of mobile solutions will present an innovative approach to business processes automation, since nowadays all companies strive to digitalise their daily activities as much as possible.

This thesis is a commissioning work that will take a look at the current processes, which take place in construction companies, and possibilities of gathering information for the tax authorities under the new regulations. The study will be combined with the research of a possible introduction of mobile solutions for construction companies instead of using other types of information technologies.

1.1 Research Question

The research question of this thesis is aimed at mapping possibilities of gathering information for the tax authorities under the new requirements. In addition, this research focuses on using mobile phones while reporting the required information. Hereby, the research question is formulated as follows:

How can needed information be collected for the Finnish Tax Administration and utilised in payroll calculation in the construction industry by integrating mobile devices?

The investigative questions (hereinafter IQs) are:

- IQ1: What payroll processes can be currently seen in construction companies?

- IQ2: How is it possible to efficiently gather information under the new requirements, so that registered information could be also utilised in payroll?

- IQ3: How could mobile phones be solution for the new reporting requirements?

The final outcome of the thesis is:

- process chart of the current situation in case companies,
- high level visualisation of future developments,
- mobile solutions scenarios.

In order to receive solid answers to the investigative questions, qualitative research was conducted. It encompassed a set of interviews with specialists and practitionists in this area and some observations on the field. In addition, the theoretical background was examined and latest research was taken look at.

The overlay matrix summarises what essential information the current thesis and research include (Attachment 1). It starts with the research question and shows the theoretical framework which is broken down to investigative questions. Furthermore, the outcome or results can also be seen from there.

An international aspect comes from the fact that research results can be helpful in other countries too. The issue of wage underreporting is delt in many countries and ways to confront it could be adopted. The current research will merely focus on the solution and practices in Finland.

1.2 Commissioning Company Introduction

The thesis has a commissioning company and case companies and they must not be used interchangeably. The commissioning company is an organisation which this study is made for. They have set the objectives and will utilise the final outcome of this research at their benefit. Case companies, however, are objects of interest where this particular phenomenon is investigated.

The thesis is commissioned by Aditro OY. Aditro offers software solutions for payroll accounting, HR and financing, along with outsourcing services, consulting and training.

Aditro as being a part of IT business are constantly in need for new solutions for their customers. Aditro aims at improving their customers' efficiency by providing digitalised automated business processes, which enable their customers to focus more on their strategic decisions. Aditro also offers tools to create access from computers, smartphones, and tablets. Moreover, Aditro assists in following the changing business environment. (Aditro 2013).

Aditro has experience in IT industry for about 45 years. It used to be a part of Tietotehdas in Finland and Kommundata in Sweden, which were established in 1968. After several mergers and acquisitions during the period of 1980-2000, acquired payroll business in Sweden and Finland was unified as one Aditro and this way current Aditro was born.

Aditro's focus is to give their customers a double-edge advantage (Aditro 2013). That means Aditro's solutions enable to increase efficiency of business activities and control processes at the same time.

Aditro has three operating models to offer, the choice of which is dependent on needs, resources and structure of each business:

- own IT development,
- purchase of a software as a service,
- fully or partly outsourcing of business processes.

Aditro underlines three core values: forward looking, dedication and human touch. Fierce competition, exploding technical development and new customer demands, customers' needs fulfillment, doing business with people are all at the centre of Aditro's activities. Hereby, Aditro's purpose is to follow new tendencies in IT development by themselves in order to offer new innovative solutions to their customers.

Aditro is also a sponsor of the Real-Time Economy of Aalto University. The core of the Real-Time Economy Programme is real-time technologies and business transac-

tions (Penttinen 2008, 2). Real-time technologies imply fast deliver of business information in a digital format.

1.3 Demarcation

Demarcation is an important aspect of every research, since it assists in focusing on essential part of the study. This study concentrates on payroll processes in the Finnish construction industry under the new requirements of the Finnish tax authorities. This research concentrates on the part where three areas – payroll, the construction industry, and the new requirements – intersect. All processes that do not take place on construction sites and do not interfere with the payroll activities in the construction industry are excluded. Also, all these aspects are considered in the context of innovation. The demarcation can be clearly seen from Figure 1.

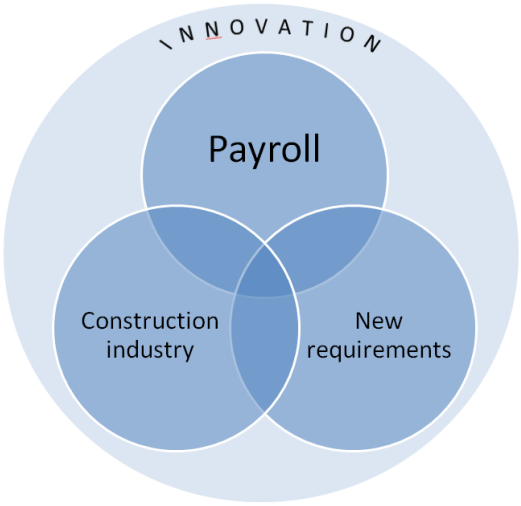

Figure 1. Demarcation

1.4 Benefits to Stakeholders

Stakeholder 1. Commissioning company. Aditro will get a solid picture of reporting procedure to the tax authorities in the construction sector and will receive ideas of possible integration of these processes to a mobile application. They can utilise the thesis outcome for updating their accounting information and improving basis for salary calculations. Moreover, mobile solution aspect corresponds with their plans to use some mobile phone application in their company as well.

Stakeholder 2. Case companies. These construction companies would obtain future benefits from cooperation with the commissioning company.

Stakeholder 3. Tax authorities. The tax office will also gain benefits in the form of an inside look of current processes in construction companies.

Stakeholder 4. The author. As for myself, I will gain new insights in business process reengineering and how business processes can be improved within one company by introducing a new IT.

1.5 Key Concepts

The following chapter summarises key concepts that are used throughout the thesis. The concepts are discussed more thoroughly in the next chapters.

Business Process Reengineering (BPR): the analysis and design of work flows and processes within and between organisations (Davenport & Short 1990, 11).

Business Processes: a structured, measured set of activities designed to produce a specified output for a particular customer or market (Davenport 1993, 5).

Enterprise Resource Planning (ERP): an enterprise-wide software solution that integrates and automates business functions of an organization (Leon 2008, 14).

Mobile technologies. The most common definition of mobile technologies relies on the common understanding that they must have one common feature – wireless communication (Stanoevska-Slabeva 2004, 2).

Mobile computing. It consists of three major components: computers, network and mobile applications (Chen & Kamara 2007, 9).

Tax number: a number given to all working citizens in Finland and utilised only if a person works on the construction site.

2 Innovation Context

Innovation in this work refers to introducing new information technologies to construction companies. Business process reengineering and mobile solutions are two approaches to implementing new technologies in an organisation. This chapter describes these two theoretical concepts and presents the case background for this research.

2.1 Business Process Reengineering

This subpart of the thesis brings into light the concept Business Process Reengineering (BPR), its relationship with the Information Technology (IT), and different approaches to BPR.

2.1.1 Business Process Reengineering in a Nutshell

Business Process Reengineering can be defined in many ways. Hammer and Champy (in Beugre 1998, 348) suggest it is "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical measures of performance such as cost, quality, service, and speed". Dixon, Arnold, Heineke, Kim and Mulligan (1994, 94) look at BRP as "the combination of emerging technological capabilities and evolving market demands".

Davenport and Short agree with Beugre's definition and state that cost and time reduction, improved output quality, and quality of worklife are the key objectives of BPR (Davenport & Short 1990, 14). Already in 1990, Davenport and Short (1990, 12) consider IT as a powerful tool in BPR and encourage individuals and companies to reshape processes around IT, since they are the natural partners from their point of view. Davenport and Short were not alone in advocating for IT in BPR. Venkatram (Venkatram 1994, 73) creates five levels in IT-Enabled Business Transformation and states that IT will have a huge impact on businesses.

Business processes are well defined by Pall (in Johansson, McHugh, Pendlebury & Wheeler III 1993, 209) as "a set of logically related tasks performed to achieve a de-

fined business outcome". Examples of these tasks are developing a new product, ordering goods from a supplier. Davenport itself has a similar definition which also makes a strong emphasis on how work is done and not on what is done (Davenport 1993, 5). This characterisation of business processes is typical for BPR researchers and is grounded on achieving competitiveness in the market.

The critical question to BPR is timing, when BPR should take place. N. Venkatraman (1994, 78) suggests following critical questions to be exploit before implementing BPR:

1. What is the rationale for the current process design?
2. What significant changes in business processes are occurring in the competitive marketplace?
3. What are the costs of continuing with the status quo?

The first question should indicate strengths and limitations of process redesign. Consequently, if limitations exceed strengths, redesign would not be beneficial. The answer to the second question should represent an analysis of possible impacts on company's competitiveness. A company should assure that the changes will take place in its key business processes. The third question is concerned with the timing of implementation of a new IT. If current processes are already costly, the pace of the redesign should be increased.

2.1.2 Example of a Successful BPR

Michael Hammer (1990) discussed a triumphant case of BPR in the American company Ford. The redesign took place in the Accounts Payable department, where more than 500 people were employed. In order to cut costs, Ford took as an objective to reduce the head count by 80 per cent. They started with analysing their existing system, which is shown in Figure 2.

First, the Accounts Payable department received a purchase order, receiving document and invoice agreed. Then they had to check whether all documents corresponded. If they did, the settlement was made. In case of mismatches, they needed to investigate

discrepancy and hold payment. The investigation was a time consuming process, therefore Ford decided to adapt "invoiceless processing".

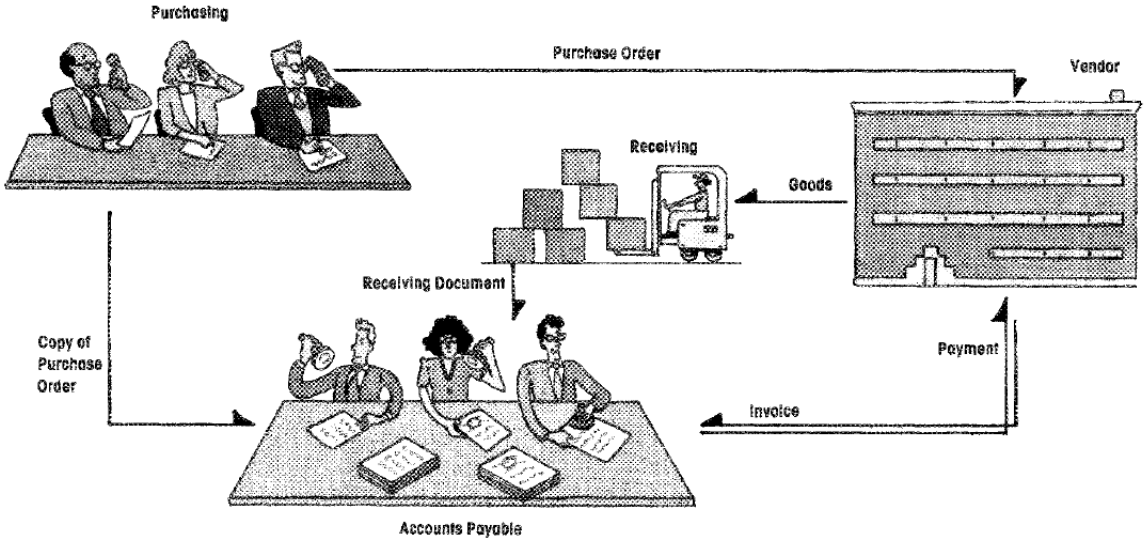

Figure 2. Ford's Accounts Payable before BRP (Hammer 1990, 106)

The process was improved by integrating on-line database, where the purchasing department placed the order. When goods arrive, a receiving clerk checks the database whether goods match the purchase order. Then he approves or disapproves them by using a computer system (Figure 3).

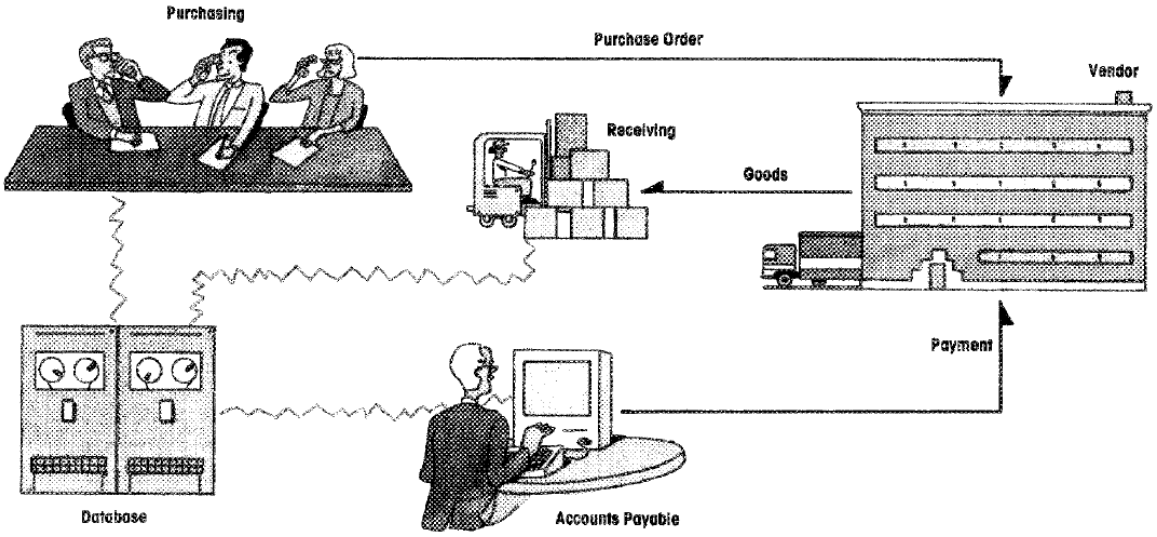

Figure 3. Ford's Accounts Payable after implementing BRP (Hammer 1990, 107)

As a result of this radical change, Ford achieved a 75 % reduction in head count and more financial accuracy, since there were no discrepancies.

2.1.3 Revolutionary and Evolutionary Theories of Change in BRP

Business process reengineering is all about change in the organisation, which is aimed at achieving radical business improvement. There are different approaches to BPR. This subchapter will take a look at two opposite ones: revolutionary and evolutionary approaches.

The revolutionary approach implies a radical change in redesigning business processes. The main characteristics of the revolutionary approach are a top-down direction and impulse from a performance crisis (Jarvenpaa & Stoddard 1998, 16). A top-down direction means that a senior management must initiate and drive the change by communicating right vision and establishing right culture. The active participants and leaders, as well as consultants, are chosen from outside organisations, since they can be objective about the status quo. The crisis serves as main motivator in designing the change.

The major advantage of revolutionary approach is pace. The change is accomplished quickly, since there is a crisis to be dealt with, and absence of active communication among employees accelerates the process. However, the biggest disadvantage of revolutionary change tactic is an increased project risk. Employees do not take an active part in redesigning process and must accept the new organisation imposed from senior management. This can lead to chaos and a loss of identity. (Jarvenpaa & Stoddard 1998, 17).

The evolutionary approach can be justified as a human reengineering. It focuses on soft factors such as people, values, and behaviour. In other words, evolutionary theory of change represents the sociotechnical change approach. Employees are in the centre of change and hence they adjust the change according to their pace and capabilities. The communication is active and wide. The initiative about the change comes from the internal dissatisfaction and willingness to improve existing processes. There is no need

for hiring outsiders, as change is managed by the current management and employees. (Jarvenpaa & Stoddard 1998, 16).

The absolute strength of the evolutionary approach compared to the theory of change is orientation on people. When employees are fully involved in the process, the risk of failure is mitigated, since employees have control over the change. The overall organisational capacity is brought together enabling acknowledging every single step. The main limitation of evolutionary approach is, however, time. Accomplishing the vision is time-consuming. Since the suggested changes unfold incrementally over a long period of time, participants might lose a sight of motivation, which can lead to a failure.

2.2 Mobile Solutions

This study will partly have its focus on designing mobile solutions for construction workers in order to simplify the process of their working time recording and reporting to accounting department. Construction workers can be classified as mobile workers. According to Anker (in Wang, de Kar, Meijer 2005, 582), mobile workers are those whose job can be merely accomplished in a 'mobile environment', which refers to the user's mobility and the absence of wired infrastructure for telecommunication. Moreover, they do not have an office where they keep records of their contacts, their addresses and phone numbers. Therefore, construction workers have characteristics of mobile workers, and designing mobile solutions for them can be justified.

Anckar and D'incau (in Wang, de Kar, Meijer 2005, 582) have determined five different situations where mobile value can be created: time-critical arrangements, spontaneous decisions and needs, entertainment needs, efficiency ambitions, and mobile settings. In case of construction workers, only last two can be relevant. Mobile solutions can make the process of reporting more efficient and less time consuming in a mobile environment for mobile workers. Furthermore, mobile solutions will bring innovative ways for an organisation where according to Tsai (in Wang et al. 2005, 582) "the traditional limitations of time and space are disappearing".

Mobile solution is a wide term which take into account all mobile devices and mobile technologies. Next chapter takes a look at different terminology in the field of mobile technologies.

2.2.1 Mobile Technologies

Mobile technologies can be seen as prerequisites for developing mobile solutions and can be an integral part of a mobile device computing. In order to clearly understand the benefits of mobile technologies in the construction industry, main features of mobile ICT are introduced in this subchapter.

Most common definition of mobile technologies relies on the common understanding that they must have one common feature – wireless communication. Mobile technologies can be classified by components they have, a type of communication they enable. Thus, mobile technologies may have Bluetooth, WLAN, personal digital assistance, Remote Frequency Identification tags. Moreover, mobile phones technologies allow three types of communication: person-to-person, person-to-machine, and machine-to-machine. (Stanoevska-Slabeva 2004, 2).

2.2.2 Characteristics of a Mobile Device

Mobile solutions can be performed through such mobile devices as mobile phones, i-pads, and mobile gadgets. Mobile technologies impose some disadvantages compared to personal computers such as small screens, limited memory, computing power, inconvenience to input data. Those disadvantages are outweighed by mobile technologies' ubiquity, identification, localization, and immediacy. (Stanoevska-Slabeva 2004, 3).

The advantages of mobile technologies could be complemented by characteristics of a mobile device which can be seen as advantages as well. Paavilainen (2001, 71) brings three relevant characteristics of a mobile device that can be significant for mobile business and indicate usefulness of the mobile ICT for construction workers.

- Convenience. This characteristic relies on a small size of mobile devices and their portability. Mobile phones, for instance, can also compete with their small weight. They are easy to use so users do not need to have any prior experience.
- Instant connectivity. This characteristic corresponds with immediacy brought by Stanoevska-Slabeva (2004, 3).
- Intimacy of a mobile device. This characteristic is extremely significant for marketing purposes. Mobile phones can be customised according to specific preferences of a single user.

2.2.3 Mobile ICT in the Construction Industry

First studies on mobile ICT in construction appeared even before 2000 but research was rather occasional. Only after the year of 2000 the review of prototype solutions increased (Suman, Ursic, Psunder & Veselinovic 2009, 401). Furthermore, some work has been done already in order to identify factors that affect ICT adoption for improving performance in the construction industry (Suman et al. 2009, 398). Mobile ICT can be used in construction sites in order to reduce construction costs and time, defects, accidents, waste, operation, and maintenance costs. Therefore, the scope of mobile technologies can be very vast and they can serve different purposes.

The construction sector with all its characteristics represents a set of challenges for ICT adoption. Nevertheless, Abrahamse and Lotriet's (2009) explored a need for the introduction of a new ICT and specifically of mobile devices in the construction industry:

- Managerial employees need to access email from construction site.
- Employees on construction site need to access head-office information resources and in-house administration system.
- Employees on construction site need to send or report some information to head-office and to the in-house registration system.

According to Paavilainen (2001, 144), companies with multiple construction sites suffer from "inefficiency and underutilization of assets" due to communication failures.

Therefore, mobile ICT could be useful in the construction sector. Mobile employees cannot take personal computers to construction sites, so mobile devices with their advantages could be a solution from Paavilainen's view point.

Consequently, mobile ICT represents the following benefits for construction companies:

- Mobile solution can make construction business more effective (Paavilainen 2001, 144), since working hours and activities can be automatically processed and distributed to the project management. The management can identify the progress of the project and receive immediate information to their budgets.
- Construction information management can be also greatly benefited from the advances in ICT. The speed of information flow can be increased, efficiency and effectiveness of information communication can be enhanced, and thus cost of information transfer will be reduced (Chen & Kamara 2007, 7).

Suman et al. (2009, 401) have collected different applications that were developed for the construction industry. They are:

- on-site inspection-oriented applications,
- navigation through drawings,
- web-based punch-list-like application,
- piling operations,
- mobile sensoring,
- on-site communication and cooperation,
- dynamic date-driven web application,
- dynamic communication environment-DyCE.

That implies that mobile ICT in construction industry has been considered and several attempts were done in order to implement it and design mobile solutions for different problems.

2.2.4 Mobile Technology Adoption

Abrahamse and Lotriet (2009) have utilised a pre-conceptualised theoretical framework for mobile technology adoption. In their research, they have collected different contexts specifically relevant to the mobile ICT adoption at the construction site and with the help of the previous studies developed further the framework on the example of a specific construction company in South Africa. (Figure 4).

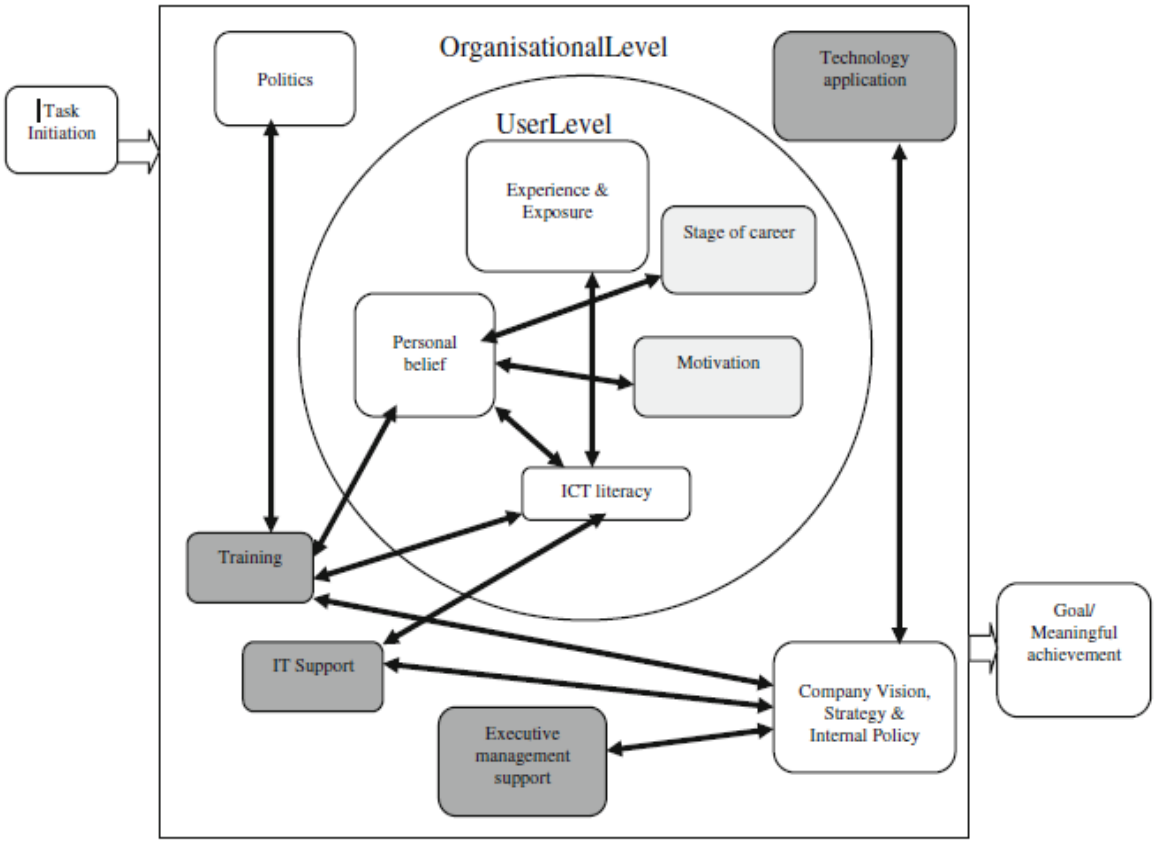

Figure 4. A theoretical framework of the mobile computing adoption and diffusion issues within the specific construction company in South Africa (Abrahamse & Lotriet 2009, 76)

The framework has clear similarities with ICT implementation constraints in the construction industry introduced by Peansuapp and Walker (2006). Both frameworks pinpoint organisational adoption and business result gaps. The organisational adoption relates to a lack of experience in ICT and resistance among employees. A wrong evaluation of ICT benefits can result in failing to achieve the desired business goal. Moreover, Peansupap and Walker have included ICT investment decision as an important

ICT implementation constraint, which definitely has to be taken into account in our study as well.

Challenges on the technical level in the construction industry can be found in the work of Stanoevska-Slabeva (2004, 12). She points out that machine-to-machine communication still needs to be included in existing interfaces. Furthermore, security concepts for mobile access are to be developed.

Mobile applications for employees are similar to the e-business component – Intranet. Hence, they incorporate same advantages such as new ways of information sharing among employees and remote working. Luff and Heath (in Stanoevska-Slabeva 2004, 10) have suggested three types of mobility in enterprises:

- Micro-mobility, which relates to the sharing of documents in an office.
- Local mobility that refers to employees' mobility between rooms, floors and buildings.
- Remote mobility, which is associated with employees that work remotely away from offices. Lyytinen and Yoo (in Stanoevska-Slabeva 2004, 10) argue that remote mobility is the most challenging to support.

2.2.5 Mobile Computing

The concept of mobile computing has been considered to consist of three major components: computers, network and mobile applications (Chen & Kamara 2007, 9). In an enterprise, for a full automation it is necessary to link mobile devices to existing operating systems which is frequently located in computers. A combination of all three components will enable to increase benefits of mobile technologies in organisations.

Chen and Kamara also identified nine requirements for mobile computing:

- mobility of hardware,
- durability of hardware,
- compatibility of hardware and operating system,

- compatibility of data between the mobile devices and PC,
- expressivity of display,
- stability of system,
- operability of user interface, processing speed,
- continuous computing environment.

The list can be supplemented with Abrahamse and Lotriet's (2009) practical mobile computing related requirement on basic ICT literacy and ICT application knowledge.

Chen and Kamara (2007) developed a model that investigates how mobile computing can be used at construction sites to manage on-site information (Figure 5).

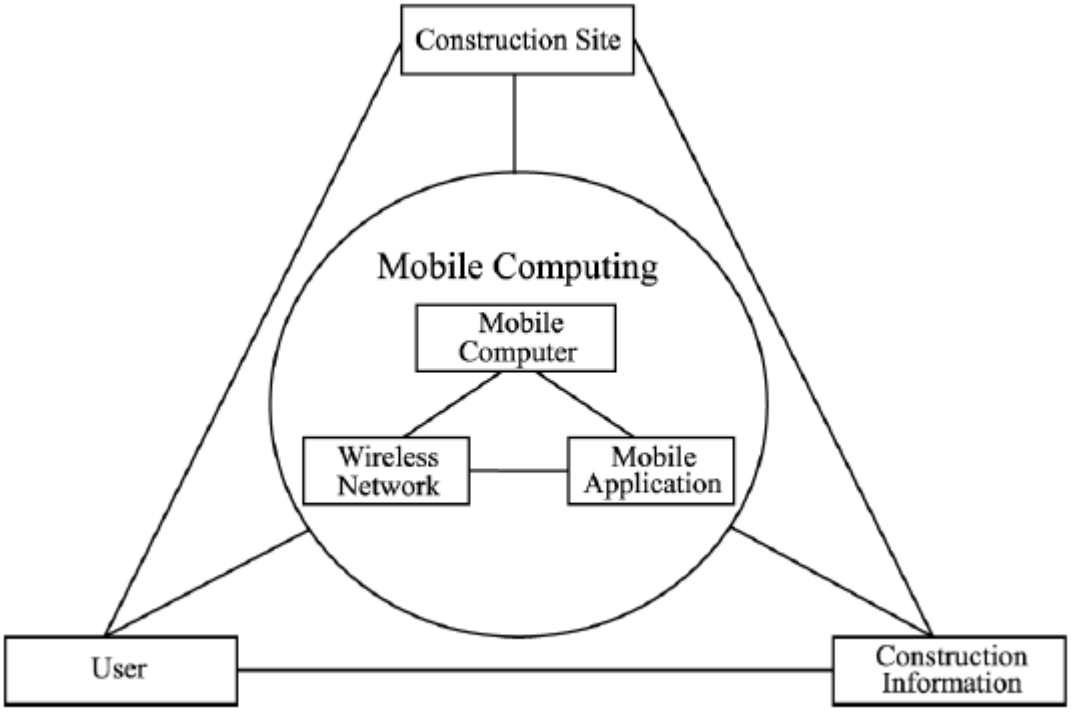

Figure 5. The framework of using mobile computing in on-site information management (Chen & Kamara 2007, 13)

At first, they suggest using a framework of using mobile computing in on-site information management, which identifies three independent factors - 'users', 'construction information', and 'construction site', and three dependent factors – 'mobile computer',

'wireless network', and 'mobile application'. The independent elements determine the use of dependent factors, which are the core features of mobile computing.

The framework can be expanded further and interrelationships between different factors can be explored. Since managing construction information is in the foreground of our study, it was placed in the center and its interralationships with dependent factores are described in depth further (Figure 6).

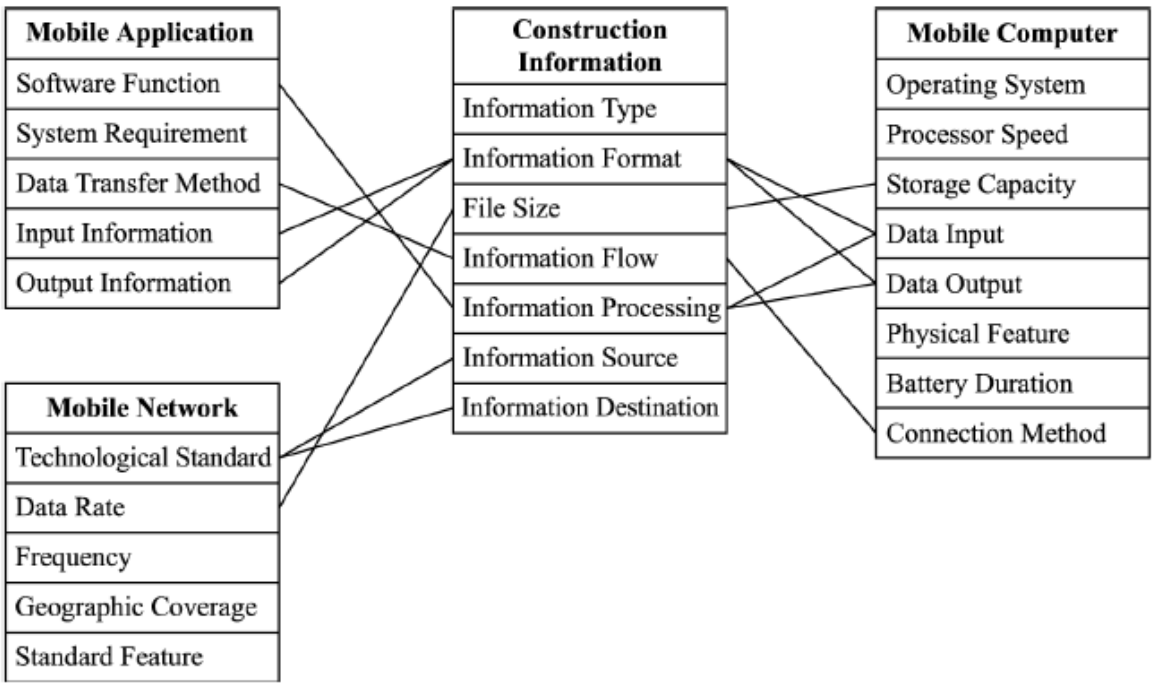

Figure 6. Interrelationships between construction information and mobile computing (Chen & Kamara 2007, 13)

Construction information and mobile application. The type of information will determine the type of mobile application needed. More specifically, information format has its impact on data input and output. Recording working hours is numerical data transfer and it does not require large screen requirements with, for instance, zoom in, zoom out functions. Information format, processing and flow have their influence on software perspective. Moreover, the function of a mobile application should depend on information processing requirements. User's information processing activities, when entering working hours, could calculate the total amount of hours worked based on starting and ending time or based on a specific cost center. Information flow is

concerned with the place where the data is tranferred. Working hours can be sent to supervisors first or directly to the office. The proximity will determine the data transfer method.

Construction information and mobile network. The choice of a mobile network should take into account a file size, an information source and an information destination. The technological standard should be selected dependend on the source and destination of information. If the source of information are construction workers that are on sites and destination is office workers, wireless network would not be available and then cell phone network could be used instead. Data rate should fulfil the requirements of a file size in such a way that the transactions are reliably made without delays.

Construction information and mobile computer. This relationship focuses on how the mobile computer provides construction information to users. As discussed earlier, the format of construction information influence output and input methods. The input methods of mobile computers include a keyboard, a touch-screen method, and voice recognition. Hence, the effectiveness and convinience of the input methods of a single mobile device should be analysed. Other factor that affect the selection of a mobile computer is storage capability. The selected mobile device should be able to store necessary information files.

2.2.6 Selecting Mobile Computing Strategy

Reengineering the information management process must be accomplished with the help of the right strategy. Chen & Kamara (2007) introduced mobile computing strategy matrices. This model is suitable for those who use paper-based information exchange and aim at moving to the digital information exchange interface. The matrix suggests different strategies, the choice of which will depend on company's needs and resources.

The matrix supposes that the current situation of the on-site information management is a paper-based communication, and, in addition, management activities are not automated. The matrix characterises the desired position as adapting a digital information

transfer and a use of the mobile computing on sites. In order to achieve the desired position, three strategy choices are offered. The first one considers the use of already existing application on market. The second strategy is similar to the first one but it includes using wireless connection for data transferring. The third strategy stresses designing mobile application software with the respect of specific construction situations and features of different information management processes (Figure 7).

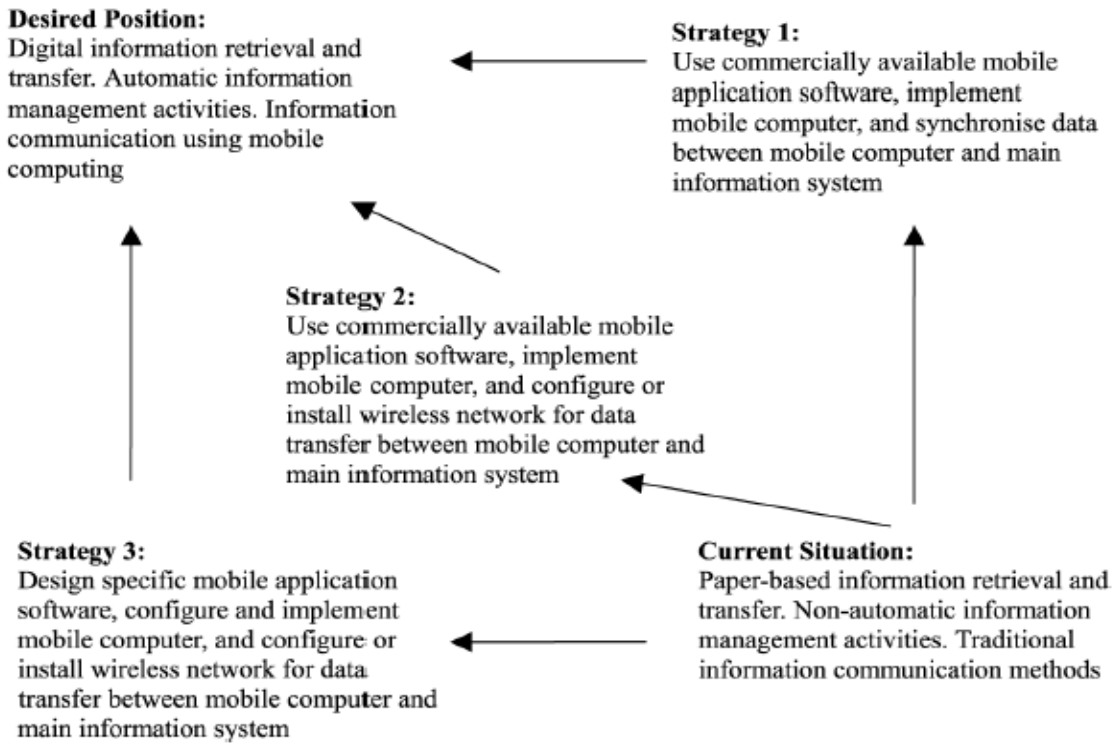

Figure 7. The mobile computing strategy matrices (Chen & Kamara 2007, 17)

2.3 Case Background

This subchapter will introduce the construction industry in short and provide information about new legal amendments and new reporting requirements in the construction sector.

2.3.1 Construction Industry

The situation in the construction industry in Finland began deteriorating in 2012. Construction investments reduced by 3 per cent and building construction investments fell by 4 per cent. 14 per cent fewer construction permissions were given compared to the

year 2011 (The Building Information Foundation 2013, 9). The overall outlook in the construction sector has a direct impact on investments in technical infrastructure.

May, Mitchell, Bowden and Thorpe (2005, 255) has established in their research that the construction industry is characterised as being slow to adopt innovative mobile technologies, despite the highly mobile employees and a use of large volumes of information. They also conclude that the uptake of innovative IT within the construction sector is disappointing (Anumba, C.J. in May et al 2005, 255). Some seminars in Helsinki in 2005 such as VAMOS (Value Added Mobile Solutions) of the Tekes also showed that construction industry was hesitant to use mobile ICT (Leskinen 2006, 11).

Moreover, May et al (2005, 255) pinpointed some challenges of the construction industry regarding the up-take of the new information technology:

- physical environment within which the technology must operate successfully,
- the variable levels of education and training of some of the workforce,
- multiple stakeholders collaborating off and on sites.

Physical environment can be diverse by its nature; nevertheless technology must be developed effectively, so that the benefits of the implemented technologies could be enjoyed. Employees are the ones who use all technologies in the first place, therefore their education and training are crucial for the IT adoption. Quite many different stakeholders are involved in the working process in the construction sites. They are project managers, customers, employees etc. Without well planned collaboration, the IT implementation would not be possible.

2.3.2 Act on the Contractor's Obligations and Liability when Work is Contracted Out

The Act on the Contractor's Obligations and Liability when Work is Contracted Out (hereinafter the Act) came into force on 1 January 2007. The aim of the Act was to ensure that terms of employment are followed and subcontractors or other temporary

agencies perform their statuary obligations. (Ministry of Employment and the Economy 2013.)

The main aspect of the Act is that a prime contractor must gather information about his subcontractor before entering into a contract. Specifically, the main contractor must make sure that the counterparty is in the Prepayment Register and the Employer Register, and is registered as VAT-liable in the Value Added Tax Register (Contractor's Obligations and Liability when Work is Contracted Out 2011, 7). Additionally, the main contractor must check whether the counterparty pays its taxes and settles pension insurances, along with accident insurances. With these measures, the government wants to ascertain that the activities of counterparties are legal and do not contradict the legislation.

Moreover, the contractor must submit an account of the applicable collective agreement of their contracting parties. Alternatively, the principal terms applicable to work can be checked instead. They include the employee's main tasks and duties, the wage payment period, regular working hours, determination of annual leave, a period of notice, and others (Act on the Contractor's Obligations and Liability when Work is Contracted Out 1233/2066).

Furthermore, the contractor is obliged to notify a shop steward and a personnel representative of any contract concerning temporary agencies or subcontracting workers. The contract must identify the number of workers to be used, details of the enterprise hiring workers, the work site, the tasks involved, the duration of the contract, the collective agreement applicable to temporary employees.

The Act applies when the total duration of work which a temporary worker must perform is more than 10 days or the amount of subcontract is bigger than EUR 7,500 excluding VAT.

In case a contactor fails to meet the obligation to check, a negligence fee will be imposed on him. The amount of the fee varies between EUR 16,000 and EUR 50,000

depending on intentional nature, achieved benefit, frequency, the value of the contact, and some other circumstances.

The Act is supervised by the occupational safety and health authorities who have right to check work places and request needed information.

2.3.3 Tax Number

The Act was expanded in 2012 by introducing individual tax numbers. Tax numbers were assigned to all people working on construction sites in Finland with the delivery of tax cards. From September 2012, all construction workers must have their identity code with a tax number displayed on their name tag. Additionally, the tax numbers are entered in the Tax Number Register. Main contractors must assure that their own employees and their subcontractors' employees are in the tax number register before they begin their work. (Finnish Tax Administration 2013a).

2.3.4 New Reporting Requirements in the Construction Industry

Tax numbers alone will not be sufficient to effectively control underreporting activities in the construction sectors. Consequently, from July 1, 2014, according to the Act governing tax administration (363/2013 and 364/2013), the customers must deliver information to the Tax Administration on construction contracts and contractors, and the main contractor must notify information on persons working at a construction site. (Tax Administration 2013b.)

The contract information must include details of the contract (contracting parties, total amount, and duration) and transaction data related to the contract (the amount invoiced during the reporting period). The employee information must contain details of an employee including their tax numbers and information on construction sites he works on. The detailed list of reporting information can be found on the website of the Finnish Tax Administration (Finnish Tax Administration 2013c). The process of reporting is shown in Figure 9.

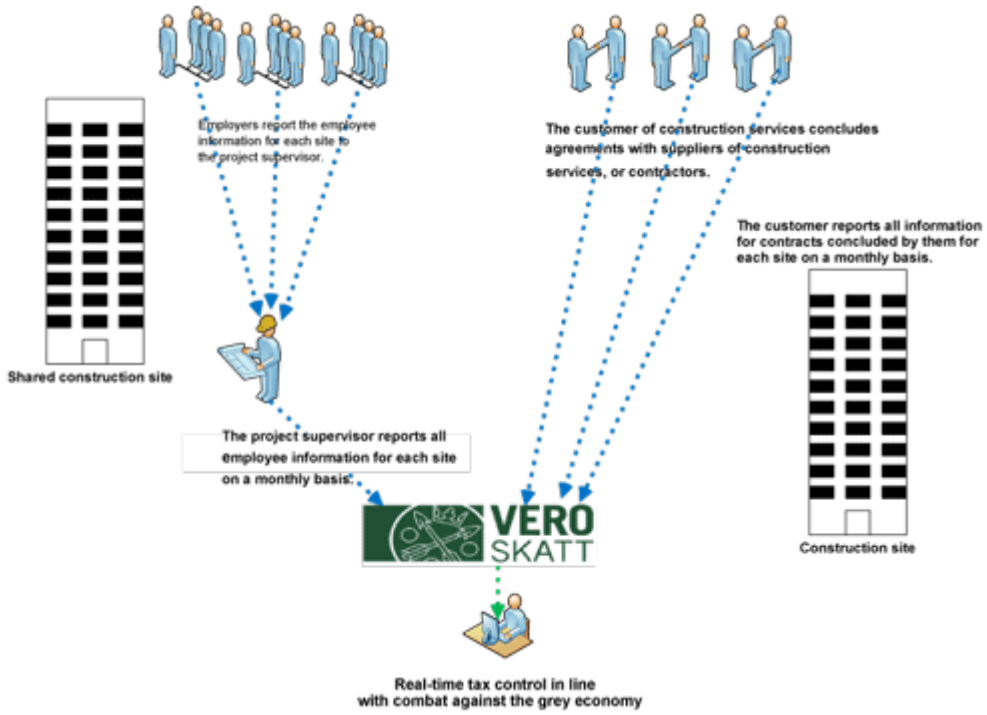

Figure 9. Parties to report to the Tax Administration (Finnish Tax Administration 2013b)

The Tax Administration is planning to develop an internet service where construction companies can send required information electronically. The specification for direct data transfer and e-filings can be found on the website of the Finnish Tax Administration (Finnish Tax Administration 2013d).

3 Research Methodology

The qualitative research method was selected in order to describe the current processes with future applications in the construction industry and develop mobile phone scenarios. Qualitative research does not employ any measurement and thus no quantitative data is collected in qualitative approach (Bryman & Bell 2003, 28). According to Saunders, Lewis and Thornhill (2007, 472), the qualitative data is based on meanings derived from words, and collected result requires classification into categories. The aim of this research was to describe or map the processes and, upon the understanding the current situation, to develop mobile phone scenarios. Since a need for collecting numerical data was missing, qualitative research was chosen. The collected material was grouped into categories, so it could be meaningfully analysed. The research included a study area analysis, where different sources that discussed business process reengineering and mobile technologies were reviewed by using a desktop method, and the field research, which comprised interviews, observations, and collected data analysis.

3.1 Research Design

The research started with formulating the objective of the thesis, which were followed by a research question formulation. Then the secondary data analysis began. Appropriate theories and models were collected in order to utilise them furthermore in the field research. Existing theory concepts helped place focus on what needs to be interviewed in the first place. In the field research, first, the search for case companies was done. Several big construction companies were contacted and as a result an interview with the representative of the company Lujatalo was appointed. The first interview was designed for the development manager of Lujatalo. After the interview had taken place, the observation of Lujatalo's construction site was made. Thereafter, an interview with the site supervisor was conducted. For receiving an opposite picture, the smaller construction company Pinta-Asennus, namely Lujatalo's subcontractor, was included in the research and one of their supervisors and accountant were interviewed. After the interviews, all data was analysed and the final outcome of the thesis was done along with necessary conclusions. The research design model can be seen in Figure 8.

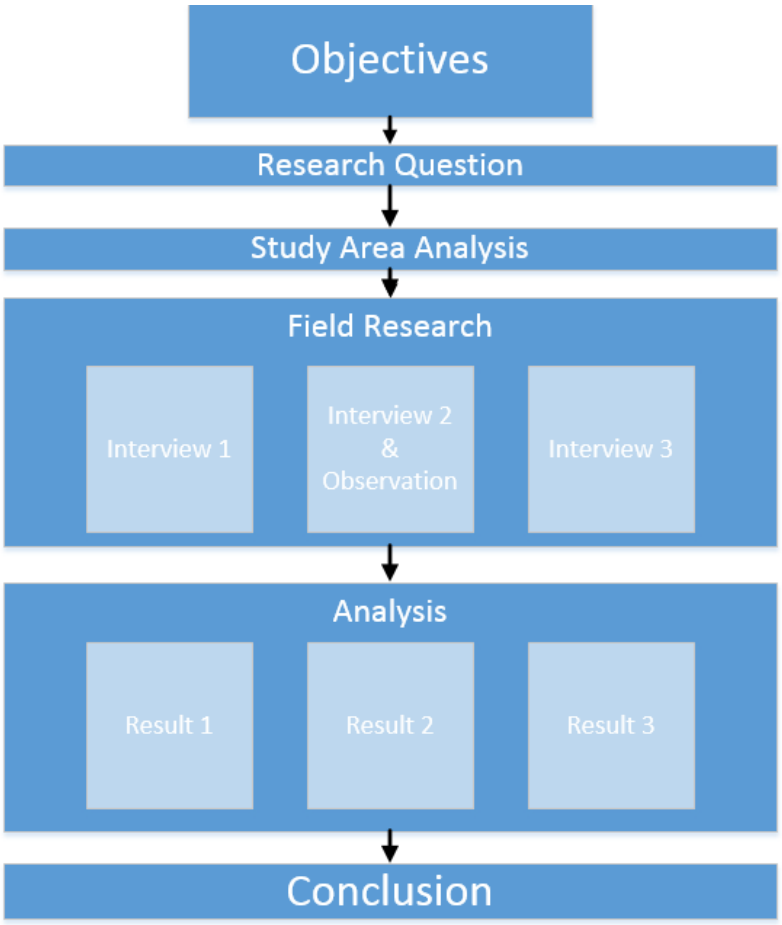

Figure 8. Research Design Model

3.2 Case Companies

The current study had two case companies where the entire research was conducted. The first and bigger case company was Lujatalo OY and the second was Lujatalo's subcontractor Pinta-Asennus OY.

3.2.1 Lujatalo

Lujatalo OY is a part of Luja Group, which is one of the biggest construction concerns in Finland. The Luja Group consists of Lujatalo Oy, Lujabetoni Oy and Fescon Oy and two subsidiaries Lujabetong Ab in Sweden and OOO Lujabeton in Russia. Luja Group operates nationwide with about 1600 top professionals. Luja is a sustainable progressive enterprise in the construction industry and, in addition, a manufacturer of concrete and dry mortar products. Lujatalo is a developer of both residential and commercial properties. Luja's turnover in 2012 was EUR 434 million. (Lujatalo 2013.)

Lujatalo was chosen as one of our case companies due to its size and awareness of the future requirements in the construction industry.

3.2.2 Pinta-Asennus

Pinta-Asennus OY is a small company located in Pirkanmaa. Its services range from floor, carpet, parquet installation, and tiling. It has 26 employees at its service and 50 years of experience (Pinta-Asennus 2013). Its turnover was about 5 million euro in 2012 (Finder 2013). Pinta-Asennus was chosen as our case company due to its size and its business relationship with Lujatalo.

3.3 Research Tools

The research process contains interviews with the case companies and is accompanied with some on-site observations. The research started in spring 2013 and continued in autumn 2013. The following subchapters take a look at the process in more detail.

3.3.1 Interviews

All interviews are shortly presented in Table 1.

Table 1. Schedule of interviews

Name of the interview	Company of Interviewee	Position of Interview-ee	Date of interview	Dura-tion
Interview 1	Lujatalo OY	Development Manager	19.04.2013	1 hour
Interview 2	Lujatalo OY	On Site Supervisor	10.06.2013	0,5 hour
Interview3	Pinta-Asennus OY	Accountant Supervisor	04.07.2013	0,5 hour

The interview framework was designed after secondary data analysis. In total three face-to-face interviews were conducted with 4 people. The first two interviews were made at Lujatalo in April 2013 and June 2013. The first interviewee was a development manager who was aware of the new system implementation at Lujatalo. The second interview was also made with a Lujatalo's employee but already at the construction site.

The third interview happened Pinta-Asennus in June 2013 with their accountant and supervisor. All interviewees were carefully selected according to their awareness and degree of involvement in the new requirements' projects.

An interview guide was created in advance before the interviews (Attachment 2) and it included questionnaires, therefore so called structured interview was conducted (Saunders et al 2007, 312). This type of the interview was chosen, since some particular questions needed to be answered and those answers could be categorised at once. The interviewer administered and led the conversation. Categorisation was significant, since three different outcomes needed to be reached. The same interview framework was used in the first and the third interview. The second interview with the Lujatalo's supervisor clarified questions which were not answered in the Interview 1. The initial interview took place in Espoo, at the Lujatalo's office, the second interview in Kangasala at the Lujatalo's construction site and the third one in Lempäälä, at the Pinta-Asennus' office. The duration of interviews varied from 30-60 minutes. All interviews were recorded and a transcript was made afterwards.

3.3.2 Observations

The observation was made in compliance with the second interview which was on the construction site. The duration of the observation was about 30 minutes. It started with the overview of the construction site, continued in supervisor's office, where different software was look at, and ended in employees' resting booth, where a time recorder was located. Some screen shots of Lujatalo's software was done as a result. While observing, the researcher did some notes and spoke with some employees but mostly with the supervisor.

The analysis of the collected data was made during the summer of 2013 and continued in the autumn of 2013. The data analysis came from the conducted interviews, observations, screen shots, and emails that were received after interviews. The responses of the interviewees were reviewed and, based on their answers, the processes in their construction company was visualised in the form of the process charts with the help of the Microsoft Vision Drawing. The mobile phone scenarios were elaborated from the

framework of mobile computing of Chen and Kamara (2007) introduced in the theoretical framework and from the researcher's own visions of digitalisation which was acquired from conducted interviews and author's working experience in the financial department.

4 Results

Interviews and observations were the main methods for collecting the primary data. Interviews were aimed at receiving a detailed picture of processes at the chosen companies. Observation's purpose was to visualise the situation in the construction industry.

4.1 Interviews

All interviews were designed in such a way that they would fit to the position of the interviewees and could be categorised to our selected topics. The first interview was reviewed further on in order to get additional data to the data already received. The third interview was a combination of the first and the second one, since two people were interviewed at the same time with the similar positions of the first two. The following chapters will discuss different categories used in the interviews.

4.1.1 Enterprise Resource Planning System

The first set of questions discussed the enterprise resource planning system (ERP System) that was implemented by companies. Lujatalo is a big construction company and due to that it has a comprehensive financial department system Microsoft Dynamics. All other secondary softwares are connected to the Dynamics System. Compared to Lujatalo, Pinta-Asennus utilises a construction software solution Jydacom. Jydacom is a software provider for construction industry which solutions range from cost estimation and control to eBusiness. The difference between these two models is that Lujatalo has a separate payroll software, whereas Pinta-Asennus' payroll is a part of Jydacom system. However, Lujatalo has integrated their payroll solution to the Microsoft Dynamics, which means that these two systems communicate with each other. Both interviewees were satisfied with the functioning of their softwares and told that they do not impose any problems related to payroll.

The interviews also contained questions about tax numbers. Both interviewees confirmed that tax numbers were not in use in their ERP and payroll systems and they need to check them separately at the Tax Authorities' internet service.

4.1.2 Tracking System

From the initial contact with Lujatalo that was made by the phone, it was found out that Lujatalo was implementing the tracking system in their construction sites. In connection to that, the interview with Lujatalo's development manager includes questions about the tracking system. The tracking system in our research is also called a punch clock, time clock, a clock card machine or time recorder. All Lujatalo's employees need to check in and check out by using a punch clock when starting and finishing their shifts. Then this information is recorded and saved in an electronic form.

The decision to integrate tracking system, which is also called Access Control System (ACS) by Lujatalo, was made after Tax Authorities' announcement for possible stricter control of employees on construction sites. In order to exclude excessive manual work, it was decided to integrate a time recorder, which is to ease the collection of needed data for the tax office. The ACS is a software based time and attendance system that has a back-up which can be integrated with payroll software. The ACS relies on computer and check in terminal which are connected to each other via network. Two construction sites in Tampere and Jyväskylä were used as test areas for a clock card machine. For setting up the Access Control System, a service provider was selected. The service provider developed a suitable tracking system for their customer. The Access Control System by the time when the research was done did not have any interface with Lujatalo's internal systems such as Microsoft Dynamics or payroll software and that was one more task for service provider to work on.

4.1.3 Processes on Construction Site

A set of questions was also related to processes on construction sites. There is a supervisor in all construction sites. Big construction sites might have 4-5 supervisors at the same time. The working day starts with a supervisor assigning working tasks to their

employees. Subcontractors' workers usually come later to the site. If it is a new employee, ID and tax number is requested during familiarisation. Data is filled in the IT system called 'Kohdetiedosto' where personal information and persons' association with multiple sites are stored. From there, the list of personnel on site can be received. Tax number verification is done by clicking 'vero.fi tark' –button, and then the web site: www.vero.fi/vere/Tarkistus/VeronumeronTarkistus.aspx opens and there employee's tax number can be checked by typing the tax number and giving person's last name. At this stage, a problem might arise as the web site recognises three first letters of the last name and therefore two people with the same surname can be confused.

Usually own workers have their tax numbers checked beforehand, meaning that a supervisor makes sure in advance that his workers are in the tax number register. However, the situation might be different with subcontractors' workers. In case a person or a number is not listed in 'Veronumero.fi', subcontractors need to request it from the Tax Administrator. This could lead to a delay of the starting of the work by 24 hours. Own workers' information has to be input in the Access Control System so far, since there is no interface between ACS and their internal systems.

Since Pinta-Asennus did not utilise a tracking system in their processes, questions concerning this part were omitted.

4.1.4 Future Requirements

Some questions were related to the awareness of our interviewees about the future requirements. At Lujatalo, interviewees were very well informed about coming requirements, and therefore they have invested in the new system, which facilitates additional reporting. Additionally, they displayed positive attitude towards the new requirements, saying that they urged them to improve their processes. Furthermore, if the new requirements increase transparency and bring benefits to the whole society, additional efforts will be paid off eventually.

In comparison to Lujatalo, interviewees from Pinta-Asennus did not receive that much information about the new requirements and did not look ahead. They did not invest

in developing new systems and did not express any additional willingness to improve their processes, as at that moment everything what they had worked well for them. Similarly, they added that as soon as they are not going to be pushed for the change, they would not undertake much.

4.1.5 Mobile Phones

One of the aspects of this research was to investigate possibilities of integrating mobile solutions in these processes. At the time of interviews, none of our case companies had mobile phones in their usage. On top of that, none of the interviewees did think of using them for working purposes. Some of interviewees expressed concerns with integrating them, since this would require huge investments. According to their opinion, construction industry in Finland is very slow in adapting new developments; even integrating the tracking system was a big step for their company. Furthermore, some legal issues can come to light, especially from the perspective of unions.

In addition to all topics discussed earlier, the possibility of having a common platform was looked at. Main contractor and its subcontractors have different ERP systems at their service. Thus, their systems cannot exchange data electronically. As a result, subcontractors still have to deal with papers and input all information manually to their system. The similar situation is with main contractors, as subcontractors' employees unlike own workers do not use their tracking system. From the point of view of our interviewees, it is troublesome to fully automate these processes, since this would require using the same standard for everyone. Hereby, as soon as there are many different service providers, 'communication' of different systems will be impeded.

4.2 Observations

Observations took place at the Lujatalo's construction site, where the tracking system was tested. The construction site was set up according to safety regulations, a fence was in place, all workers had helmets, etc. While observing, the most attention was paid to the ACS and its functioning. The actual employee clock card machine is situated in the resting booth. Every morning when workers come to work, they place their chips

to the machine and make a check in. The similar activities happen when they finish their work. The data is sent to the ACS interface and is stored there. From this interface it is seen when all people have checked in and out. Naturally, it is possible to print out all sorts of reports. Each day a supervisor needs to transfer working hours of his employees manually from the ASC to their internal payroll software to the Mepco Hour Recording System which has a common interface with the payroll system. Overtime calculation is also made in the Mepco Hour Recording System which is able to interpret the workday and weekend overtime automatically. All hours are stored in the hour recording system and this wage information can be used in the project level to see what the average pay per hour per worker is. The payroll office receives all working hours electronically.

While implementing the ACS, there were some challenges. The working hours were not reliably recorded and contradicted with the real situation. However, this small dysfunction was fixed and now the system works correctly and none of the interviewees complained about its functioning.

5 Data Analysis and Outcome

At the beginning of our research, we have identified three investigative questions to be answered by the end of our project. The following chapter will discuss the final outcome for our stakeholders.

5.1 Current Processes in the Construction Industry

The following subchapter answers the investigative question 1: What payroll processes can be currently seen in construction companies?

Business processes could not be redesigned without clear picture of the current situation, therefore our first investigative question was aimed at illustrating current business processes or status quo. As mentioned in our theoretical part, before making decision of business process redesign, the rationality of the future reengineering must be investigated. Our case company Lujatalo determined that the cost of continuing their model will exceed the cost of financing the redesign. Therefore, it was unquestionable to make changes in their chain of business activities in advance, before the real crisis occurs. Another case company, Pinta-Asennus, did not make any preliminary changes in their business processes. The cost of implementing radical changes and investing in different system did not outweigh benefits from their point of view. Since their operations functioned without any difficulties and hurdles, they decided to delay business process redesign until they will be pushed to do it. The latter part of this chapter presents analysis of our interviews and observations done in the case companies.

5.1.1 Current Processes at Lujatalo

The current processes at Lujatalo have been mapped in the process chart (Figure 10). Before employees can start their work on construction sites, their information has to be filled in at least three different systems: Lujtalo's payroll system, Kohdetiedosto and ACS. The Kohdetiedosto is a new IT system where employees can be associated with their tax numbers. The Kohdetiedosto has a direct connection with the vero.fi web site which has been tested but not in use yet. Thus, it can be checked whether a person is

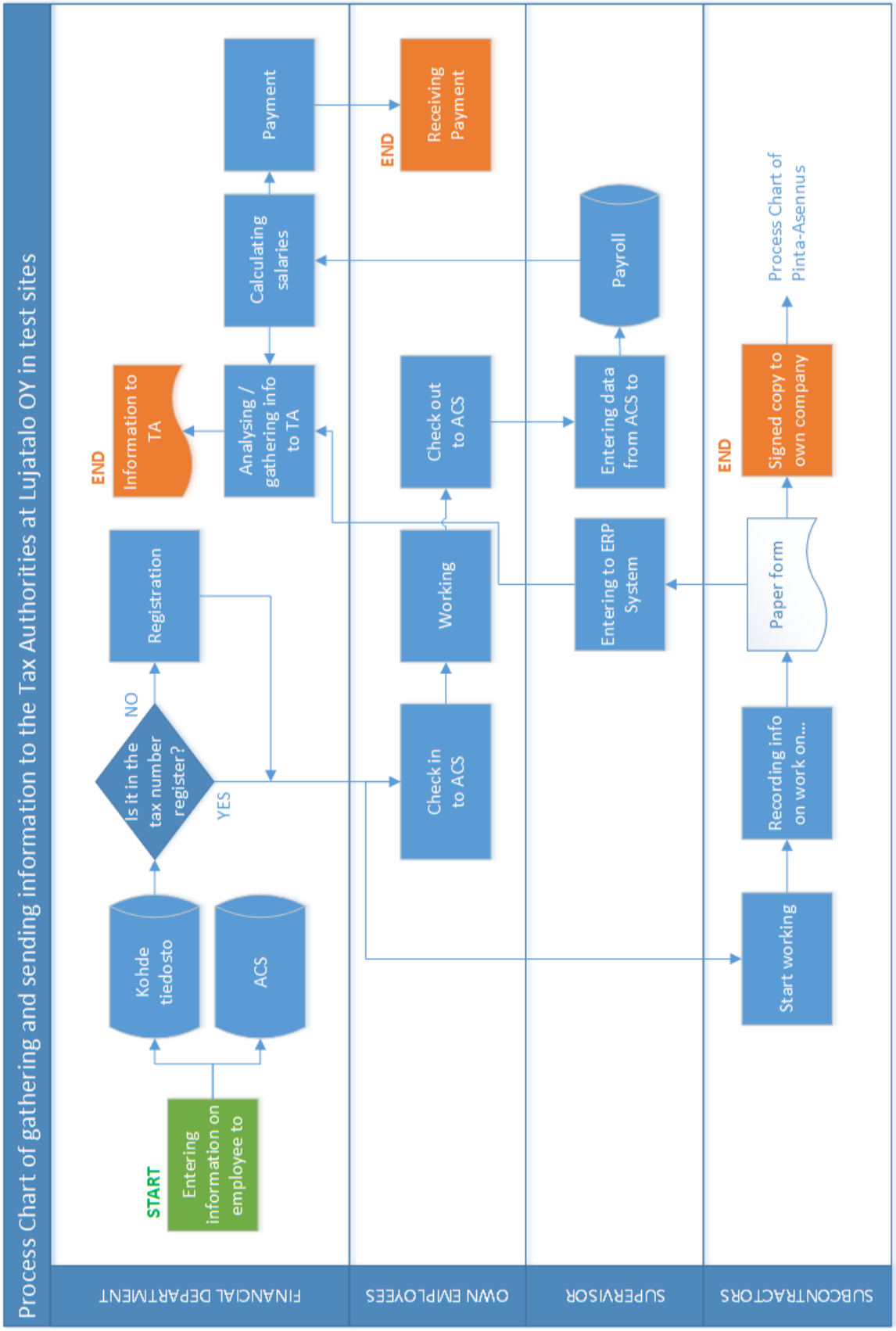

Figure 10. Process Chart of gathering and sending information to the Tax Authorities at Lujatalo OY

registered in the tax number register. For that, the button 'Vero.fi tark' should be pressed, after which tax number register web site opens (www.vero.fi/vere/Tarkistus/VeronumeronTarkistus.aspx). If a worker is not found in the register, a company has to request a registration from the Tax Administrator. As discussed already, usually only subcontractors' employees are not registered. If this information is not checked in advance, then the work will be delayed, which leads to inconveniencies and additional costs for Lujatalo.

After the registration is confirmed, an employee can start his work. At the beginning of his working day Lujatalo's own workers have to check in with the help of the punch clock, which is located in their resting booth. All associated workers have their own chips, which they locate to the check in terminal. After that, they receive instructions from their supervisor and start their duties. At the end of the day, they have to check out by using the same time card machine.

With the implementation of the tracking system, the workload of a supervisor has slightly increased. As the tracking system was a new phenomenon on the site, every day a supervisor has to make sure that all his employees are checked in. In case they are not, he has to remind them of that. When employees' working day is over, a supervisor prints out the report from the ACS and fills working hours of his employees to the payroll. As a result, there is some manual work to be done by a supervisor. However, a supervisor of Lujatalo did not call these additional tasks burdensome. His overall feedback about the punch clock was positive. He was not able to recall many challenges related to the implementation and said that the system works well and he was satisfied with it.

Subcontractors' workers cannot use Lujatalo's punch clock. Their working hours are marked in the paper form and signed by a supervisor. This hard copy is meant for both a subcontractor and main contractor Lujatalo in our case. At first, all initial information about employees is filled in at the familiarisation stage. Then a supervisor must add data about construction sites and working hours manually at the end of the working day.

The Kohdetiesdosto, Payroll, and the ACS are not connected to each other yet, which at this moment leads to additional manual work. However, automated checking from 'veronumero.fi' had been already tested in IT and it functioned. I got information from our interviewee that the Tax Administration is developing their own internet service after which information will be received from the "Veronumero.fi" with name and tax number. Additionally, Kohdetiedosto will send information monthly according to Tax Authorities guidelines. Furthermore, Lujatalo's service provider is developing an IT interface, which would allow integration with Kohdetiedosto.

At the beginning of our research, we have received a list of the future requirements that Tax Administration planned to require from main contractors (Finnish Tax Administration 2013c). Below, I have made a comparison between data requested by the tax authorities and data that the Kohdetiedosto stores.

Table 2. Comparisons of the Tax authorities' demand and Kohdetiedosto

Tax Authorities	**Kohdetiedosto**
Personal social ID number	Personal social ID number
Tax Number	Tax Number
Date of Birth	Date of Birth
First and Last Names	First and Last Names
Phone Number	Phone Number
Address	City of Residence
Citizenship	Citizenship
Certificate E101/A1	Certificate E101/A1
Employment type	Employment type
Construction sites	Construction sites
Working Hours	-
-	Education

The Table 2 clearly shows that the Kohdetiedosto can deliver all necessary information to the tax authorities. Hereby, Lujatalo is almost ready for sending needed information.

The secondary data indicated that there are two approaches to business process reengineering: revolutionary and evolutionary. Below I will consider which approach was taken at Lujatalo when redesigning.

The main differences between radical and evolutionary change are time and costs (Jarvenpaa & Stoddard 1998). If BPR is not pushed by a crisis in a construction company, building new processes can go step by step involving all associated employees. However, the idea about redesigning needs to be revolutionary in order to avoid any confusion among employees. The decision about reengineering at Lujatalo came from top management and brought enthusiasm and motivation. The planning of BRP started in advance and it resembled a sort of vision with a long-term road map which was communicated to employees. However, while implementing, Lujatalo used evolutionary approach which gave more time for employees to adapt and test the new IT system upfront. Confidence of employees and preliminary testing usually reduce risk of failure and result in a better outcome what Lujatalo tried to achieve. Hereby, when designing upcoming changes, revolutionary approach was used, and while implementing evolutionary tactics was adhered to.

5.1.2 Current Processes at Pinta-Asennus

The current processes at Pinta-Asennus are illustrated in Figure 11. Pinta-Asennus does not have their own construction site and therefore their workers are moving from one object to another. At each site they mark the work they have done and how many hours they spent on a separate sheet and then give it to their supervisors. Moreover, they make a time card, and after it has been signed by a supervisor, all time cards are given to the payroll office. All payroll calculations are done in the Jydacom Payroll and all data must be entered manually.

At this stage Pinta-Asennus would need to send all necessary information manually to the tax authorities' internet service. Since Pinta-Asennus is a small company, the manual work won't impose huge difficulties for them.

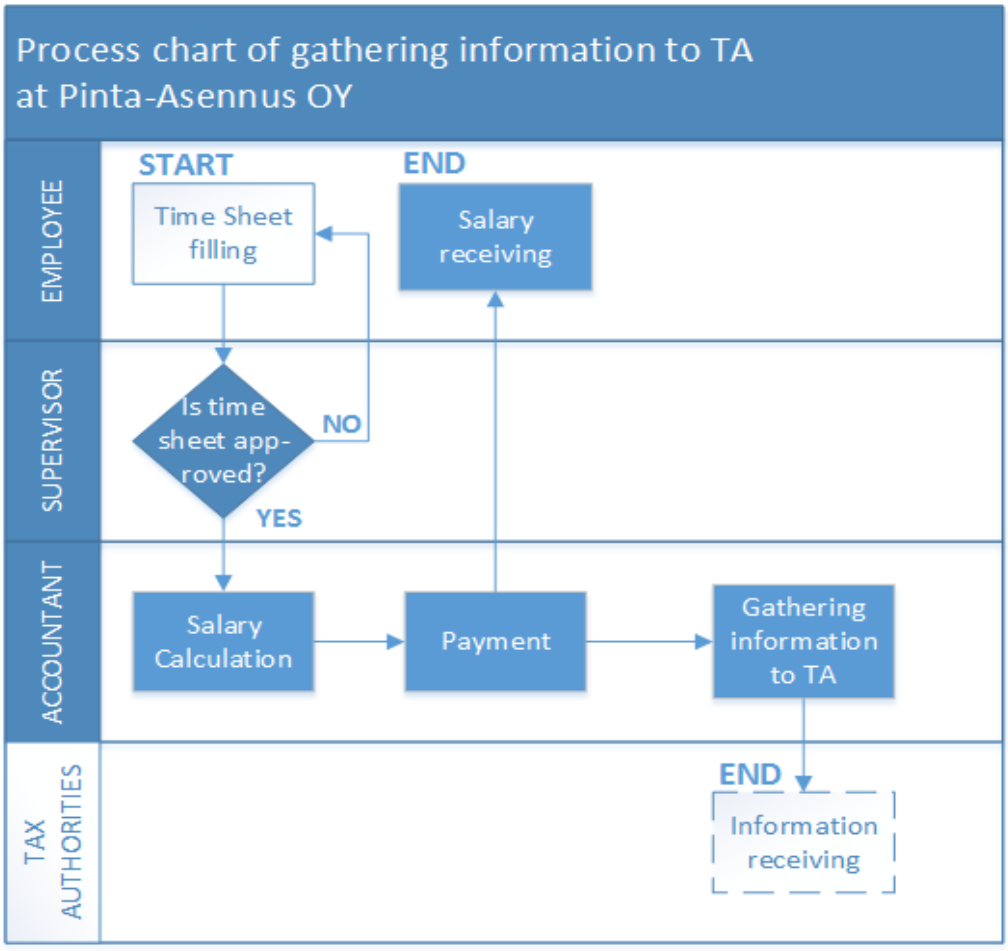

Figure 11. Process chart of gathering information to the tax authorities at Pinta-Asennus OY

5.2 Future Developments

This subchapter answers the second investigative question: How is it possible to efficiently gather information under the new requirements, so that registered information could be also utilised in payroll?

The previous subchapter mentions future developments at Lujatalo. The following figure illustrates how the process of sending data to tax authorities might look like (Figure 12). The process modelled in Figure 12 is a high level visualisation. Unlike a detailed workflow description in previous subchapters, the visualisation focuses on displaying the phases of the processes that affect the flow of information from one entity to another. The main goal is to integrate all three systems in such way that the

information must be filled in only once at the initial stage, meaning when a new employee is registered in the company.

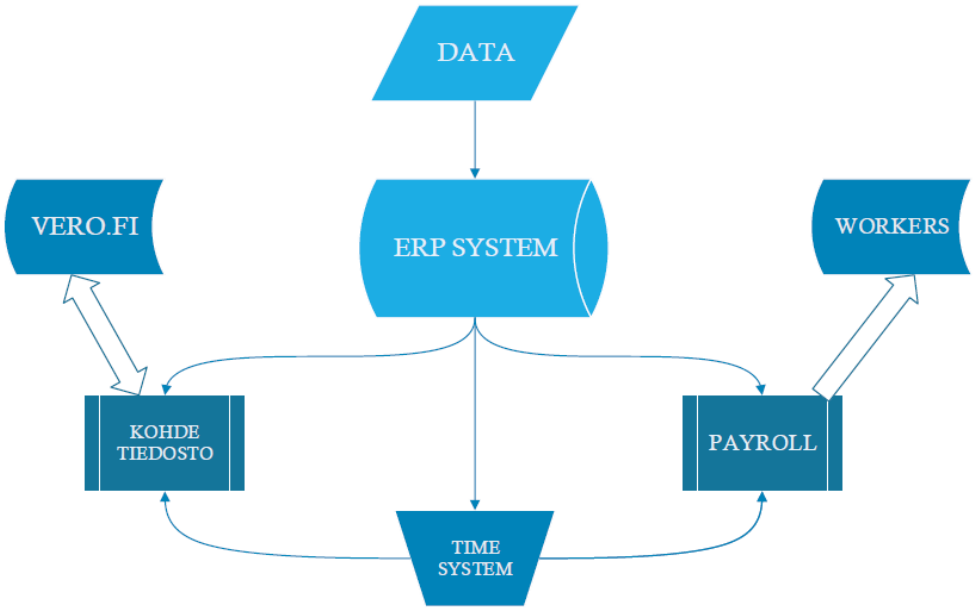

Figure 12. Future developments in the process of reporting to the Tax Administration

The Figure 12 shows that all information about an employee is input in an ERP system, in case of Lujatalo it is Microsoft Dynamics. The ERP system is integrated with the kohdetiedosto, payroll and time recorder. At the same time, the kohdetiedosto can accept information from the tax number register and send information associated with an employee and his working hours to the tax authorities on demand. Simultaneously, a punch clock has interface with payroll and on daily basis the information about working hours of all employees can be retrieved from a software based time system to payroll, so supervisors do not need to report their employees' working hours separately.

After achieving described above automation, the processes will look like illustrated in Figure 13. The main difference takes place in the supervisor's role, as he does not need to enter employees' working hours manually to different systems.

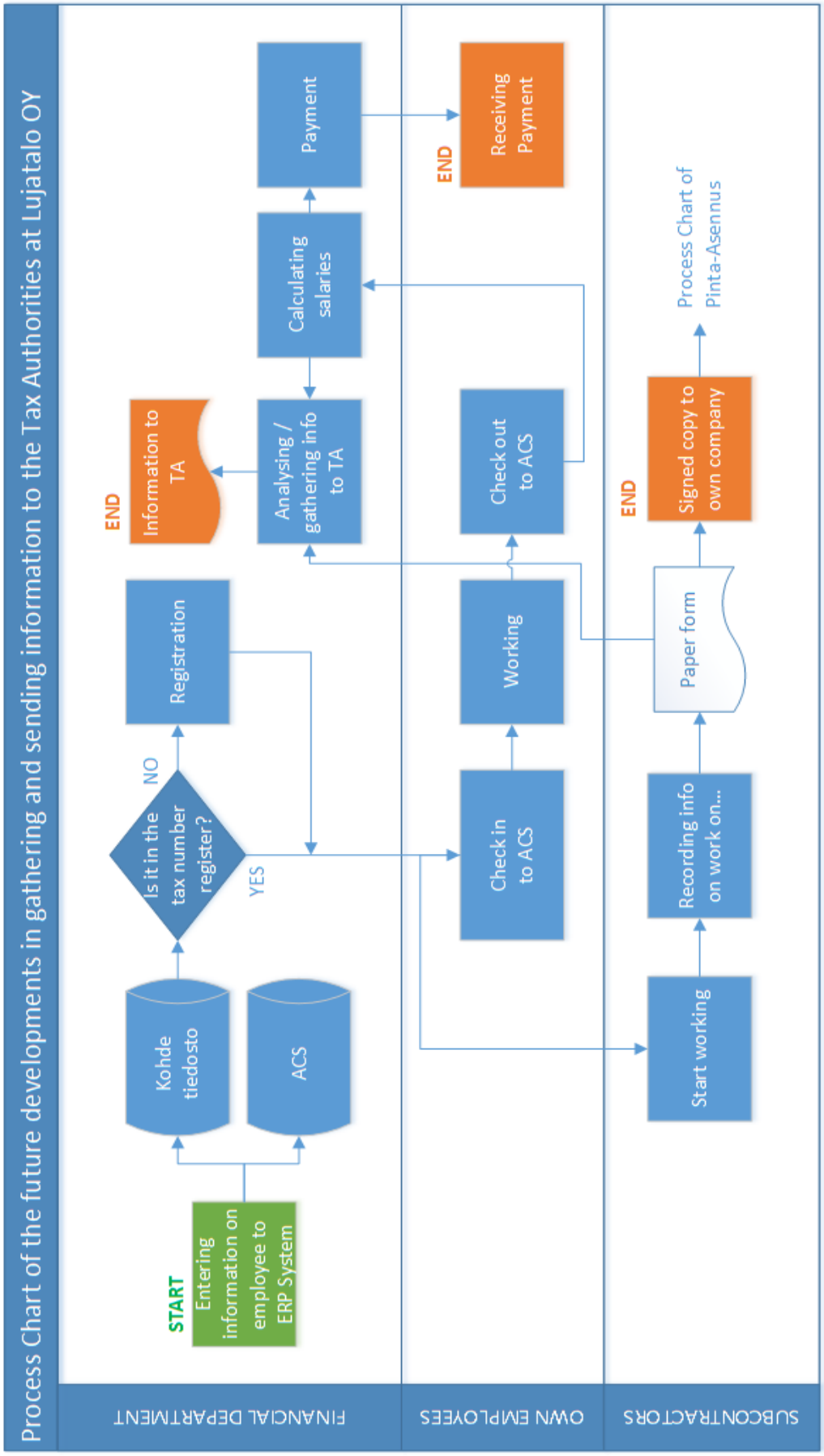

Figure 13. Process Chart of the future developments at Lujatalo

As we can see, the main contractor can reach automation within its own company. However, the real challenge might occur when attempting integration with the other companies. As we have seen from our observations, subcontractors are not involved in the tracking system. The ideal scenario would be that subcontractors' employees could also use the same ACS and this information could be send to their systems. Since different providers use different interfaces, this integration is unlikely to happen at the moment.

5.3 Mobile Phones Scenarios

The following subchapter brings the answer to the third investigative question: How could mobile phones be solution for the new reporting requirements?

The collected secondary data showed that mobile technologies can bring sufficient benefits to construction companies. Mobile technologies advantages such as immediate transfer of data and possibility to localisation along with their characteristics can add new value in business process redesign. From our observations it is obvious that mobile phones were not used in our case companies. Moreover, interviews with representatives of the case companies made clear that mobile phones were not even considered to be utilised in their future BPR. The fact that most of the sources of the secondary data were more than ten years old can testify abrupt interest in mobile technologies. From my point of view, the reason for that could be the complex nature of the mobile ICT and lack of faith of managers in the use of mobile IT tools.

A framework of mobile computing adoption introduced by Abrahamse and Lotriet (2009) has brought four important aspects that are success factors for a successful mobile technology implementation. Task initiation can be equal to managers' commitment and the rational of entire restructuring. A vision of the top management or crisis motivates organisation to change. The top management of Lujatalo was committed to their ICT reengineering and thus it was a success. The support of the transformation was done on the organisational level where managers' involvement was also decisive.

Our interviewees mentioned user resistance and namely union resistance in adopting mobile phones among employees. The framework of mobile computing displays this possible resistance in the form of users' motivation, their ICT literacy, personal beliefs and exposure. ICT literacy must be present not only among employees but among top managers as well, so they can evaluate ICT benefit at the right stage. All above described factors determine successful and meaningful achievement. This research exposed similar results that were discussed earlier in related articles.

The following table summarises the scenario proposals. The mobile phone scenarios were developed based on the mobile computing work made by Chen and Kamara (2007). Hereby, they are categorised according to three elements of mobile computing – computers, network and mobile application. In our scenarios, computers will be replaced with the target system where all data has to be predominately transferred from mobile devices. The name of scenario symbolises the main function of a mobile device.

Table 3. List of mobile phone scenarios

Name	Target System	Network	Mobile Application
Exchange	Payroll	Mobile network	Commercial Mobile Application
Control	Main ERP system	Mobile network	Custom Mobile Application
Reporting to Tax A.	Tax A. internet service	Mobile network	Custom Mobile Application

5.3.1 Exchange

The first scenario serves the purpose to exchange data to the payroll system. In this scenario, mobile phones will exhibit the same function as the Access Control System. Employees will have a mobile application in their phones which will allow them marking their working hours by punching in and out with the help of this application. Then this data is transmitted directly to the payroll. In this case, the worker will be not associated with his tax number. The tax number will be recorded in the payroll but not in the mobile application. Each worker has their codes or number given by the payroll

system and the data is reconciled with these numbers. In this scenario, all information to the Tax Administration has to be sent separately. The payroll might be connected to another system like Kohdetiedosto where all data can be synchronised (Figure 14). This scenario will be suitable for those who do not need to report extensive data to the tax office. This could be a small subcontractor like Pinta-Asennus OY, where manual work won't take much time.

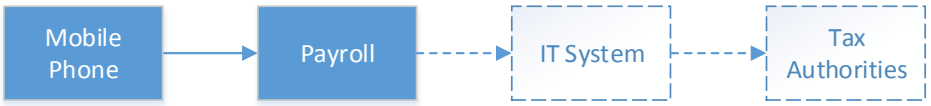

Figure 14. Data flow in the Exchange scenario

Construction workers are mobile and can be associated with different construction sites. Thus, mobile network and not WLAN could be used, so employees could be independent from a specific construction site. Mobile applications for sending working hours already exist, therefore there is no need to use a specifically developed application and commercially available ones can be utilised.

5.3.2 Control

Mobile phones can be used as a control tool as well. Similar applications such as Employee Time and Location tracking can be developed. These applications can help not only to record employees' time but, in addition, to locate them. This would allow supervisors to determine where their employees are during their working days. However, such scenario will demand employees' permission for using. Using GPS might invade privacy of an employee. Therefore, it is significant that the tracking is used only for that purpose that an employee has given his permission to. This application might lead to bigger resistance from employees and unions.

A type of the network in this scenario is also a mobile network for the same reason as in the previous scenario. As there are not many time and location tracking applications and those existed could have been developed for different purposes, developing new mobile application that could include time sheet and location tracking and could be

used for reporting to the Tax Administration as well. This application also could embrace tax numbers and site names in order to simplify reporting.

Data from the Control application can be synchronised with the main ERP system and payroll and can be utilised in different analyses as well. The reporting to the tax office can be accomplished through the main ERP system that can have the same interface with a similar IT system as the Kohdetiedosto (Figure 15).

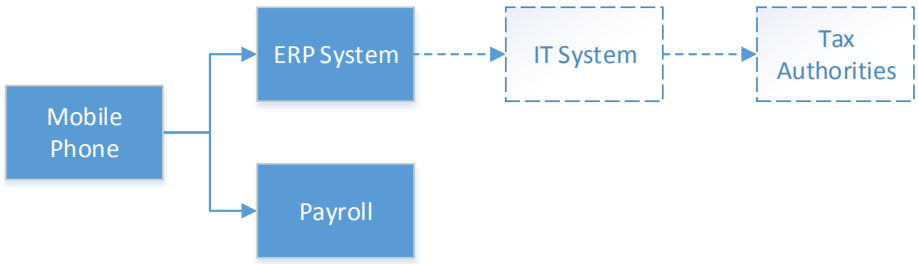

Figure 15. Data flow in the Control scenario

5.3.3 Reporting to Tax Authorities

The third scenario is based on the purpose to report all necessary data directly to the tax authorities. This mobile application has to include required information that the tax authorities demand to send. This information must contain tax numbers, all employees should be associated with construction sites they work on, their working time on each specific construction site. Then this application needs to be synchronised with the tax authorities' internet service through an IT system. In addition, the data must be delivered to the payroll as well. The mobile network could be used as well and since this kind of applications does not exist yet, custom application should be developed (Figure 16).

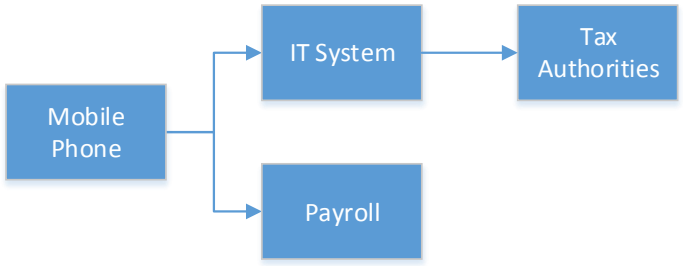

Figure 16. Data flow in the Reporting to Tax Authorities scenario

6 Conclusions

The Ministry of Employment and the Economy undertook a reform concerning construction companies to tackle grey economy. As a result of this reform, construction companies are required to send more information about their on-sites employees in order to increase transparency in wage reporting. The preliminary amount of data that is planned to be requested from construction companies is huge, so a certain standard must be developed to manage to collect all necessary data meaningfully. The research has shown that bigger companies have undertaken some steps in order to create a faster way of gathering and sending needed material. However, smaller companies were not the same involved in the transformation process. The final chapter summarises research findings, discusses validity and usefulness of results and presents researcher's own professional development and learning.

6.1 Interpretation of the Results

The bigger company Lujatalo has created a separate IT system that would be integrated with the tax authorities' web service, so they can send required information upon tax office's request. Lujatalo received a preliminary list of required data and built a new IT system which can receive and send needed data. Furthermore, Lujatalo implemented a clock card machine to track employee's working time and also to extract it and send them in the end to the tax office. The feedback about new systems received from representatives of the company was positive. The example of Lujatalo's redesign is one of the approaches to gather necessary information for the tax office. In order to achieve the maximum reduction of administration time, Lujatalo has to integrate new IT systems with their existing ERP systems, so that synchronisation of data consumed as less effort as possible and time and information is captured only once at the source. In this scenario, the investment used for this project will be totally paid off in the end.

Lujatalo had several construction sites and most of their workers were employed by this company. The existence of different construction sites enables installation of a check in terminal. In the contrary, Pinta-Asennus does not have any construction sites. The absence of construction sites makes it difficult to utilise a punch clock which re-

quires a check in terminal which cannot be portable. In this case, using a mobile device as a time recorder is a reasonable idea. By using mobile devices, employees will be independent from the necessity to transport a clock card machine along with moving from one location to another. The constraint for adopting mobile devices in massive use remains the same. It requires huge investments from the company side and not merely material investments but also investment in educating employees. The fear of using new technologies is still present and thus the resistance of trying something new will be a big hurdle. This finding is also proved by earlier research discussed in our theoretical framework.

The research question of this thesis was: how can needed information be collected for the Finnish Tax Administration and utilised in payroll calculation in the construction industry by integrating mobile devices? This thesis has shown two ways of collecting necessary information and using it further in payroll; one with the help of the clock card machine and the other by the means of mobile devices.

6.2 Validity and Usefulness of the Results

The current research came to similar conclusions that previous studies on business process reengineering and mobile technologies. The revolutionary and evolutionary approaches in BPR should be combined, construction industry is very slow for a new IT system adoption and mobile computing is still not trusted. Interviews were conducted in the core of the construction industry and interviewees were selected by their awareness and involvement in new projects.

The chart of current processes in the case companies gives an inside look at today's situation in the construction industry. Two different companies represent two different target groups that must be approached differently. Mobile phone scenarios represent a different way of approaching a problem and give an innovative aspect of business process reengineering.

6.3 Own Professional Development and Learning

The current work was a new type of the challenge for a researcher. Since this kind of work was done for the first time, a lack of previous experience was a sort of a hurdle and anxiety at the same time. After accomplishing this study, some lessons were learned. Although many possible risks were mapped out before starting the research and a lot of recommendations from the peers were given, some challenges occurred on the way.

The biggest issue for all junior researchers remains the same, it is the time management. This work was not an exception. Preliminary planning and following initial time line is crucial for the successful result. Unfortunately, this issue will always remain an issue, therefore it is important to start early enough and reserve some time for unexpected issues.

Another challenge to be dealt with was getting interviews. For this part of the research more time should be allocated in the beginning. Agreeing on interviews and arranging appointments is the most time consuming part of the research unless it is done in one familiar company.

Gathering secondary data can be challenging as well unless the clear picture of the result of the research is vivid. Thus, the initial planning is necessary along with immediate actions.

Last but not least, the researcher got acquainted with a hot current issue of digitalisation. Reorganising business activities and integrating IT systems is still a challenge for many companies. Therefore, the studied area will be beneficial for researcher's future career development.

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Attachments

Attachment 1. Overlay Matrix

Research Question How can needed information be collected for the Finnish Tax Administration and utilised in payroll calculation in the construction industry by integrating mobile devices?		
Investigative Questions	**Theoretical Framework**	**Results**
What payroll processes can be currently seen in construction companies?	- Business Process Reengineering. - Evolutionary and Revolutionary Approaches.	Process Charts (Figures 10 and 11).
How is it possible to efficiently gather information under the new requirements, so that registered information could be also utilised in payroll?	- Business Process Reengineering.	Future Developments (Figures 12 and 13).
How could mobile phones be solution for the new reporting requirements?	- Mobile Solutions. - Mobile Computing.	Mobile Phone Scenarios.

Attachment 2. Interview Guide

Q1: ERP System.

What software are you currently using and how does it function?

Are you satisfied with it? Why or why not?

Is there a tax number implemented? Why or why not?

What information do you need to send currently to the Tax Authorities?

Is it easy to find out working hours? Why or why not?

How is it connected to payroll?

Q2: Tracking System

Could you describe how it works?

Can you rely on your registration system? Why or why not?

Are employees moving from one site to another? Do they use different tracking systems?

Are they all connected to each other and to your software?

Do employees need to give their permission that their come&go registered information can be used and stored?

Q3: Processes on Construction Sites

Could you explain what employees do when they come to the construction site?

Are they supervised? Do you have any control issues with them? Please, describe.

Q4: Future Requirements

What do you know about future requirements?

What is your opinion about government's plans? Will these new requirements be effective? Why or why not?

I have a list of planned future requirements. Could you say your opinion about voluntary information? What do you think are they needed?

Is there difference between foreign or local subcontractors?

Q5: Mobile Phones

Where do you use mobile phones? (navigation through drawings, on-site inspection)

Have you ever thought of having mobile phones for sending working hours of employees?

What kind of mobile phones will best suit for that purpose?

What constraints in mobile ICT adoption can you identify? (costs/investments, adoption/user resistance/training and support programs, no business gain/cost benefits)

Could you identify any legal issues that you can't follow by integrating mobile devises?

Q5: Miscellaneous

Do you have anything else to say?
I will draw a picture of processes, could you then check it?