Mobility for the Swedish Police Authority

A case study to increase efficiency in debriefing

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Mobility for the Swedish Police Authority: A case study to increase efficiency in debriefing

by

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Mobilitet för Polismyndigheten i Sverige:
En fallstudie för att öka effektiviteten vid avrapportering

av

Emil Karlsson
Abstract

Digitalization is a topic that affects most of the industries as well as the society overall today. Within this topic, the use of mobile technology devices, such as smartphones, allows organizations to perform tasks in an anytime-anywhere situation – usually called enterprise mobility. The Swedish Police Authority see the potential of this technology shift that is happening and are currently focusing on developing tools to support the daily operations. The debriefing process for the intervention police is an area where digitalization and mobility could improve the efficiency. However, it is today unknown what technical solution could support the operations, what features it should include, and how it should look.

The purpose of this study was to investigate how mobility can support the debriefing process in forms of efficiency for the police in field from an exploratory point of view. An inductive research approach was chosen together with a case study research method. Semi-structured and unstructured interviews were held with 35 participants from different parts of the organization to get both a breadth and depth of knowledge. The delimitation was made to study the Swedish Police Authority and more in detail the intervention police. The current debriefing process was observed and mapped in the first part of this study, followed by part two which included a technical specification and prototyping of a mobile debriefing tool based on interviews and observations. The findings from part one and part two resulted in a proposed specification of a mobile debriefing tool for what it should include and how it should look.

The study shows that the proposition of a debriefing tool can increase the efficiency for the Swedish Police Authority by reducing the duplication of work, increase the usability for the users, reduce the risk for human errors, and reduce the dependency of stationary workplaces for debriefing. The debriefing tool includes quality assurance of the information gathered through a structured working process at the same time. The factors mentioned above can also be linked to reduced time spent on the tasks while retain or even increase the quality of the results – which in this case is the debriefing report.

Key-words: digitalization, enterprise mobility, business process mapping, prototyping, user experience, usability evaluation
Sammanfattning


Studien visar att förslaget på mobilt avrapporteringsverktyg kan öka effektiviteten för Polismyndigheten i Sverige genom att minska dubbelarbete, öka användarvänligheten för användarna, minska risken för mänskliga fel, och minska beroendet av stationära arbetsplatser för avrapportering. Samtidigt inkluderar förslaget kvalitetssäkring av insamlad information genom en strukturerad arbetsprocess i verktyget. Ovanstående faktorer kan även kopplas till en minskad tid som spenderas på uppgifter, samtidigt som kvalitén på resultaten bibehålls eller till och med ökar.

Nyckelord: digitalisering, enterprise mobility, kartläggning av processer, prototypframtagning, användarupplevelse, användbarhetsvärdering
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<td>Business process management</td>
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<tr>
<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>mICT</td>
<td>mobile Information and Communication Technologies</td>
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<tr>
<td>PMF</td>
<td>Polisens multifråga. An IT-system to get information on a person or vehicle</td>
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<td>RAR</td>
<td>Rationell Anmärkningsrutin. An old IT-system used for debriefing.</td>
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<td>ROC</td>
<td>Regional Operations Centre</td>
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<td>Event report</td>
<td>A report written by ROC regarding what witnesses have observed and told through phone while calling ROC.</td>
</tr>
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<td>Intervention police</td>
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Foreword & Acknowledgement

Firstly, I would like to thank Per-Ola Sjöswärd for all the support during the thesis and help with administrative tasks. Secondly, thanks to Tomas Landeström and Anna Gunther-Hanssen for the opportunity to write the master thesis at the Swedish Police Authority. Also, I want to thank the IT-department for the trust and feedback throughout the research. Finally, I would like to thank all the intervention police at Södermalm for the interviews and the possibility to see your everyday work – you are great! Especially thanks to Patrik Jensen, Christoffer von Langenberg, Marcus Berglind, Peder Nordin och Joakim Sjöberg. The thesis work at the police authority has been a great experience!

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Lastly, I would like to express my gratitude to family and friends for the support during my entire period of studying - this wouldn't have been possible without you. Thank you!

Emil Karlsson
Stockholm, June 2017
1. Introduction

This chapter will introduce the background of the thesis followed by the problematization. The purpose and research questions will then be presented together with the delimitations. The chapter will end with describing the thesis collaboration with a similar master thesis.

1.1. Background

The police authority in Sweden is under great pressure which has led to a big reorganization in the Swedish Police Authority. The aim of the reorganization is delivering higher quality, increased cost-efficiency, increased flexibility, and highly increased operation results – which all have been required from the government. (Statskontoret, 2016) The reorganization has resulted in a single and coherent police department from the previous 23 departments including the national police boards in Sweden and Swedish National Forensic Centre. At the same time, a critical point has been reached, the number of solved crimes for example has reached the lowest number in 16 years – only 14 % were solved in 2015 (Örstadius, 2016). This can be argued to imply that the change of the police department was needed. However, the reorganization has met a lot of critique. For example, dissatisfaction among the employees have occurred, especially regarding bad leadership, low wage and faulty IT-systems to support their work (Örstadius, 2016). The dissatisfaction is even that big that some polices have decided to leave their profession (Ahlman & Fredén, 2016).

An area that are affecting most of the industries today are digitization. Exactly what becoming digital and digitization means have not been defined. For some it is about using new technology, others for how they do business and how the business model are built up, while others define it as a way to engage the customers (Dörner & Edelman, 2015). Friedrich et al. (2012) even states that “Every company in every industry will be dramatically affected, and it will be the responsibility of CEOs to lead the charge by building the right capabilities for their companies to remain relevant in the digitized environment, achieve growth, and fend off competitive threats.” The customers are expecting the industries to deliver a digital user experience regardless the desired case, but the customers are not the only winners if the organizations succeed to become more digital (Markovitch & Willmott, 2014). The organizations will be able to reduce cost, reduce the turnaround time and at the same time reduce risk (ibid). However, there is not a complete digital solution that can be implemented at a company or organization with guarantee of success – instead a holistic digital strategy need to be developed where the whole business is taken into account (EY, 2011). Within the digitalization, the use of mobile information and communication technologies (mICT) such as smartphones are increasing (Basole, 2008). When mICT are being used within organizations, this is usually called Enterprise Mobility (referred as “mobility”) (ibid). This allows organizations to perform tasks in an anytime-anywhere situation (Kleinrock, 2001).
Mobility is something that the Swedish Police Authority is interested in and can be found in the IT-strategies involving for example debriefing. (Polisen, 2014b). The police authority have realized that the polices can spend more hours out in the field which increase the safety and reduce crimes with help of mobility and digitalization (Polisen, 2016a). Today, they use several IT-systems for different purposes but are trying to catch up to deliver applications that can support the people within the organization in their daily work tasks (ibid). Today’s ways of working, for example during debriefing process, often include duplication of work where notes on paper which later are transcribed into a computer system is common. This is both time consuming and increases the risk of human error which can affects the quality of crime solving. One of the main goals for the Swedish Police Authority is to develop the tools for the polices in field to increase their efficiency (Polisen, 2016b). The lack of such an IT-system makes this goal hard and time consuming to achieve, and at the same time hampers the opportunity to get a holistic view how to improve the daily operations. With mobility, there are lots of opportunities for the Swedish Police Authority to improve the current working processes and get more efficient if handled in the correct way.

An extensive project was driven to deliver a new debriefing IT-system, PUST (Polisens utredningsstöd), to support the polices in a better way. The IT-system was rolled out as a beta¹ in October 2010 with great result which led to continuous development to deliver a version including full-functionality. The system was finalized and ready for implementation, but suddenly did not meet the requirements and needs that the polices in the field required. Several attempts were made to fix the issues but lastly ended with a depleted project in 2014 and with a development cost about 145 million SEK (Polisen, 2014a).

1.2. Problematization

Organizations in general is challenged with constrains on resources. Within the Swedish police authority, one of the constrains are the limited number of polices working in the field. The requirement to have great tools to support the daily work are then essential to the polices in field to stay efficient. Due to failure of the extensive IT project mentioned above, the polices still uses the outdated working tools and processes. There is a lack of support from IT-tools to improve their current working processes to be more efficient with the retained quality. With the number of crimes solved still decreasing and with the limited resources, it is essential to get better support for the daily operations. However, it is yet unknown what technical solution could support the operations, what features it should include, how it should look and what additional benefits that could be achieved other than increasing the efficiency.

¹ A beta is a limited version of an IT-program to get user feedback and test it in a real environment.
1.3. Purpose & research questions

The purpose of this thesis is to investigate how mobility can support the debriefing process in terms of efficiency for the polices in field from an exploratory point of view. The objective is to provide the IT-department at Swedish Police Authority with new insights on what features such a debriefing tool should include, a proposition how it should look, and what effect it will have on the efficiency of the current processes. The proposition will consist of a prototype of a debriefing tool which is tested among the polices to serve as a pre-study for developing such a debriefing tool.

The following main research question (MRQ) need to be addressed to fulfill the purpose:

- **MRQ**: How can mobility support the debriefing process for the Swedish Police Authority to increase the efficiency?

Three sub-questions were developed to answer the MRQ:

- **RQ1**: What processes exist in the current debriefing flow?
- **RQ2**: What features are needed to improve current debriefing processes?
- **RQ3**: What design should the features have in the mobile debriefing tool?

1.5. Delimitations

Due to the timeframe of this thesis, delimitation was needed to be formulated. The main delimitation for this study will be to focus on the debriefing process for intervention police. Moreover, the study will focus on the Swedish Police Authority where the observations will be made in Stockholm. Hence, the proposition might be biased and therefore should be complemented with future research to be certain that the whole Police Authority across Sweden is represented. Due to the complex and varying work tasks, felony crimes will not be covered and taken into account in the study and therefore need to be complemented in future study. The study will not cover change in the work method and processes, rather focus on how IT can be used to support the work methods and processes. Legislations and regulations is an extensive topic connected to debriefing but will due to the timeframe not be considered for this study.

1.6. Thesis collaboration

This thesis has been written individually. However, some of the data has been collected in collaboration with Alexander Dexwik, a master thesis student at Royal Institute of Technology (KTH). Dexwik has been writing a thesis with a similar topic but have instead focused on performance measurement system for the debriefing process for the Swedish Police Authority. The analysis and conclusion of the shared data has been made individually but resulting in similarities such as the process generalization of the observations.
1.7. Disposition of the thesis

Table 1 present the disposition of the thesis report. This thesis will in the next chapter give a brief description of the Swedish Police Authority and an explanation of efficiency for the police authority. After this, the method used for this thesis will be presented before moving into the first part of the thesis where literature and theory, empirics, and analysis will be presented. Part 1 follows by part 2 where the similar structure consisting of literature and theory, empirics and analysis are presented. The thesis will after this present a proposition and discussion on findings before summing up with a conclusion.

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*Table 1 - Disposition of the thesis report.*
2. Introduction to the Swedish Police Authority

The Swedish Police Authority is the governmental agency in Sweden with the goal to reduce the crimes and increase the safety for the people. Moreover, the mission is to increase the safety and retain the legal certainty and democracy. (Polisen, 2016b) This section will shortly describe the needed information regarding the Swedish Police Authority for this study.

2.1. Organization

The organization within the police authority consist of seven police regions who have the overall responsibility for policing within their geographical area. There are support departments to help these regions such as human resources, IT department etc. All of them are illustrated in Figure 1. The departments overall are led by the National Police Commissioner Dan Eliasson. (Polisen, 2016c)

![Figure 1 - The organization of the Swedish Police Authority.](image)

This study will focus on the Police Region Stockholm together with the IT Department who are marked red in Figure 1. Moreover, the type of polices focused on in this the one named intervention police. These are the police that wear uniform, patrolling the streets, and is being ordered by alarms.

2.2. IT-systems

The Swedish Police Authority have a large number of IT-systems to support different parts of the organization. This section will give a general introduction to the most commonly used IT-systems for the intervention police involved in the debriefing process.
RAR (Rationell Anmälningsrutin)
RAR is a IT-system that was developed in the 1980s for the police. This system is today used as the main system for debriefing cases that need a police report. The interface of the system is made up of a command line interface where keyboard is the only input source. One of the strategies for the Swedish Police Authority’s IT department is to stop using RAR and instead focus on extending the current version of DurTvå to be used.

DurTvå (Datoriserad utredningsrutin och Tvångsmedelhantering)
This IT-system is today used for additional documents attached to a report such as interrogation notes, memorandum, documentation of evidence etc. As described above, DurTvå are being developed today to be able to include also the main report instead of RAR. It is this system that should be taken into account when looking into integrate mobility solutions.

mPMF (mobil Polisens multifråga)
mPMF is a mobile application that enables access to information regarding for example vehicles and persons. The application is integrated with the register of convicted and suspected persons. Thus, application has gained a lot of advantages to the intervention police and relieved the pressure on ROC.

STORM (and webSTORM)
STORM is the case management system used by ROC to take notes from callers and at the same time coordinate resources in field. Some of the information can be access by the intervention police at a stationary workplace through webSTORM which is a limited version of STORM.

Formulärportalen
This is a web-portal where forms are stored and used by intervention police to for example include specific documents to debriefing reports.

2.3. Efficiency for the police
The resource limitations mentioned in the background of this thesis put high expectations on the intervention police to be efficient. A pronounced goal for the IT department of the Swedish Police Authority is that the intervention police should be able to perform the double amount of tasks with the same amount of human resources enabled by IT-tools. Thus, this study will use the definition of efficiency as “with the same amount of resources, perform more activities and reduce the idle time for intervention police while retaining the same level of quality”.
3. Method

The following section will cover the method used for this study. Firstly, the research design will be described with the overall research process for the different research questions. Secondly, the method for literature review will be presented followed by the data analysis method. Lastly, this section will cover the validity, reliability and generalizability.

3.1. Research design

An inductive research approach has been used for this study to address how the Swedish police authority can use mobility to increase the efficiency for the intervention police in field. The inductive approach base the research on a given problem and then use theory to better understand and explain the empirical findings (Blomkvist & Hallin, 2015). The theory can during an iterative research process change over time which is decided depending on the empirical material gathered (ibid). For the choice of research design, the explanandum and explanans was decided carefully which is recommended by Blomkvist & Hallin (2015). The explanandum for this study regards how mobility can be used for debriefing to increase efficiency for the police in field while the explanans focuses on today’s working process which involves the debriefing process. Additionally, we are interested to study the working process in the real context, which is allowed in the case study research method (Farquhar, 2012). The case for this study is to investigate the use of mobility for the Swedish Police Authority. Figure 2 shows the overall research process for this study. The main research question is divided into three sub-research questions. The overall study is structured into two parts. The first part covering research question 1 while part two focuses on research question 2 and 3. Each part will have its own literature review, empirics, and analysis. The last section of this study will give a proposition and discussion and end with a conclusion.
3.1.1. Method for research question 1

The first research question for this thesis was: “What processes exist in the current debriefing flow?”. To answer this question, a literature review was conducted with the purpose to understand the basis of the Swedish Police Authority before finding literature on business process management. More in detail, business process mapping became the focus within business process management to gain knowledge to describe the current debriefing process. Qualitative interviews and observations was performed to advance the knowledge about the processes observed. As Blomkvist & Hallin (2015) suggests, unstructured interviews were held in the beginning to explore the subject, while semi-structured interviews were used in a later phase to get more detailed information on interesting areas. For research question 1, interviews were held with persons from different organizations to get a broad general view of the subject and problem, before narrowing down the number of persons interviewed to gain deeper knowledge. Observations was chosen to be performed to get a view of how polices works in their daily operations, what processes existed, and the relationship between the processes. Blomkvist & Hallin (2015) argues that the observation methodology is suitable for exploratory questions, which is the case for research question 1. This part of the study was conducted by being observer as participant where follow-up question was asked to gain deeper
understanding for different actions and situations. The observations were documented and later analyzed by applying the theory from the literature review.

3.1.2. Method for research question 2
The second research question was formulated: “What features are needed to improve current debriefing processes?”. To understand what features that was suitable, deeper interviews were conducted with stakeholders and involved person. The aim was to understand how the barriers from part 1 could be overcome and how the processes could draw benefit and be increased in terms of efficiency by mobility. The interviews were semi-structured to get deep knowledge regarding specific areas, while other parts where open for discussion to gain additional value-adding information. Knowledge regarding enterprise mobility laid the base for the interviews and was acquired through a literature review on the mobility topic with different perspectives and context.

With a general understanding of what features to implement into a mobile application, a confirmation from the polices were needed to secure that the whole process flow was considered and could be realized. With the empirics in term of feature, additional literature was reviewed to find a way to visually communicate the new suggested process flow. The visualization tool used was extended with semi-structured interviews were used once again for this study. These interviews where specified to certain areas to get the participants opinion regarding the suggested process flow presented as a storyboard.

3.1.3. Method for research question 3
The third and last sub-research question was: “What design should the features have in the mobile debriefing tool?”. To answer this question an extensive literature study was conducted on mobile application prototype development, human computer interaction, user experience design, and usability testing. The knowledge acquired from the observations served as a key role in the basic development of design layout due to the awareness of what layout the current polices are used to for their application today.

For the user testing, a mixture of observations and interviews were used. The purpose of using observations was to see how the users interact and experienced the user interface. Semi-structured interviews were used with the purpose to get an understanding how to improve the user interface by the opinion of the evaluator. Structured interviews were performed to measure how the iterative development process progressed and improve the results. The structured interview consisted of a survey where the evaluator graded the user experience from the test. Participants involved persons with different occasion to get broad feedback, although the number of actual users were focused to once again get a deeper understanding for this specific target group.
3.1.4. Method for main research question

The main research was stated as the following: “How can mobility support the debriefing process for the Swedish Police Authority to increase the efficiency?”. The answers from research question 1, 2, and 3 creates the fundamentals for answering the main research question. By mapping the current debriefing process and identifying critical barriers in research question 1, together with the list of features to implement to improve the current debriefing in research question 2, identifies improvement opportunities of today’s situation. The research question 3 serves as an addition to deliver a concrete suggestion how the mobility can be implemented to support the intervention police in their daily operations to increase the efficiency. Due to the inductive research approach, additional literature was added for further explanation of the empirics and results from research question 3 in order to deliver the final proposition, discussion and conclusion of this study.

3.2. Literature review

Books and scientific articles have been used as primary literature material this this study. These literature sources have been gathered from the library at Royal Institute of Technology (KTH) together with digital services such as Google Scholar and KTH library online service Primo. The last service mentioned have multiple external databases connected to a search engine. Consultancy reports have been used carefully and served more as guidelines and indications.

The study was divided into two parts. The first part involved the current debriefing process and focused on a literature review to gain knowledge regarding process management. The purpose of this was to gain better understanding of the processes, identify critical processes and barriers, and map out the processes to recognize the relationships. Relevant keywords for this section was for example:

“Business process management”, “business process mapping”, “process analysis”.

The second part of the study concerned enterprise mobility and development of a prototype. The literature was therefore firstly concentrated on enterprise mobility and digitalization. Thereafter, the focus shifted towards prototyping, user experience and usability testing.

Relevant keywords for this section was for example:

1. “Enterprise mobility”, “digitalization”, “mobile information communication technology”.
2. “User experience”, “user experience testing”, “usability testing”, “heuristic evaluation”, “system usability score”, “system usability score grading”, “prototyping”, “prototyping mobile applications”, “paper prototype”, “hi-fi prototype”, “lo-fi prototype”, “storyboarding”.

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3.3. Data analysis

The empirics for this report have in a large extend been collected through interviews and observations. The data gathering has generated large amount of empirics and it would not be suitable to present all of it, and especially not in the raw format. Instead, Blomkvist & Hallin (2015) argues that the analysis of empirics need to be processed in a critical manner. For this study, a thematic analysis has been chosen to process the data in a structured way. A reason for this decision is that thematic analysis it suitable and a common way to analyze qualitative empirics gathered (Blomkvist & Hallin, 2015). Farquhar (2012) also confirms that the data analysis of an inductive approach should aim to find common themes throughout the empirics. The interviews were transcribed while the observations documented on paper which simplified the analysis and identification of themes. Repeated concepts, opinions, and words founded the categories to structure the thematic data analysis.

3.4. Validity, reliability and generalizability

This section will cover the quality of the study including the validity and reliability before ending with the study’s generalizability.

3.4.1. Validity

The validity of a study according to Collis & Hussey (2014) refers to “the extent to which a test measures what the researcher wants it to measure and the results reflect the phenomena under study”. Blomkvist & Hallin (2015) simplifies this by using the description that the “validity entails studying the right thing”.

The literature used for this study have critically been evaluated before being used. Criterias for use has for example been articles published by credible research organizations where the articles also have been peer-reviewed. The number of citations to the article have been taking into consideration. Also, the subject of the literature reviewed have been evaluated to be coherent with the problematization, purpose and research question to be answered, which is mentioned as face validity by Collis & Hussey (2014). Some internal reports have been used throughout the study which can be biased and reduce the validity. These reports have therefore been complemented with interviews to verify the information and therefore increase the validity. The validity of this study for the literature review can therefore be argued to be high.

For the interviews conducted through the study, the interviewees have been briefed with the purpose of the study which Collis & Hussey (2014) claim to be important. Furthermore, triangulation have been used to verify information by interviewing a broad audience to get different perspectives on the subject, but still focus on deep knowledge from specific target groups of
interest. An illustration of the interview layout can be seen in Figure 3. The triangulation is one way to improve the validity (Collis & Hussey, 2014). The validity of this study regarding the observations and interviews can therefore also be argued to be high.

![Figure 3 - The interview layout of the study. Take advantage of both breadth of knowledge as well as depth of knowledge.](image)

3.4.2. Reliability

The reliability of a study according to Collis & Hussey (2014) refers to “the accuracy and precision of the measurement and the absence of differences if the research were repeated”. Blomkvist & Hallin (2015) simplifies this and describe reliability as entailing that the research is studied in the right way.

The majority of this study is founded on semi-structured interviews and observations which, due to its context, probably will not give the exact same results if repeating the study. For example, the way questions in interviews are formulated, both semi-structured and unstructured, will affect the results and thus the difficulty to repeat the study with the same results. For the interviews, the study follows the recommendations by Trost (2012) to use simple words and avoid negation to increase the reliability. Moreover, the reliability is also affected by the interpretation of the gathered empirics and literature reviewed. Another researcher might interpret the material differently which can affect the results. Due to our semi-structured interview approach together with the observations, this study can be argued to have relatively low reliability, which also is generally
confirmed by Trost (2012) for semi-structured interviews. However, Collis & Hussey (2014) argue that the reliability for qualitative studies can be seen as of little importance and instead focus on the importance of that the information gathered from interviews and observations should be authentic.

3.4.3. Generalizability

Generalizability concerns to which extent the findings from a study, which often is based on a sample, can be extended to other cases in other contexts (Collis & Hussey, 2014). Due to the limited number of observations together with complex and varying work tasks, the generalizability of the results from this study can be argued to be low. Certain areas such as enterprise mobility, developing prototypes for mobile applications, and conduct usability testing can be seen as more or less generalized and therefore be used for other cases. Because of the delimitation regarding only study the Swedish police authority, one can argue that the generalizability for the results can also be seen as low.
Part 1

Part 1 will cover RQ1 described in section 1.3. Purpose & research questions. It will start off by introducing literature and theory needed to study the research question before moving to the empirics gathered and the analysis.

4. Literature & theory

This section will cover the literature and theory used to answer RQ1. The literature presented are mainly regarding business process management with deeper knowledge regarding business process mapping.

4.1. Business process management

Business process management, from now on BPM, is an important area which combines an organizations business and IT setup to increase efficiency and effectiveness for the business operations. BPM is also helps managers to analyze new business opportunities and non-monetary value-creation options and not only cost-centered perspective. (vom Brocke, Mathiassen, & Rosemann, 2014) Beverungen (2014) contributes to the BPM research area by developing a framework for business processes as a organizational routines that are represented, enabled and constrained by IT artifacts. Beverungen (2014) argues that the framework is based on the phenom that business process infrastructure are at drift, especially in the modernity context of lack of top-down management control.

Even though BPM often are linked with factories and physical production environments, van der Aalst, La Rosa, & Santoro (2016) argues that BPM also can be applied to administrative process and services. Furthermore, governmental agencies can be seen as an “administrative factory” which BPM therefore can be applied to (van der Aalst, La Rosa, & Santoro, 2016). When working with business processes, modeling the process helps to both gain a better understanding of the process, but also to share the understanding with the daily people involved (Dumas, La Rosa, Mendling, & Reijers, 2013).

4.1.1. Business process mapping

To better understand processes in order to find improvement opportunities and create efficiency, Mike Jacka & Paulette (2009) suggest to use business process mapping. Business process mapping and process analysis gives a holistic view and is a good way to verify that the work done is aligned with the key business objectives relating to efficiency, effectiveness, customer service and profitability. By getting the holistic view, relationships between the processes will be more easily seen and how changes in the processes will affect each other. The business process mapping
involves understanding what a process is, identify the processes and their stakeholders, describe the process and then visualize the processes as a process map, story line or flowchart. Each process should have a goal to support a bigger process that is aligned to the business objectives. In other words, the output of a process should always deliver some value to a customer. The customer can either be the primary customer who will use the product/service or an internal customer that might use the output from a process as the input of their process. The importance of this are highlighted by Mike Jacka & Paulette (2009) that argues that the most important benefit from the process mapping is probably that it is customer-driven. A completed process map should include the knowledge for everyone to understand what is delivered to the customer and why. The holistic view also enables the opportunity for the employees to see where their job comes from and how it contributes to the final product. This should motivate the employees to understand what they do and why, which in the long run should increase the benefit for the customer. (Mike Jacka & Paulette, 2009)

Glykas (2013) defines a process as ”a collection of related, structured tasks that produce a specific service or product to address a certain goal for a particular actor or set of actors.” The classical definition of a process are the mixture of inputs, actions and output – where some are extremely complex while others are simple to understand (Mike Jacka & Paulette, 2009). Furthermore, Mike Jacka & Paulette (2009) argues that transformation is a better word for what happens. They explain that if a transformation of the input has not been made for the output, there is no need for the process. A good process is instead decided on if its better supports and contributes to the organizations strategic objectives or not (van der Aalst, La Rosa, & Santoro, 2016).

To analyze a process fully, a system is needed to understand and classify the main process. The main process is built up by several layers of sub-processes, which needs to be broken down into manageable elements. Mike Jacka & Paulette (2009) use a movie as a metaphor for how a process can be broken down, illustrated in Figure 4. They use the full movie as main process, which then can be broken down into acts, scenes, shots and then script – which all are smaller processes that makes up the main process. (Mike Jacka & Paulette, 2009)
To avoid missing processes with the major processes identified but also understand how they interrelate, a Business Process Timeline Worksheet could be used – illustrated in Figure 5. The timeline contains the processes from first trigger event until last trigger event which the customer is involved in. Support processes can be included to get the overview how they depend on each other throughout the customer process (Mike Jacka & Paulette, 2009).
5. Empirics for part 1

This section will present the empirics for part 1. The empirics are divided into findings from observations followed by findings from interviews.

5.1. Findings from observations

Each case observed during the field study will be presented below. The duration of the cases mentioned is limited to the time when the intervention police got the case from either the Regional Operations Centre (ROC) or initiated by the patrol themselves, until the case is handed over from the police patrol to the coming process owner. The process owner in this case is mostly the police station commander. A rough generalization of the observed cases is illustrated in Figure 6. The process starts with that an event occurs (illustrated in red). This could either be that the patrol itself see a crime or decide to make any action, or it could be an order given from the ROC. The event is followed by transportation to the scene of the event (illustrated in orange), this could be by car or by foot. On arrival at the crime scene, the information gathering is started and any needed activities could be performed (illustrated in yellow), e.g. apprehend a person. Information gathering could for example be taking photos of evidence, interrogate suspected person or witnesses. When the required information is gathered and no more actions are needed, transportation to the police station (illustrated in green) will start. Lastly, the police station is reached where debriefing and activities at the police station can take place (illustrated in blue). This could for example be to a person into custody or just debrief the case. The processes illustrated do not need to be performed exactly sequentially. If for example a prioritized case is received, the first case can be put on hold and will then later be continued.

![Figure 6 - A high-level illustration of the rough generalization of the observed case processes.](image)

The following sub-sections will cover empirics from each case observed.
5.1.1. Case 1
Case 1 was classified as suspected assault, stolen car, illegal carrying of a weapon and crimes against the Narcotics Drug Law (NDL). The total time of handling the case was 225 minutes (= 3h 45 min). Five processes were used to handle information regarding the case and nine processes involved handling of photos. Two of the three processes for information was duplication of work where information was gathered to a notebook and later transferred from the notebook into an IT-system manually.

During the case, 9 different IT-systems were used to for example take photos of evidence, look up a person and then transcribe and debrief the interrogation. Several processes were handled in parallel due to the complexity and the number of people involved in the crime. Due to the parallel processes, plenty of idle time occurred before all the polices were free and able to leave the crime scene for continued work at the police station.

A special occasion with case 1 was that multiple police patrols were involved with the total number of polices as 5. The observation therefore cannot be seen to be complete due to fact that some processes was handled by another patrol, as for example the main police report.

5.1.2. Case 2
Case 2 was classified as suspected assault and hate crime. The total time of handling the case was 205 minutes (= 3h 25 min). Ten processes were used to handle information regarding the case and 3 processes involved handling of photos. Three of the ten processes for information was duplication of work for the information gathered.

During the case, 8 different IT-systems were used to for example take photos of evidence, look up a person and then transcribe and debrief the interrogation. Two police patrols with four and two polices involved handled the case, with the observed patrol as case owners. Several processes handled in parallel led to idle time for some polices.

5.1.3. Case 3
Case 3 was classified as pilfering. The total time of handling the case was 140 minutes (= 2h 20 min). Eleven processes were used to handle information regarding the case and 4 processes involved handling of photos. Three of the ten processes for information was duplication of work.

During the case, 6 different IT-systems were used to for example transfer photos and debrief the interrogation. This type of case can be seen as a volume crime with a non-complex process.
However, the number of sub-processes and tasks that need to be carried out is outlined in a way that takes a lot of time and include plenty of duplication of work.

5.1.4. Case 4
Case 4 was classified as crimes against the Narcotics Drug Law (NDL). The total time of handling the case was 85 minutes (= 1h 25 min). Four processes were used to handle information regarding the case where one of these processes was duplication of work.

During the case, only 2 IT-systems were used to for the debriefing. At the police station, a report needed to be written about deprivation of liberty which occupied one of the polices for 25 minutes which can be seen as idle time for the other police.

5.1.5. Case 5
Case 5 was classified as death. The total time of handling the case was 220 minutes (= 3h 40 min). Four processes were used to handle information regarding the case where one of these processes was duplication of work. The case was given to the police right before the end of their shift which resulted in about two hours of overtime for the patrol. In the case, several documents and third parties needed to be involved which led to additional time (e.g. waiting time) at the crime scene.

5.1.6. Case 6
Case 6 covered take a person into custody due to intoxicated. The total time of handling the case was 20 minutes. Three processes were used to handle information regarding the case. Only one IT-system needed to be used which reduce the complexity of the case. The document that needs to be delivered to the custody is a form with standardized fields which are straight forward for the intervention police to fill in.

5.1.7. Case 7
The classification of case 7 was pilfering. The total time of handling the case was 75 minutes (= 1h 15 min). Six processes were used to handle information regarding the case where two of the six processes included duplication of work. The interrogation with suspected person and injured person was held in parallel and left one of the intervention police in considerable idle time. During the case, three IT-systems were used for looking up the ID, transcribe interrogation and lastly writing the final police report. As clarified earlier in case 3, this can be seen as a volume crime.
5.1.8. Case 8
Case 8 was also classified as pilfering. The total time of handling this case was 75 minutes (≈ 1h 15 min). Six processes were used to handle information regarding the case where one of these processes included duplication of work.

5.1.9. Case 9
The classification of case 9 was drunken driving. The total time of handling this case was 75 minutes (≈ 1h 15 min). Four processes were used to handle information regarding the case where the information collected in the field where reused at the station for debriefing. One document for strip search was also issued.

5.1.10. General findings
There are many IT-systems used for all the different cases that the polices in field are facing. The IT-systems have been built to solve a specific problem rather than trying to extend current systems. The use of all different IT-systems lead to duplication of working in terms of reuse of information throughout the debriefing process. Also, the working process has been adjusted by the available support of the IT-systems rather than the desired working process. Lack of knowledge how to use certain IT-systems together with lack of the desired system itself has led to “home-made” working processes and tools to increase the efficiency has been developed by polices in field.

5.2. Key findings from interviews
This section will present key findings from the interviews conducted in part 1.

Process leader
The quality of the debriefing is increasing by digitalization; the reports are more descriptive and include more details. The quality is highly important for the legal action and the reports generated will be used by many parts. Today’s IT-systems are however unmodern and built around forms instead of information centric.

Department of regional operations
The implementation of mPMF have led to more flexibility and the initial information gathering for the polices in field, in contrast to the previous process of talking over radio. This has however led to decrease in statistics by skipping to report some cases without needed action. For example, information regarding a person’s network can be crucial in a legal action. To allow the polices in field to start an event report would be a bad idea which could lead to that no polices are available to use when needed. The IT-system STORM should be visible and used only by ROC as a tool for coordination of resources and not an information system for the polices to gather information.
(today visible through webSTORM). The general problem for ROC is the lack of available polices in field.

**Polices in field**

Mobility and especially mPMF tools have helped the polices radically with the daily operations. An opinion is the lack of news regarding IT-systems – everything from implementation of small features to how to use certain IT-tools. Also, the person that is head of custody and head of police station have different opinions and requirements of how the debriefing should be outlined and consist of. Lack of possibility for change and clearness of where to report suggestions have led to less motivation for feedback and suggestions. Previous failures of IT-systems such as PUST are also connected to this decreasing motivation. Polices in field has more or less accepted the tools available but shows a big interest for developing better operational support in field.
6. Analysis of business processes and critical processes

The aim for part one of the study was to be able to generalize the cases in a detailed way to get a detail-rich overview of the current processes. However, only a rough generalization could be drawn due to the big variety of the cases observed. The reason behind this was the great variety in terms of three perspectives. Firstly, the type of crime (classification). Secondly, the working process how to handle the case and lastly depending on third-parties involved such as doctors. On applying the theory from Mike Jacka & Paulette (2009) on how to break down processes, the generalization could only be done on second layer as they use “act” as a metaphor. Instead, the Business Process Timeline Worksheet theory by Mike Jacka & Paulette (2009) were used to visualize the case process over time. However, the individual cases were still broken down in details which enabled the opportunity to understand how the processes was connected and what information and IT-system that was used.

Many IT-systems were used throughout the different cases to perform certain activities. Some of the IT-systems was more integrated between themselves than other. By having some suboptimal integrations resulted in unnecessary process activities linked to duplication of work by some extent. Some of the systems was also developed many years ago (some over 15 years) but still perform good with minimal downtime. This however harms the possibility for integration to some extent. One of the main systems (RAR) are being replaced by extending the current DurTvå-system which are being tested as of today. The information gathering on the field often consisted of taking notes in a notebook with information such as names, personal numbers, notes from interrogation etc. These notes were then transcribed at the police station for debriefing. Names and personal numbers also needed to be rewritten many times in different IT-systems, especially those that lack integration. Moreover, the observations clearly showed that idle time on the field for one or several polices (depending on the size of the patrol) is not rare. This time could instead be turned into efficient working time by start and thereby save time spent in a later phase.

The lack of vertical integration in the IT-systems entails duplication of work as mentioned above. This duplication can be both in small scale such as writing a person's personal number, name, address phone number etc. several times in different systems, but also in bigger scale such as describing the sequence of events. This affects not only the efficiency in terms of time spent, but also the quality of the work. This quality affects firstly the report which may affect the outcome of the actual legal action in the end. The lack of transparency of information in IT-systems also increase the duplication of work for collaboration internally in the patrol when debriefing. The debriefing often contains several parts such as witness notes, personal description of the situation, forms for the arrest, evidence reports etc. The different parts are often distributed between the
involved polices where information often are similar or same in the parts but lacks integration. A whiteboard is therefore usually used today during the debriefing process to share the information. This duplication of work and sharing of information is a crucial process in terms of quality, efficiency and effectiveness. During the field study, a human error was observed during this process were one of the personal numbers was written incorrect at the whiteboard. The three polices during this case then used this information but luckily detected the error before submission.

The police authority is working with mobility and launched an app in 2015 called mPMF. This app enables the polices in field to look up fundamental information on persons and number plates on cars. Before using the app, the polices needed to talk over the radio to the ROC for them to look up information. The app has however not only positive effect. Information from interviews described that less statistics are gathered by having the polices look up information themselves. If for example a police patrol have stopped a car to inspect a person’s driving license, ends without any further actions, some polices might not register an event report through the radio. This missing information might not be seen so crucial at this point, but can in a later face be decisive when mapping for example relations between different persons.

When observing, this study measured the time spent on each process to be able to map problems to specific processes and optimize the throughput time of them. During the observations, the time differed much depending on the experience the person had, how used the person was with similar cases etc. Due to the nature of this study, social factors will not be considered. Therefore, it is more suitable to look at the number of activities and will still be able to strive for more effective processes. The underlying logical reasoning, by reducing the number of activities, you will also reduce the overall process time.
Part 2

Part 2 will cover RQ2 and RQ3 described in section 1.3. Purpose & research questions. It will start off by introducing literature and theory needed to study the research questions before moving to the empirics gathered.

7. Literature & theory

This section will cover the literature and theory used to answer RQ2 and RQ3. The first literature cover enterprise mobility and how this are being used. This is followed by literature on user experience design and usability evaluation.

7.1. Enterprise mobility

The role of mobile technology is being more important every day. The modern technological development has led to an increase use of information and communication technology and more specifically the adaption to mobile solutions by using laptops, smartphones, tablets, among other devices – also known as mobile information and communication technologies (mICTs) (Basole, 2008). There are almost 1 billion smartphone users worldwide, where people in average look the phone every 6,5 minutes (Accenture, 2013).

The overall expression that encompasses mICT in organizations is named Enterprise Mobility and there is furthermore an ambiguity of its definition (Basole, 2008). The two different perspectives that make up the definition is on one hand Enterprise Mobility as narrowly and tactically defined, whereas the other is defined broadly and strategically (ibid). In Figure 7, the variety of perspectives are put on an axis to illustrate the differences.

![Figure 7 - Enterprise Mobility Perspectives (Basole, 2008).]

Towards the left hand of the spectrum, enterprise mobility is viewed from a solution perspective on a specific matter or task with mobile emails as a concrete example (ibid). On the other hand of the spectrum, towards the right, enterprise mobility encompasses a holistic and strategic view with
that involves implementation on a wide-spread organizational level that enables for instance new core competencies and to gain and maintain competitive advantage (ibid). The definition that this report will refer to represent more point and task specific solutions and the implementation of an integrated series of mobile solutions, hence the central and left spectrum of the perspectives, as these are aligned with the Swedish Police Authority’s viewpoint of incorporating mobility into the debriefing process.

Incorporating mICT and a mobile work structure refers to developing an anytime-anywhere situation for workers to perform their tasks. It is enabled by communication capabilities, services and systems through information sharing, and distribution that is both convenient and adaptive (Kleinrock, 2001). Thereby, the work environment shifts from being bounded to a physical workstation, to a performing tasks and activities at a greater distance from the office space (Chen & Corritore, 2008). Furthermore, the people that actively make use of such systems and communication capabilities to perform their tasks and activities, are defined as mobile workers, or nomadic workers (ibid). The impact of transforming to a mobile workplace however stretches beyond the individual nomadic worker and has a profound impact on the organization and how it accomplishes work.

Research have illustrated enterprise mobility can deliver substantial benefits for an organization or business by making information through new technological solutions, such as increased efficiency and productivity, process improvements and higher-levers of convenience for the end-user (Basole, 2004). Additional research has illustrated that there are certain enablers for organizations to capitalize on the proposed benefits such as technological infrastructure, business processes, organizational culture, leadership, among other aspects (ibid).

The police authorities around the world are exploring how technologies and enterprise mobility can deliver the substantial benefits and for example make them safer and more effective (Accenture, 2013). Thomson (2010) says that the police work is notorious for the extensive amount of form-filling required – which indicates an opportunity for applying enterprise mobility and thereby help the intervening police to handle the task at the scene directly. Much of the police staff themselves use smartphones in their personal lives and therefore expect similar simplicity to access information and the same level of technology at work. The empowerment of polices by mobility increases their security, improve ways of working, enables analytical outputs directly to intervening polices in field (ibid). Accenture (2013) states that questions is not if mobility can improve efficiency and effectiveness, rather the question is how to unlock it. A key for success is the collaboration between intervening police and technology innovators. The boundaries need to be pushed with the innovative ideas while the practicalities for the polices reality need to be in
consideration. The police authority need to realize the advantages with mobility and understand the opportunity for how it could decrease cost, improve citizen satisfaction, security for the polices, and increase efficiency. To unlock this, it need to be developed for polices, by polices in collaboration with innovators. (Accenture 2013) Moreover, Thomson (2010) says that the police work is notorious for the extensive amount of form-filling required.

An example of a police force that have used mobility is the South Yorkshire Police. They issued 700 smartphones to the frontline officers to save time by developing a mobile application to help them while away from the station and instead handle the tasks directly at the scene. A project manager for mobile data for the police force in South Yorkshire describes that they had huge problems identifying and verifying information regarding persons stopped which affected the daily operations. The new mobile application now helps the polices to verify the information and gain access to additional information regarding the person. (Thomson, 2010)

7.2. User experience design and usability

A buzzword that is thrown around today are user experience. User experience is “person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service” according to the International Organization for Standardization (2010). Kraft (2012) instead uses the definition “as the feelings that the user gets when using a product” to be able to use it as a comparison model where the user experience can be for example anything between love to hate. Another buzzword used together with user experience are usability. International Organization for Standardization (1998) defines usability to “Extant to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”. Usability is more about if the user can achieve a specific goal, while user experience is more about if the user had a delightful experience before, during and after the use (Mifsud, 2011). How the usability is for a product is often judged based on how easy the product is to learn and use (Dumas & Redish, 1999). This is often translated into how much time it takes to perform a task, the number of steps needed and the success of prediction of the right action to take place (ibid). The usability also concerns the learning curve of the product where the desired curve is illustrated in Figure 8 where the user continuous develop
the knowledge of the functionality offered (ibid). However, the process of developing knowledge of a product is often that difficult that many users get stuck at a low level of knowledge illustrated in Figure 9 (ibid).

Kraft (2012) describes the importance of verification of the user experience when innovating. Furthermore, he explains that one common mistake is to wait with the user testing until the solution is almost finish. Instead, Kraft (2012) suggests to implement the verification process way earlier and verify also the raw ideas, core tasks etc. This verification can be done in several ways, for example with storyboards and prototypes. The developed prototype will work as a user interface prototype hypothesis where users will be observed while using a candidate design solution (Pernice, 2016). To create a usable product of service, no one can substitute the actual or potential users, which makes it important to work with the users to know and understand them (Dumas & Redish, 1999). Moreover, Dumas & Redish (1999) describes that usability can be ensured by for example having an iterative design and development process, involving users throughout the process and allowing usability and users’ needs to drive the design decisions.

7.2.1. Storyboard

There are many techniques to communicate stories and ideas how users interact with a system, such as wireframes and prototypes. Storyboards can however communicate a wider perspective. (Quesenbery & Brooks, 2010) The origin of storyboards is from the film-industry and are used in user experience design for visualization purposes in different form and shapes (Markopoulos, Martens, Malins, Coninx, & Liapis, 2016). The storyboards can either represent the flow of interaction for the user throughout the use of the application, or scenarios of use (ibid) – illustrated in Figure 10. Storyboard can also be used for describing how a problem can be solved by using this new product or solution (Quesenbery & Brooks, 2010). In contrast to wireframes and prototypes, storyboards offer a wider perspective and include the context and events of the user (ibid). Also, a user’s feelings and thoughts can be illustrated (ibid). With the growing number of development of mobile applications, challenges appear due to move from static desktops at the office to highly varianting environment. The designers therefore need to include factors such as the physical embodiment of a system, the user’s emotions and the environment of use in addition to the user interaction of a system (Truong, Hayes, & Abowd, 2006).
Löwgren & Stolterman (1998) describes storyboards as a combination of the benefits of scenarios and sketches – they are expressive, flexible, and easy to get an understanding of. There are however some disadvantages as for example the extensive time to revise because you often must re-draw the changes in many places (ibid). Quesenbery & Brooks (2010) argue that one of the biggest advantages with storyboarding is the low (or non-existing) requirement of translation. International teams can therefore share knowledge and understanding of a prototype even though the regular language barriers might be high. Furthermore, the barriers for translation in terms of technical knowledge and use of different terminology is lower and enable people to communicate an idea between organizations and teams. For example, a user interface designer an easily communicate the idea and concept through storyboards to a sales team. (Quesenbery & Brooks, 2010)

7.2.2. Low-Fidelity Prototypes

Low-fidelity prototyping, from now on “lo-fi prototyping”, is used to demonstrate a behavior for an interface of a prototype in a very early stage (Retting, 1994). This can be used to test with real users for the structure and logical behavior before spending lots of time developing extensive prototypes (ibid). The difference between the final product and lo-fi prototype is the interaction style, level of details and visual appearance (Walker, Takayama, & Landay, 2002), or in other words how closely the prototype is the final product in look-and-feel (Pernice, 2016).

The most common type of lo-fi prototypes are paper prototypes (U.S. Department of Health & Human Services, n.d. a) which describes an interface but makes it clear to the user that it is a “fake” system they are testing (Snyder, 2003). An example of paper prototypes can be seen in Figure 11. Retting (1994) further explains that “lo-fi prototyping is a technique that can dramatically increase quality”. (Figure 11 - Example of paper prototypes (Snyder, 2003).)
Moreover, lo-fi prototyping allows a team to test many ideas in a fast and relatively cheap way in contrast to developing extensive prototyping, also known as high-fidelity prototypes (hi-fi prototypes) (ibid). Firstly, the time spent to sketch the paper prototypes are low and the time can instead be spent on sketching multiple pages, menus or content (Pernice, 2016). Secondly, the time to make changes in the design is also lower than a hi-fi prototype and can easily be done during the test (ibid). When doing user testing with hi-fi prototypes, users tend to put focus on the finish of the design (color, font etc.) rather than the actual interaction flow and content of the application which lo-fi user testing instead keeps the focus on the big things tested (Retting, 1994). There is therefore less pressure of the users which encourage them to express negative reaction, but also gives stakeholders better understanding regarding time to release (Pernice, 2016).

7.2.3. High-Fidelity Prototypes

High-fidelity prototypes (hi-fi prototypes), in contrast to lo-fi prototypes, are computer-based prototypes which often allows user interactions (U.S. Department of Health & Human Services, n.d. a). The prototypes are created to look and work very alike the real product (Snyder, 2003) and therefore can test the true user experience and gather data such as time to complete a task with a more accurate result as the final product will have (Bailey, 2005) (U.S. Department of Health & Human Services, n.d. a). Retting (1994) explains that the purpose of hi-fi prototypes is to “selling an idea, testing look-and-feel, detailed proof-of-concept, testing changes to an existing system, and so forth.”. An example of the difference of a low-fi prototype versus a hi-fi prototype can be seen in Figure 12. The left side contains two low-fi sketches of how a website should look while the right side illustrates a more final look how the website could look.
7.3. Usability evaluation

As described in previous chapter, the usability and user experience are highly important when developing a new system. To verify that the final product will have a good usability, usability evaluation should be included to understand how users can learn and use the product to complete a specified goal, while understanding how satisfied the user are during the execution. (U.S. Department of Health & Human Services, n.d. b) If the product has a good design need to be judged in a situation (Löwgren & Stolterman, 1998). An IT-product that offers the best user experience and interface cannot be seen to have a good design if the functionality is not what the user needs. In other words, the focus on the usability can answer if the product can be used quick, effectively, and efficiently – but not if the product is suitable for the actual situation or context (ibid).

Within the area of Human-computer interaction (HCI), usability testing can be seen as one of the core concepts (Löwgren & Stolterman, 1998). The usability testing is a more or less formal experiment where a user is testing a product or prototype (ibid). Focus of the usability testing for the observer can often divided into four parts. Firstly, to understand how much time a specific part takes to perform. Secondly and thirdly, how many mistakes occurred and what type of mistake it is. Lastly, regards how hard it is to perform the task, for example how many times the user asks the observer for help. A challenge with usability testing is the access to users which also is connected
to time consuming and costly. To overcome this, several alternative methods have been developed such as design guidelines and heuristic evaluation. Design guidelines consist of results from HCI research regarding human thinking and action to be able to compare the prototype towards and therefore get an indication regarding problems people might get problems with. (Löwgren & Stolterman, 1998) The heuristic evaluation will be described in the following section.

Usability tests can be done remotely as well and being carried out in a very similar approach. The users can access the prototype remotely and a phone call or a video call could be established to apply the think-aloud concept as well. Nielsen (1999) states that an alternative to describing the task to perform vocally, a text could be used to describe clearly about the task and be sent over Internet. Disadvantages for remote testing is the lack of visual feedback of what the users action. (Nielsen, Designing Web Usability: The Practice of Simplicity, 1999)

7.3.1. Heuristic Evaluation

One method for usability testing is Heuristic Evaluation. This is an informal method where user interface (UI) specialist evaluates a presented interface design (Nielsen & Molich, 1990) in an iterative develop and design process (Nielsen, 1995a). The users examine the interface and considers the compliance with the usability heuristics for user interface design (ibid) and look for properties that the know from experience will cause usability problems (Jeffries, Miller, Wharton, & Uyeda, 1991). Nielsen (1995 b) defines 10 usability heuristics for user interface design as rule of thumb when evaluating an interface design. A usability problem should be mapped towards a one of these heuristics during usability evaluations instead of just pointing out a problem (Nielsen, 1995a). Furthermore, Nielsen (1995a) propose to use scenarios that lists realistic tasks for the user to perform when evaluating the system.

In a study made by Jeffries et al. (1991), a comparison of four user interface evaluation techniques were made; heuristic evaluation, usability testing, guidelines, and cognitive walk-through. The result was that heuristic evaluation “found the most problems, including more of the most serious ones, than did any other technique, and at the lowest cost” (Jeffries, Miller, Wharton, & Uyeda, 1991). Additionally, advantages of heuristic evaluation are that it is a usability testing method that is cheap, intuitive, easy to conduct, and can be used from an early phase in the development (Nielsen & Molich, 1990). However, disadvantages of the method are that the results sometimes point on a problem but without any solution suggestion (ibid) but also requires UI expertise and several evaluators (Jeffries, Miller, Wharton, & Uyeda, 1991). Heuristic evaluation has however also showed that also non-expert evaluators can help identifying usability problems (Santos, Ferreira, & Dias, 2016). Figure 14 illustrates the results from a study of Nielsen (1995a) regarding the number of evaluators versus the number of usability problems found. Single evaluators found only
35% of the usability problems while five evaluators seem recommended to find around 75% of the problems. The cost-benefit in relation to number evaluators for the study from Nielsen (1995a) illustrated in Figure 13, shows that the optimal number of evaluators were four.

Allen et al. (2007) conclude that neither heuristic evaluation or usability testing is a superior method for evaluating the usability of a product. Instead, they suggest to combine the two methods to create a comprehensive evaluation method. For example, heuristic evaluation often find a wide collection of usability problems, while usability testing tends to find the problems that affect the real users (Allen, Drewski, Engelhardt, & Kim, 2007). The same findings have been made in a study by Partala & Kangaskorte (2009) when combining usability testing and expert evaluation, as well as by Matera, Costabile, Garzotto, & Paolini (2002) which shows how to combine the two methods to increase the reliability while still make it cost-effective.

7.3.2. System Usability Scale

Brooke (1996) originally create the System Usability Scale (from now on SUS) as a “quick and dirty usability scale” to be able to measure usability and compare it in different context. The SUS is a Likert scale consisting of 10 agree/disagree statements on different perspectives of the system and will output an overall scale between 0-100, where higher number describes better usability (Brooke, 1996). The SUS have been used widely after being presented by Brooke in 1996 with smaller suggested adjusted, such as using “awkward” instead of “cumbersome” in question 8 (Finstad, 2006). Directly related to when a user has been using a system, the SUS should be filled in, before any further discussion has taken place (Brooke, 1996). Even though the SUS according to Brooke would be unidimensional, Lewis & Sauro (2009) concluded that the SUS actually analyzes two factors; usability (8 of the questions) and learnability (2 of the questions). Learnability is connected to question 4 and 10. Moreover, they describe that the current version of SUS can be used and additionally get more detailed information from their SUS data (Lewis & Sauro, 2009). Sauro &
Lewis (2012) describes that these two questions related to learnability could be removed and instead focus on the usability. However, they also argue that the little time saved by removing these questions is relatively small and therefore the overall SUS score including the learnability could be of higher value rather than the saved time (Sauro & Lewis, 2012).

What can be hard to understand is what the SUS score means after performing tests. Bangor et al. (2009) presents a comparison of the adjective rating, acceptability ranges and school rating scale, compared with the SUS score – displayed in Figure 15. They argue that the correlation is high between the SUS scores and the adjective rating and could be used as an alternative way of presenting and understanding the SUS score (Bangor, Kortum, & Miller, 2009).

![Figure 15 - Comparison of the SUS score in relation to acceptability ranges, school grade scale and adjective ratings (Bangor, Kortum, & Miller, 2009).](image)
8. Empirics & analysis

This section will present the empirics for part 2 together with analysis of the empirics. The first part will cover a features specification from the interviews and observations followed by the prototype development.

8.1. Feature specification from interviews and observations

When working on the debriefing, the information need to be structured throughout the whole process. When Regional Operations Centre (ROC) receive an alarm, they create a case where notes are written during the call. The notes can for example contain information such as the address of the place or a phone number to witness. This information could be good for the polices assigned to the case to see and easily access without talking through the radio with ROC for each detail.

Most of the cases includes several persons in some way. This can be witnesses, injured party, suspected perpetrator etc. A feature for having all involved persons listed with labels on the role on the case would be of interest to structure the information in the case. Each person should be connected to their personal number, address etc. and tentatively verified and imported from mPMF. In a later phase when arriving at the police station, the names could easily be automated on the different part of the debriefing needed. For example, generate a handcuff protocol with the person details automated and just fill in the description manually.

The GPS functionality should be used for determine the exact crime scene. This will be even more important and useful for places where no street address and number could be pointed out to be precise. Outside the debriefing, a map feature could be useful in an on-going crime for intervention police to see were their colleagues are located and for the responsible police commander to lead the resources. An example could be to circle a search area and then instantly push it to polices around that visually can see the area of interest.

The notes that today are taken into a notebook could instead be written directly into the phone. Also, some of the notes could be transcribed in the observed idle time on field which can save time later at the police station.

A commander at the police station mentioned that they today have rather good overview when police patrols are on their way with an arrested person. However, from time to time, polices arrive without further notice that can create congestions in handling the persons.
8.2. Prototype development & usability testing

This section will present the empirics for the prototype development proceeded by usability testing of the prototype.

8.2.1. Storyboard & Paper prototype

Based on knowledge and information from observations, interviews, and the general process overview from part 1, a storyboard could be sketched to illustrate how features could change the ways of working for the intervention police. An example case is illustrated in the storyboard displayed in Figure 16. The work shift starts out by having the police commander setting the patrols together and linking them to the police application. When the Regional Operations Centre (ROC) receives an alarm, one or several patrols is ordered on it by radio call and at the same time receiving the notification on the phone regarding the case. The application displays information from ROC regarding the case that can be seen as important while transporting to the crime scene. Once in place, information gathering can be done directly into the application, such as interrogation notes, information regarding a perpetrator, crime scene location etc. In the transportation back to the station, any transcribing can be done and then generate the needed forms upon arriving. Information gathered at the crime scene are being loaded when debriefing continues at the desktop. The involved patrols can share the information internally to increase the transparency of needed information.

![Figure 16 - The final storyboard produced to lay the base of the coming prototype development.](image-url)
The storyboard first got feedback by an expert within user experience and storyboarding before iterating with polices to validate and improve the case to be as close as a real case. The storyboard enabled the possibility to gain feedback from these two types of audience with large difference of technology experience as described by Quesenbery & Brooks (2010) in the literature section. The final storyboard can be seen as the base from where the paper prototype was developed. A similar feedback sessions was conducted with a paper prototype to get feedback before developing a hi-fi prototype. Example of feedback for this early phase feedback can be seen below.

"The application seems promising. Some of the labels in the application need rephrasing, but it looks good overall.” – Intervention police men

"I definitely find this paper prototype as a good base to build upon. I’ve given more detailed feedback on how the flow through the application could be adjusted to be align with today’s working process. Great work!” – Intervention police men

The different sketches of the screens for the paper prototypes can be found in Appendix B. Many different concepts of design could be tested due to the advantages of low time required to sketch lo-fi prototypes as described by Pernice (2016). Moreover, the feedback was clearly successful to give feedback on the structure and layout rather than details (font, colors etc.) that could have been the case if a hi-fi prototype was shown directly.

8.2.2. Usability test round 1

The first usability test round was conducted with twelve people, where five of these tests where in a virtual meeting context and seven in a physical meeting, illustrated in Figure 17. For the virtual meetings, detailed instruction of scenarios with tasks to complete were given through email and can be found in Appendix C. The instructions of the physical meetings were instead told by the observer verbally. The overall value from the SUS for usability test round 1 was 86.46 which can be seen as high for being the first test round and according to the grading scale by Bangor et al. (2009) would be given the adjective grade “excellent”. Divided into physical and virtual meeting, physical had the score of 88.57 while virtual had 83.5. The overall results per question for test round 1 have been illustrated in Figure 18, where odd question number should be as high as possible while even number should be as low as possible for best SUS score.
To understand the differences in the results between evaluators who tested it virtually and physically, Figure 19 was created. According to the scoring, the physical meetings generated better SUS score which can be due to the meeting context where a more detailed explanation could be given. Also, the standard deviation of the results from physical meetings were lower, down to 0.64 compared to 0.89 for virtual meetings. During the heuristic evaluation, the users gave plenty of feedback for suggested improvement. Besides important text changes and minor interface changes, a list of major suggestions where...
summarized and given a priority to fix for the next version of prototype. A small summary of this list can be found in Table 2. These improvements were classified as necessary to be fixed before going further.

<table>
<thead>
<tr>
<th>Type</th>
<th>Suggested improvement</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bug</td>
<td>Add missing signalement information</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Collect phone number in an earlier phase when importing persons from mPMF.</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Add “Read aloud and approved” on save for interrogations.</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Redraw flow to also accept adding involved persons to the case without having interrogation.</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Add field for preliminary criminal offense.</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Add additional fields from the event report.</td>
<td>3</td>
</tr>
<tr>
<td>Bug</td>
<td>Improve usability by adding a “Done” button on scroll views.</td>
<td>3</td>
</tr>
<tr>
<td>Bug</td>
<td>Add a grey hue to fields where information have been imported from another source, e.g. mPMF.</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2 - Improvement suggestions including the given priority from the first test round.

As extend to Table 2, the number of clicks needed to perform certain tasks was observed as a potential improvement. Observations to find weaknesses like this are well aligned with the argumentation by Löwgren & Stolterman (1998) for using usability testing.

8.2.3. Usability test round 2

Usability test round two contained a bigger test group consisting of 20 evaluators. The number of physical meetings where the same while the virtual meetings increased up to 13, shown in Figure 20. The test setup for the instructions where equivalent to the first usability test round and did by this reason not affect the results. The overall SUS score increased to 88.88, which is an improvement of 2.42. The Table 3 shows the differences between test round 1 and 2 in both overall score, physical score, and virtual score. All the summed score increased in the last round which is a good gesture that the product itself has improved in terms of usability.

![Figure 20 - Meeting context for usability round 2.](image)
<table>
<thead>
<tr>
<th>Usability round</th>
<th>Overall score</th>
<th>Physical score</th>
<th>Virtual score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usability round 1</td>
<td>86,46</td>
<td>88,57</td>
<td>83,50</td>
</tr>
<tr>
<td>Usability round 2</td>
<td>88,88</td>
<td>89,64</td>
<td>88,46</td>
</tr>
</tbody>
</table>

Table 3 - Comparison of usability round 1 and 2 in terms of overall score, physical score and virtual score.

A difference can still be seen between the physical score and the virtual score, although the difference is less for this round. This is especially noted for question 2 and 5 in Figure 21 where the variation between the two meeting contexts was big for round 1 but now more balanced for round 2. One of the biggest differences are the standard deviation for question 2 in the physical context which increased a lot, while it decreased for the virtual context.

![Figure 21 - SUS grade per question compared between physical and virtual meeting context for usability round 2.](image)

A comparison of the two usability test rounds per question have been illustrated in Figure 22. The result was better in round 2 in eight of the ten questions. According to the SUS score, the evaluators thought that the application became slightly more complex (question 2) and at the same time felt a little less confident using the system (question 9). Due to the added functionality, one could argue that the app became more complex but did not affect the usability and learnability due to the increase in those categories according to the scores. Another interesting detail is that the standard deviation decreased with the same relation as the score per question, question 2 and 9 therefore were the exception. Due to this high standard deviation, the median value of these question is
interested to look closer to. For question 2, the average was 1.70 while the median was 1.00 which is the lowest (best) answer. For question 9, the average was 4.25 (out of 5) and median 4.

![Comparison usability test round 1 & 2](image)

*Figure 22* - Comparison of the overall SUS score per question between usability test round 1 and 2.

Usability round 2 gave a smaller amount of suggestions for improvements. This has been summarized with the most crucial improvements in Table 4. Improvements of a greater scale has been noted down and will be included in the discussion in section *Error! Reference source not found.*

<table>
<thead>
<tr>
<th>Type</th>
<th>Suggested improvement</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>Add feature to extend the details regarding the sequence of events with a map where drawing is enabled.</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Visually present if an interrogation has been made or not with involved persons.</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Add opportunity to fill in email instead of phone number for involved people.</td>
<td>3</td>
</tr>
<tr>
<td>Bug</td>
<td>Verify the “read and agreed” section if more alternatives need to be added.</td>
<td>3</td>
</tr>
</tbody>
</table>

*Table 4* - Improvement suggestions including the given priority from the first test round.

Example of feedback from the usability test round 2 follows:

*This application would be extremely valuable for us police in field. Especially for the cases under the law §23:22 where everything could be debriefed in the application without the need to go back to the police station” – Intervening police men*
If a feature for adding evidence was implemented in the application, then the full debriefing of severe unlawful driving could be reported from the phone” – intervening police men

“It is important to always have a field ‘other’ when working with pre-defined fields to be able add any rare information if desired” – expert within the area

“The prototype is designed in a professional way and well-adjusted to fit with the police ways of working. The layout is consisted with the design standards which most users are used to.”

– expert within user experience design
9. Proposition

Many of the Swedish police authority’s IT-systems today seem to be have been developed separately with their own aim and purpose. This might be a reason for the lack of integration between the systems. Instead, this proposition suggests to use the current systems and build a mobility system for debriefing as a module with integrations rather than a separate system. The suggested system from this study are named mobile DurTvå (from now on mDT) due to the aim to help gathering information on the field for debriefing in a later phase (which is today done in the system DurTvå). A suggested system architecture is illustrated in Figure 23. Part A describes the integration with other systems such as mPMF, STORM etc. Part B illustrates the cloud where the information is stored, tentatively on the police physical storage rather than an external cloud provider due to security reasons. This however need to be studied more in detail in future research. Part C shows the integration to the system DurTvå which today is used for debriefing. The information gathered in the mDT should be loaded into DurTvå upon arriving at the police station for completion of debriefing.

Figure 23 - Suggested system infrastructure for systems to be integrated with mDT.

To structure the information regarding involved persons, a feature for listing all persons are suggested as illustrated in Figure 24. Each person is imported through an integration with the system mPMF and then requires additional information such as phone number, type of person, and information on how the person are identified. A future suggestion is to add the opportunity to fill in email instead of phone number in desired cases such as addicts who often change phone
number but keep emails. As illustrated in Figure 24, each person that is involved in the case are listed in a suitable category such as suspected prosecutor, witness, injured party etc. The involved vehicles are also listed here, which is the reason of naming this part involved parties instead of involved persons. Persons that have been interrogated are indicated with a green checkmark while not yet interrogated persons have an orange chat-bubble icon.

Increase the access to information has been one of the key findings that can increase efficiency and satisfy the police in field. The system STORM that are used by the Regional Operations Centre (ROC) have today a web view that the intervention polices can access at a desktop. The information regarding an event is noted in STORM and communicated through radio to the patrols. This can be as a good method for fast communication to several parties simultaneously. However, some of the information such as address, phone number and description of persons would be good to visually be read when needed. Therefore, an interface for the notes taken by the ROC is presented in the proposition for the application, illustrated in Figure 25. Important notes should be highlighted to more easily be found among the notes which in this example are done by coloring the note in a light blue color. This stream of notes can today be seen as one-way communicated, from ROC to the
polices. With such an interface, two-way communication could create advantages and improve the information transparency. A concrete example could be the sharing of description of a person that is recorded during a witness interrogation. All involved patrols could then get a notice of this information while ROC at the same time communicate the information through radio. The radio should be as less occupied as possible to be able to communicate important messages when needed. Skipping repeating messages due to hearing problems for intervention polices in the mixed physical environment decreases the traffic needed on the radio connection.

Quality of the debriefing is, as mentioned earlier, highly important. The information gathering in field are the first step that need to be verified to obtain correct information. During interrogation, information is today mostly gathered by asking questions and writing down the answers in a notebook. This is a method that are time efficiency but with the disadvantage of the structure and lack of feedback if enough and correct information is collected. As an improvement of today’s method, a structured interrogation tool is integrated which contains the general information for interrogation together with detailed input for description of persons and vehicles, illustrated in Figure 26. Important information that should be collected is structured into fields to fill in. Fields that contain information that can be seen as general such as gender, age, length etc. have predefined answers for the most common phrases that easily can be chosen to increase the efficiency. It is however important that the fields with predefined fields also have “Other” as an option where special alternatives can be written freely.

Figure 26 - Shows the interface of interrogation, description of a person and predefined alternatives for the field gender.
The description of vehicles has similar functionality with predefined answers for important fields. Additionally features to improve the quality of the information have been included and illustrated in Figure 27. The left screenshot shows how the information from a witness can be compared towards a database of registered vehicles (VTR) to see if they match. This can highlight different scenarios such as inaccuracies in the information from the witness or a vehicle with false registration plate. The information for the observed registration plate can be displayed by opening mPMF that is linked for additional details. As mentioned above, this verification could be of interest for other involved patrols and should therefore be share in the two-way communication to STORM as suggested before. For example, if a crime has happened and the prosecutors have used a vehicle with false registration plate they will probably put another plate on as soon as possible to divert the polices to detect the car. If the polices can get this information that a car with incorrect number plate have been used, they can change their searching. Furthermore, a feature for selecting the type of vehicle have been implemented. When asking witnesses today, a limited number of people can give precise name of the type which can affect the quality. Instead, symbols that illustrates the type can be shown to the witness if needed to secure the most likely correct answer. Both these two functionalities can also be seen as improving quality of information gathering by verifying the correctness in an early phase.

![Figure 27 - Illustrates the description of vehicles with the comparison functionality on the left. Right screenshot shows alternatives for different vehicle types.](image)

For both descriptions regarding persons and vehicle, the information regarding which direction the person/vehicle deviated is interesting. Describing this by words for another person to understand can be hard. Figure 28 shows how the text field for deviate in direction could be extended with an illustration for the sequence of events. The events can be marked out at the map with support of tools for drawing an arrow, mark a car, mark where the witness was standing, and additional events.
A similar tool is suggested to be used for determining the crime place. When placing the marker on the map, the exact position is pointed out as illustrated in Figure 30. This generates the exact coordinates together with the closest address. The exact coordinates should be used to indicate the exact position where the event has happened while the address can be used as an approximate position for getting to the position. The location in police cases can be used by other parties. For example, the Swedish Transport Administration are using it and evaluating traffic accidents to improve the conditions and reduce risk for similar accidents. However, without the exact position of the accident this work will be hard and might lead to repeated accidents. In bigger city today’s solution with only the address might not be a problem due to the short distance between the addresses. However, the distance for the addresses in the suburb and on the countryside can be long which creates a potential error source. Figure 29
illustrates an example of this. The address Enköpingsvägen 29 range from point A to E in the figure which is a distance more than 1,2km. An accident reported on this address will be hard to determine where it actually happened and where a possible change is required for the road to increase the safety.

Lastly, a final feature included are the notification to the arrest. This is more of a “nice to have” feature rather than increasing the value of the application. However, the responsible person of the arrest could in an easier way have control that multiple patrols are not arriving at the arrest at the same time with a notification.
10. Discussion on findings

The tasks that are performed by the intervention police are complex and highly varying. Thus, almost every case can be seen as unique due to all the different aspects. To add to this, the variety of context and physical environment makes the development of a mobile system even harder. It becomes clear that the development process of an application like this need to be created through an iterative process where intervention police work closely with innovators as suggested by Accenture (2013).

Through interviews with polices around Sweden, another perspective on idle time was gained. Except the bigger city as Göteborg, Stockholm, and Malmö, the time consumed while driving back to the station after completed tasks at the crime scene can be argued to be high. With a mobile debriefing tool with ability to transcribe the interrogation, today’s idle time could be converted into efficient working time that otherwise would have been spent at the police station. It became clear throughout the study that the intervention police have a strong habit of using a notebook for interrogation notes. A strong resistance was met when proposing to use a smartphone for these notes by several reasons, mostly due to the speed of noting by pen. However, most of the intervention polices agreed on having a field for interrogation notes available for idle time situation where transcribing could begin in field. The notes will probably be captured directly in a mobile application in the long run when technology such as speech-to-text functionality for dictaphones improves. Also, other formats as video recordings could be of interest to avoid the duplication of work by noting down on paper and later transcribing it into digital format.

The suggested proposition possesses a seamless integration between the different IT-systems. The effect this has on the intervention police is that they do not need to jump between different applications throughout the debriefing process. Also, the information gathered can be used automatically in the different systems without the need of manual typing which today can be seen as a high degree of duplication of work when handling for example personal information. This automation also reduces the risk of human errors in the transcribing phase. The quality of the description of suspected persons and vehicles could be increased in interrogations by using structured and pre-defined categories and answers. The availability of mobility tools like this on the field reduces the dependency of stationary workplaces. Idle time can instead be converted into efficient working time that otherwise would have required additional time spent at the police station. The debriefing process can in less severe cases be finalized already on the field and in the best case avoid to spend time on transportation back to the police station for debriefing. All the above mentioned factors are connected to increased efficiency combined with retained or increased quality.
Apart from the efficiency and quality, the sustainability aspects can be discussed for the proposed solution as well. One can argue that the solution will result in less paper use and instead use digital documentation which will have a positive impact on the environmental aspect. Moreover, less transportation back to the station can also have a positive impact with less carbon dioxide emissions. For the social aspect, a more effective debriefing tool can decrease the additional overtime spent on debriefing and instead take advantage of the idle time and transportation time to debrief. Also, a mobile tool that help the employees in their daily operations can result in more satisfied employees. Most of these aspects can also be linked to the economical aspect where efficiency and quality improvement will for example decrease cost due to less overtime and reduced cost of resources associated with vehicle and transportation.
11. Conclusion

The following section will cover the conclusion for this study. Firstly, reviewing the purpose of the study and then describe the contribution and areas for future research.

11.1. Reviewing the purpose of the study

The purpose of this study was to investigate how mobility supports the Swedish Police Authority’s debriefing process in forms of increased efficiency for the intervention polices in field. This was performed by the main research question of this study:

“How can mobility support the debriefing process for the Swedish Police Authority to increase the efficiency?”

The big research question was divided into three sub-questions to be able to answered. The coming sub-sections will walk through each of these questions and what conclusions have been made throughout the study.

The objective of the study was to provide the IT-department at Swedish Police Authority with new insights on what features a mobile debriefing application should include, a proposition how it should look, and what effect it will have on the efficiency of the current processes. The proposition consisted of a prototype of a debriefing application which is tested among the polices to serve as a pre-study for developing such a debriefing tool.

11.1.1 Review of research question 1

The first research question was formulated: “What processes exist in the current debriefing flow?”

With literature on business process management and more in detail business process mapping, a field study was setup. Information regarding the everyday work was gathered through the observations from the police work together with interviews with polices. This included everything from observing the physical context while working, to the tasks performed and what IT-system used.

A high-level generalization was the result of the observations and interviews to give an overview of the current process and how they were connected to the debriefing flow. One of the key findings was the large amount of IT-systems used where some of the systems were more integrated together than others. This usually led to the requirement of filling in the same information repeatedly in
different systems throughout the debriefing flow, resulting in additional time spent and risk for human errors.

11.1.2. Review of research question 2
The second research question was formulated:
“What features are needed to improve current debriefing processes?”

Interviews regarding the working process and barriers from research question 1 laid the base for research regarding suitable features to be included into a mobile application. Literature regarding enterprise mobility gave deeper understanding and guidelines which results could be achieved through increase use of mobile solutions and integrations of today’s situation.

As the result of the interviews, a storyboard was produced to show a suggested new process flow through the opportunity of a mobile debriefing tool to support the work in field. Iterations of feedback from the intervention polices and experts within the area concluded critical features to be included.

11.1.3. Review of research question 3
The third research question was formulated:
“What design should the features have in the mobile debriefing tool?”

Literature study provided a base of knowledge on how to develop prototypes to study how to build the flow of the application and further study the design. Additional literature extended the knowledge how to literately include the users into the development process and evaluate the prototype throughout each phase.

The results of the prototypes and user evaluations suggested how the features from RQ2 should be integrated into a mobile debriefing application to fit the working process. Also, it resulted in a suggestion of how the application should be designed in the best way to fit the use from intervention police.

11.1.4. Review of main research question
Finally, the main research question was formulated:
“How can mobility support the debriefing process for the Swedish Police Authority to increase the efficiency?”

With the findings from RQ1 – critical processes related to the debriefing process together with findings from RQ2 – what features to be included to increase efficiency with mobility in the debriefing and findings from
RQ3 – *how to design the features in the debriefing tool* offers a proposition for how mobility can support the debriefing process for the intervention police to increase the efficiency for their work. The proposition increase the efficiency by reducing the duplication of work, increase the usability for the users, reduce the risk for human errors, and reduce the dependency of stationary workplaces for debriefing. The debriefing tool includes quality assurance of the information gathered through a structured working process at the same time. The factors mentioned above can be linked to reduced time spent on the tasks while retain or even increase the quality of the results – which in this case is the debriefing report.

11.2. Contribution to knowledge

The delimitations and limitations of study reduces the ability for generalizability of the results. The focus of the debriefing process for the Swedish Police Authority can be seen as narrowed and hard to apply for other organizations. However, this study can contribute to the academia of enterprise mobility for extending the knowledge about the relation of increased efficiency through mobility in a Police Authority. Other Police Authorities around the world could use this thesis for extending knowledge of applying mobility into daily operations for increase efficiency. Other organizations that use similar debriefing processes such as parking attendants can probably apply knowledge from several parts from this thesis.

11.3. Suggestions for future research

The Police Authorities process large amount of data that should be restricted within the organization. Having control of this data is easier with stationary workplaces where the dependency on third parties involved are limited. The use of mobility creates an anytime-anywhere situation where access to information can be issued whenever and wherever. Thus, this study suggests that various security aspects are studied in detail regarding the use and implementation of enterprise mobility in the daily operations for intervening police. This might affect the given proposition from this study in terms of information access, information gathering etc.

Another topic that was commonly recurrent throughout this study was the legal aspects. This topic need extensive research for both the given proposition, but also how to develop the application in future. The given proposition has not taken the legal aspects in consideration for the application flow or design. Instead, some parts that was complex and involved many legal aspects was put aside for future research, such as interrogation with suspected offenders.

Lastly, the delimitation to focus on the polices in Stockholm requires further studies to ensure that the proposition support the ways of working throughout whole Sweden.
12. References


Appendix A

Visualization of processes from the observations
Event occurs

Transportation to the scene of event

Information gathering & crime scene activities

Transportation to the police station

Debriefing & activities at the police station

Händelse & brottsplats åtgärder

Avrapportering & stations åtgärder

Transport till plats

Transport till station
Appendix B

Paper prototype screen sketches
Erik Andersson
19901212-1212
Storgatan 12
123 12 Storstenen

Typ av person
V

Misstänkt
Vitine

Sök Q

19901212-1212

Nytt färör
Vill du lägga till en ny person?
Ja
Nej
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**PMF:**
Pers. nr: 0070212-1212
Adresse: Storgatan 12
Post sek: Stortorget
Brott: Städsladen

**Importen till:**
# Appendix C

## Usability test round 1 - SUS score

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| Average     | 4.25 | 1.33 | 4.33 | 1.50 | 4.08 | 1.42 | 4.42 | 1.42 | 4.58 | 1.42 | **86.46** |
| Std dev.    | 0.97  | 0.89 | 0.89 | 0.90 | 1.00 | 0.67 | 0.67 | 0.90 | 0.67 | 0.51 |           |

| Physical    | Average     | 4.43 | 1.00 | 4.29 | 1.71 | 4.43 | 1.57 | 4.57 | 1.14 | 4.71 | 1.57 | **88.57** |
| Std dev.    | 0.79        | 0.00 | 0.95 | 1.11 | 0.79 | 0.79 | 0.53 | 0.38 | 0.49 | 0.53 | 0.64   |

| Virtual     | Average     | 4.00 | 1.80 | 4.40 | 1.20 | 3.60 | 1.20 | 4.20 | 1.80 | 4.40 | 1.20 | **83.50** |
| Std dev.    | 1.22        | 1.30 | 0.89 | 0.45 | 1.14 | 0.45 | 0.84 | 1.30 | 0.89 | 0.45 | 0.89   |
## Appendix D

### Usability test round 2 - SUS score

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Appendix E

Heuristic evaluation cases

Uppgift 1
RLC har beordrat din patrull på ett larm. Du får en notis på mobilen om det aktuella ärendet. Du är intresserad av att se vilken adress ärendet gäller och vilken information RLC skrivit ner medan ni transporterar er till platsen.

Uppgift 2

Uppgift 3
Under förhörets gång kommer det även fram att personen kan lämna signalement på en person samt ett fordon (uppgifter nedan). Lägg in signalement, förhandsgranska signalement, läs upp förhör och spara sedan förhör.

Allmänna uppgifter
- Blek hy
De allmänna uppgifterna du får av personen
fylls i när du klickar på fälten. Signalement
person
- Man - Skägg
- 25-30 år - ABC123
- 175 cm - Grön
- Mediär kroppsform - BMW
- Rund ansiktsform - Coupé

Uppgift 4
Ni har nu samlat en uppfattning om vilken den exakta brottsplatsen är och vill nu lägga till det till ärendet.

Uppgift 5
Utifrån signalement-uppgifterna har ni lite senare lyckats få tag i en misstänkt gärningsman. Personen är gripen och skall läggas till i ärendet.
Uppgift 6
Vid gripandet av gärningsmannen brukades ett fordon utan att gärningsmannen hade körkort. Detta är inte första gången och fordonet skall därför tas i beslag enligt TBL7.

Uppgift 7
Ni är nu klara på plats. Ni har lastat personen i bilen och är redo att åka men undrar vilken arrest som är närmast och har plats. Målet är att meddela närmaste lediga arrest innan ni börjar rulla…
## Appendix F

### SUS survey (Structured interview)

<table>
<thead>
<tr>
<th>Fråga</th>
<th>Håller inte med alls!</th>
<th>Håller med helt!</th>
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</thead>
<tbody>
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<td>Jag tror att jag skulle vilja använda den här Appen regelbundet</td>
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<tr>
<td>1 2 3 4 5</td>
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<td>Jag tycker att Appen är onödigt komplex</td>
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<td>Hjälp av en teknisk person skulle behövas för att jag skulle kunna använda den här Appen</td>
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<td>Jag tror att de flesta människorna skulle lära sig att använda denna App väldigt fort</td>
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<td>Jag kände mig bekväm när jag använde Appen</td>
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</tbody>
</table>
Jag behövde lära mig mycket innan jag kunde använda mig av Appen.