Transport- and Construction Equipment Theft in Sweden

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Abstract

Purpose: The purpose of this thesis, is to relate the areas of crime theory and supply chain to the transport- and construction industry, by exploring factors that influence the occurrence of theft as well as factors that influence the police reporting tendency in the same industry. The thesis intends to support decision making in the transport- and construction industry.

Design/methodology/approach: To fulfil the purpose a mixed-method research design is constructed. The research is based on a literature review of crime theory, sustainable supply chains, transport crime and police reporting tendency. Semi-structured interviews with representatives from the studied industry were performed to complement the research. A quantitative survey of the practitioners' company profile, theft experiences and tendency to report crime is conducted, and a qualitative case study. A theoretical framework of theories connected to both the occurrence of theft, as well as the considerations when conducting a police report is identified in the literature and used to structure the survey and analyse the findings.

Findings: The occurrence of theft is influenced by the practitioners' workplace conditions. Security guards alone are the most efficient security measure against crime, while workplaces characterised by an urban environment are the most vulnerable to theft. Temporary workplaces are also especially vulnerable to theft, as well as fenced workplaces. A linear relationship between theft experiences and police reported thefts, was also identified. The survey shows that practitioners in the studied industry, in general, lack trust in the police and believe that more resources need to be dedicated to the investigated type of crimes.

Originality/value: This thesis is providing a comprehensive review of transport- and construction equipment theft in Sweden. Factors needed in order for a theft

to occur within the industry have been identified and presented, as well as important considerations when deciding to report a theft to the police. As such, this thesis provides a foundation for future research of transport crime in the field of movement patterns, crime prediction and organised crime.

Keywords: Transport- and construction industry, transport crime, theft, crime occurrence, police reporting tendency, workplace conditions, and security equipment.

Sammanfattning

Syfte: Syftet med examensarbetet, är att relatera befintlig teori, beträffande kriminologi och försörjningskedjor, till transport- och anläggningsindustrin. Detta genom att undersöka vilka faktorer som påverkar förekomsten av stöld samt anmälningsbenägenheten inom den studerade industrin. Arbetet ämnas kunna användas som beslutsunderlag inom transport- och anläggningsindustrin.

Design/metod/tillvägagångsätt: För att uppfylla syftet har en forskningsdesign, bestående av två metoder konstruerats. Forskningen är baserad på en litteraturstudie inom följande områden; kriminologi, hållbara försörjningskedjor, brott i transportindustrin samt anmälningsbenägenhet. Halvstrukturerade intervjuer med representanter från den studerade industrin genomfördes för att stärka forskningsstudien. En kvantitativ enkätundersökning om aktörernas företagsprofil, stölderfarenheter samt anmälningsbenägenhet har genomförsts, därtill en kvalitativ fallstudie. Ett teoretiskt ramverk, kopplat till teori om varför brott förekommer samt teori om anmälningsbenägenhet, har identifierats i litteraturen och används för att strukturera enkäten och anslysera resultaten.

Slutsatser: Förekomsten av stöld beror av egenskaperna på aktörernas arbetsplatser. Säkerhetsvakter är den mest effektiva säkerhetsåtgärden, medan arbetsplatser belägna i en stadsmiljö är de mest utsatta för stöld. Tillfälliga arbetsplatser är också särskilt utsatta för stöld, likaså inhägnade arbetsplatser. Ett linjärt samband mellan antalet stölderfarenheter och antalet polisanmälningar har identifierats. Enkätundersökningen visar på att aktörerna i den undersökta industrin, generellt, har ett bristande förtroende för polisen och tror att det krävs mer resurser dedikerat till de undersökta brottstyperna.

Originalitet/värde: Detta examensarbete ger en omfattande insyn i transport- och anläggningsindustrins stöldsituation i Sverige. Faktorer som krävs för att en

stöld ska inträffa inom den undersökta industrin, samt viktiga beslutsfaktorer för att en stöld ska polisanmälas, har identifierats och presenterats. Denna studie utgör således en grund för framtida forskning beträffande stölder inom transport- och anläggningsindustrin. Framtida forskningsområden hade kunnat vara kartläggning av rörelsemönster, förutsägelse av brott eller organiserad brottslighet.

Nyckelord: Transport- och anläggningsindustrin, transportbrott, stöld, förekomst av stöld, anmälningsbenägenhet, arbetsplatser samt säkerhetsutrustning.

Transport- and Construction Equipment Theft in Sweden

The transport- and construction industry is especially vulnerable to theft. The occurrence of theft is influenced by the conditions of the practitioners' workplaces. The tendency to report these crimes are influenced by cost-benefit considerations.

Two out of three machine entrepreneurs, three out of five hauliers and two out of five farmers were subjected to theft in 2018. The tendency to report a crime was found to be 60% independent of practitioners' history of theft. This means that the likelihood of reporting the first theft is as likely as reporting the hundred. A high reporting tendency was identified for high-value thefts, characterised by higher levels of the amount of loss, the severity of the injury or the perceived chance to receive some sort of compensation, such as insurance payment. Practitioners in the industry are feeling a great deal of hopelessness and frustration caused by these thefts, and the financial impact on their business. The financial impact of theft is usually far from just the loss and replacement of the stolen goods. Often, downtime occurs as a result of sabotaged machines and equipment that needs repairing. In the county of Skåne, the number of thefts that occurred in 2018 was estimated to be 15 800 thefts, corresponding to 44 thefts per day. The total financial impact of these thefts was estimated to be 727 million SEK. Not all practitioners in the industry were equally subjected to theft. The most targeted group was identified to be the machine entrepreneurs, followed by hauliers and farmers. The main reason behind this difference was found to be the practitioners' workplace conditions. Machine entrepreneurs' workplaces are more often than for hauliers, and farmers, characterised by being temporary, located in an urban environment and have a low degree of security, conditions found to increase the likelihood of theft. Intuitively, many would probably think that security equipment would decrease the likelihood of theft or at least not

increase the likelihood. However, a fenced workplace was found to increase the likelihood of theft. The reason for this could be that the purpose of a fenced area first and foremost is to protect pedestrians and the surroundings and seems to do little to stop motivated thieves. Five types of transport- and construction equipment thefts were analysed in a frame population constituting of machine entrepreneurs, hauliers and farmers, aiming to represent the industry as a whole. This thesis relates the areas of crime theory and supply chain to the transport- and construction industry by exploring factors that influence the occurrence of theft as well as factors that influence the decision making behind the police reporting tendency in the same industry. The study intends to support decision making in the transport- and construction industry. This thesis can be seen as the first step towards a systematic approach to acquiring theft in the transport- and construction industry. However, before further actions can be taken, the police reporting statistics must become more comprehensive and better reflect reality. With higher data quality, researchers in the next step have the opportunity to demonstrate movement patterns, highlight organised crime or predict theft.

Stina Bengtsson Charlein Simonsson

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Lund, May 2019

Stina Bengtsson and Charlein Simonsson

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List of acronyms and abbreviations

BRÅ	the Swedish National Council for Crime Prevention (Brottsförebyggande rådet)
crime code	a system for registering crimes reported to the police, which facilitates the development of statistics
crime code 0822	burglary theft from temporary barracks, carriages etc. at a construction site
crime code 9803	theft of trucks or trailers
crime code 9804	theft from trucks or trailers
crime code 9823	diesel theft from a vehicle tank
crime code 9824	diesel theft from a larger tank (not attached to a vehicle)
LRF	the Federation of Swedish Farmers (Lantbrukarnas Riksförbund)
ME	the Association of Swedish Earth Moving Contractors (Maskinentreprenörerna AB)
SÅ	the Swedish Association of Road Transport Companies (Sveriges Åkeriföretag)

1. Introduction

A machine operator arrived at his workplace in the morning as usual. However, this morning he discovered that the refuel pump on the machine was gone. The refuelling pump had thus been unscrewed and removed. The damage was considered small but still had a quite high financial effect on the business due to reparation and downtime, during which the machine was inoperable. This crime cost the business 13500 SEK and affected the profitability of the machine negatively. The event was reported to the police but was not investigated. This was just one of the 16 thefts the same company experienced during the year 2018 in the county of Skåne.

This anecdote addresses the topic of this thesis. In this chapter, an introduction to the project is presented. The chapter starts by providing motivation for the thesis. Following that, the purpose, research questions, studied context, focus and delimitations are presented. The chapter ends with a description of the outline for the rest of the report.

1.1 Motivation of the thesis

Trends of today such as; a turbulent geopolitical situation, strong population growth, digitalisation and sustainability issues are affecting the criminal world (Campbell, 2014; Trygghetskommissionen, 2018). In particular, organised crime, defined as; "..structures, networks, or organisations that are involved in criminality; the provision of illegal goods or services; or certain types of crimes of a given level of gravity" has got increased attention globally (Campbell, 2014, p. 229). Organised crime has increased as a consequence of the high mobility across national borders due to that the importance of borders in Europe have decreased (Trygghetskommissionen, 2018). In other words, the globalisation of

today promotes this type of crime and organised crime has in some respects moved on to be a political issue and a matter of national security (Campbell, 2014). Internationally, Sweden is considered an attractive target for criminal activities. Two main reasons for this could be the good supply of goods and capital, as well as the juridical system, characterised by relatively low penalties for these crimes. (Fors & Hansén, 2014; Trygghetskommissionen, 2018)

The transport- and construction industry is particularly vulnerable to crime (Ekwall, 2007; Sternberg & Lantz, 2018). The cargo thefts alone are estimated to cost the practitioners 86 billion SEK each year solely the European Union (van den Engel & Prummel, 2007). In Sweden, diesel fuel, construction equipment and vehicles are also attractive targets for a potential offender and are frequently exposed to theft (Ek, 2019). According to Hampe Mobärg (2018), CEO at Maskinentreprenörerna AB (ME), these type of thefts have a palpable financial effect on their members' businesses, that decreases the profitability of the whole industry. Just considering members of ME, the cost of diesel theft alone is estimated to half a billion SEK each year (Anläggningsvärlden, 2018).

At the same time, Per-Arne Nilsson, retired police commissar specialised on transport theft, means that the knowledge and experience in how to fight these specific crimes have decreased (Rosengren, 2019). The incentive to report this types of crime to the police is low among the practitioners and this is one reason why the police's registration statistics is of lacking quality (Ekwall, 2007; Lindh, 2019). As a consequence, there is limited knowledge about the actual amount of thefts in the industry and the possibilities to analyse the micro-data behind the statistics are very limited. Therefore, it is interesting to study similarities and differences among practitioners active in the transport- and construction industry. Aspects of interest are among others; crime rate, workplace conditions, security measures, police reporting tendency and financial implications. By identifying parameters affecting the practitioner's tendency to report crime and make them visible, the tendency could hopefully increase and so would the quality of the police's micro-data. This would open up for future research with the opportunity to analyse micro-data characterised by high quality and greater substance. The thesis also contributes to the theory of transport crime. This is of

relevance since the academic field of transport crime and statistics today is limited (Sternberg & Lantz, 2018).

In order to reduce the occurrence of crime, one first must understand why it takes place (Eskridge, 2005). In order to fight crime, Chris Eskridge (2005), professor in Criminology and Criminal Justice at the University of Nebraska, states that a definite body of knowledge, as well as an understanding of cause and effect, is of major importance. This thesis can thus be seen as the first step in order to approach the theft that occurs within the transport- and construction industry. This explorative approach is thus a necessary fundamental step for future normative approaches within the areas of crime theory and supply chain for the studied industry. Insufficient data in this field leads to a lack of knowledge, fewer police resources, more targeted companies and lost tax revenue for the state which could have been reinvested in society.

1.2 Purpose and research questions

The purpose of this thesis is to relate the areas of crime theory and supply chain to the transport- and construction industry by exploring factors that influence the occurrence of theft as well as factors that influence the decision making behind the police reporting tendency in the same industry. The thesis intends to support decision makers such as policymakers, practitioners, and scholars in the transport- and construction industry.

To achieve this purpose the following research questions have been selected.

RQ1: What is required for transport- and construction equipment theft to occur?

> *Sub-RQ1.1: Do the conditions of the practitioners' workplaces influence the occurrence of theft?*
>
> *Sub-RQ1.2: Does the company size of the practitioners´ influence the occurrence of theft?*

Sub-RQ1.3: What characterise the stolen goods?

RQ2: What is required for a transport- and construction equipment theft to be reported to the police in a micro-level context?

Sub-RQ2.1: What influences a practitioner's tendency to report a crime to the police?

Sub-RQ2.2: Does the tendency to report crime depend on the type of theft committed?

Sub-RQ2.3: Does the tendency to report crime depend on the number of theft experiences?

1.3 Studied context

The transport- and construction industry consist of, among others, actors within machine operation, transportation, and agriculture. The practitioners operating within this industry are particularly vulnerable to theft since many of their workplaces are constantly changing, and hence often unguarded (Ekwall & Lantz, 2013; Hultgren, 2019; Mobärg, 2019; Svensson, 2019). Furthermore, some practitioners within the industry are dedicated to project-based operations with varying lengths (Ek, 2019; Hultgren, 2019). This is especially true for machine entrepreneurs and the security efforts dedicated for each workplace are thus of varied quality since it is very costly and time inefficient to protect everything at all times (Mobärg, 2019). In order to avoid supply chain disturbances and risk of theft among hauliers, the need for more strategically placed secured parking areas are thus being analysed by the industry (Svensson, 2019). Many of today's farmers combine their work with an additional job, leading to that the farm is often left unprotected during the day (Hultgren, 2019).

Machine entrepreneurs, hauliers, and farmers have the possibility to become a member in one, or several, of the following member organisations; Maskinentreprenörerna AB, Sveriges Åkeriföretag or Lantbrukarnas Riksförbund depending on their business. Some actors practise in more than one

business area. Hence, multiple memberships are not unusual within the industry. (Hultgren, 2019; Mobärg, 2018; Svensson, 2019) A brief introduction of the three member organisations is presented below.

MASKINENTREPRENÖRERNA AB

Maskinentreprenörerna AB (ME), in English the Association of Swedish Earth Moving Contractors, is the leading trade- and employers association for earth movers and contractors with construction equipment in Sweden. ME has 4000 company members active in regions all over Sweden, which makes them a big actor in the industry. The association is intended to act as a source of guidance for their members and a source of reassurance for clients. (ME, 2017) This is accomplished partly by helping members with difficult tasks, such as bargaining and employment, and by identifying and understanding the problems that their members are experiencing. ME has therefore worked a lot with thefts. Theft has been included in the business plan of the South region since 2010. In the county of Skåne, ME has a coverage of approximately 65-70% of the relevant professionals. (Ek, 2019)

SVERIGES ÅKERIFÖRETAG

Sveriges Åkeriföretag (SÅ), in English the Swedish Association of Road Transport Companies, aims to boost proud and profitable haulage companies in a healthy and attractive market (SÅ, 2019a). As a member of SÅ, hauliers get increased influence as well as support in the shape of knowledge and industry-specific tools. SÅ inform their members about new laws and regulations and technology. Members can get help with issues, and also subscribe to regulatory updates. (SÅ, 2019b) Approximately 60-65% of transport companies in Sweden are members of SÅ (Svensson, 2019).

LANTBRUKARNAS RIKSFÖRBUND

Lantbrukarnas Riksförbund (LRF), in English the Federation of Swedish Farmers, has a vision formulated and presented as; “We make the country grow. The green industry has a key role with respect to growth, profitability, and attraction in the sustainable society.” (LRF, 2019a). As a member of LRF, you

get access to newspapers, insurances, educations, discounts, as well as personal support and advice regarding your business (LRF, 2019b). LRF Skåne is the largest region of LRF. It is estimated to be 10000 farmers active in Skåne, of which approximately 7500 are members of LRF, giving LRF a coverage of 75% in Skåne. (Hultgren, 2019)

1.4 Focus and delimitations

The thesis is limited to investigate thefts in the transport- and construction industry in Sweden. More specifically five crime codes are investigated, namely diesel theft from a vehicle tank (9823), diesel theft from a larger tank (9824), theft from a vehicle (9804), theft of a vehicle (9803) and burglary theft (0822). In order to reach the professionals in the industry three Swedish member organisations were approached. The members of these member organisations are professionals operating in the transport- and construction industry and constitute the target population of the research.

To conduct this project some delimitations had to be made, due to the time restraint required for a master thesis. The time frame for the project was limited to 20 weeks. This has influenced the scope of the project in several ways. Firstly, the area of concern had to be narrowed down and defined in order to avoid an incoherent approach. Secondly, the literature review is influenced to be limited in scope in terms of the number of articles read. Thirdly, the project does only involve the identification of required actions in order to increase the police reporting tendency among practitioners and hence not the implementation of found measures.

1.5 Outline of the report

Following the introduction, the theoretical framework used in the project is presented and the methodology of the project is explained. This is followed by the empirical findings from the case study and the survey as well as analyses of

these. The project ends with stating the requirements for committing- and reporting a crime and by presenting the conclusions and research contributions.

INTRODUCTION

This chapter introduces and motivates the thesis. It also presents the purpose, research questions, studied context, focus and delimitations of the study.

FRAME OF REFERENCE

This chapter provides a description of the industry, crime theory as well as crime prevention measures. The theoretical framework used throughout the thesis is presented and motivated.

METHOD

This chapter introduces the research approach and methodology used in this thesis. The chapter contains a detailed description of the survey, the case study as well as a critical evaluation of the execution.

CASE STUDY DESCRIPTIONS

This chapter includes case descriptions for all case companies and a summary of the case study descriptions.

RESULT AND ANALYSIS OF SURVEY

This chapter presents the results of the survey, item for item, as well as the analyses made in order to test the hypotheses.

DISCUSSION

This chapter discusses some of the main findings of the survey in relation to theory and the case study. The methodology and its limitations are also discussed.

CONCLUSION AND RESEARCH CONTRIBUTION

The final chapter first states the purpose of the thesis then presents a short conclusion for each of the research questions. Finally, the research contribution and suggestions on future research are presented.

2. Frame of reference

This chapter presents the literature review with the purpose of providing the reader with a general understanding of the industry, crimes and crime prevention measures related to the problem and research question. Moreover, the theoretical framework is presented which should help the reader follow the logic of the research method.

2.1 Transport- and construction industry

2.1.1 Workplaces

The most common transport chain location type for hauliers is non-secured parking areas (Ekwall & Lantz, 2013). In order to avoid supply chain disturbances and theft risk among hauliers, the availability of secure parking places has been discussed. Inside parking areas, a security system is the second main service required by truck drivers, restaurants being the most requested service. Security is requested six times more often than showers. (Carrese et al., 2011) Another solution discussed for the same purpose is improved and more exact delivery times. (Ekwall & Torstensson, 2011) However, shorter time windows to load/unload cargo at terminals would have the opposite effect by forcing trucks to wait outside facilities and hence increase the vulnerability and hence also the risk of theft (Urciuoli, 2016).

2.1.2 Social Sustainability in the transport industry

Sustainability was defined by the World Commission on Environment and Development in 1987 as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Davis-

Sramek et al., 2018, p.87). Usually, three dimensions of sustainability are mentioned; environmental, economic and social (Ammeberg, 2012). Sustainability in a company context is related to Corporate Social Responsibility (CSR) which by definition mean that companies should take responsibility for their impact on society. That means following the law and incorporate sustainability, customer and human rights concerns in their operations and business strategy. (European Commission, 2019) Turon (2016) mean that CSR has become of increasing importance in society and that good CSR earn company goodwill and make them an attractive employer.

However, as shown by Davis-Sramek et al. (2018), the increasing importance of sustainability and CSR are yet to be fully represented in the competitiveness of the transport industry. According to Davis-Sramek et al. (2018), the aspect that is first and foremost considered when choosing a transport contractor is the price. Meanwhile, the lacking social sustainability in the transport industry is palpable when anecdotal evidence shows that low wage drivers spend weeks on the road with almost no funds to pay for fuel or make a living (Sternberg & Lantz, 2018). Sternberg and Lantz (2018) mean that the wage gap between EU countries with high wages, such as the Scandinavian countries, and the low wage EU countries, such as Bulgaria and Romania, has lead to that many drivers from low wage countries work abroad for long periods of time.

The lack of a social sustainability focus in the industry can affect not only the organisation itself but also the whole supply chain (Pagell & Wu, 2009). One example of this was discovered in December 2016, when transport subcontractors to IKEA, a global Swedish furniture company, were found to pay their drivers under 2000 SEK per month (Julius, 2016). This discovery led to that IKEA started to negotiate with their subcontractors and came to an agreement with new and better conditions (Bodensjö, 2018; Blomquist, 2018). Organisations now hope for clearer EU directives regarding cabotage laws. (Blomquist, 2018; Svensson, 2019). According to Peter Svensson (2019), an industry representative for SÅ, clearer and harder regulations can hopefully help to achieve fair competition in the transport industry.

2.2 Crime and crime prevention

The Swedish National Council for Crime Prevention (BRÅ), has developed crime codes, which facilitates the analysis of different types of crime. The system with the crime codes facilitates the development of statistics by allocating registered crimes reported to the police through a predefined number (BRÅ, 2019). In this thesis the crime codes of interest, as listed in BRÅ, are;

- 0822 burglary theft from temporary barracks, carriages, etc. at a construction site,
- 9803 theft of trucks or trailers,
- 9804 theft from trucks or trailers,
- 9823 diesel theft from a vehicle tank, and
- 9824 diesel theft from a larger tank (not attached to a vehicle).

2.2.1 Targeted practitioners

Every year, thousands of cubic meters of diesel are stolen in Sweden. The estimated cost for the machine entrepreneurs operating in Sweden, as the result of the diesel thefts, are estimated to be half a billion SEK every year. The machine entrepreneurs are only one group of practitioners that are affected by diesel thefts. Along with farmers and hauliers, the machine entrepreneurs are one group of practitioners that are considerably subjected to diesel thefts. (Anläggningsvärlden, 2018) Furthermore, diesel is usually stolen from trucks or construction machines that are operating at different temporary workplaces. One can see that the great majority of all police reportings related to diesel theft are dedicated to theft from trucks (36%) and construction machines (33%). (Persson, 2014)

These organisations are not only an attractive target for diesel theft but other transport crimes as well. The official Swedish criminal statistics for freight-related crimes show that 81% of all reported crimes attacked unprotected trucks or trailers. Theft of commercial vehicles and their loads are not only a problem within the Swedish borders, the total loss of value for cargo theft in the EU is

estimated to be more than 85.9 billion SEK each year. (van den Engel & Prummel, 2007)

According to a survey, conducted on the behalf of the Swedish Farmers' Association, three out of ten farmers have been subjected to crime. Most commonly are thefts of machines, tools, as well as diesel fuel. (Svenska Dagbladet, 2013)

2.2.2 Organised crime

Although there has always been organisation among thieves, a much higher degree of professionalism in crime can now be distinguished and it is common that both thieves and stolen property disappear outside the borders of Sweden (Lindh, 2019; Trygghetskommenssionen, 2018). Crime today is thus characterised by a high degree of organisation, great mobility that does not know any country borders and extensive technical expertise (Brown & Smith, 2018; Campbell, 2014; Ekwall, 2010; Lindh, 2019). These characteristics have resulted in a type of crime that the policymakers have little knowledge about and small means to investigate. As a consequence, many of these crimes do not lead to prosecution. (Lindh, 2019) One of the reasons for the low prosecution rate is also the fact that it can be difficult to detect and prove the nature of the serial crime. Hence, if someone is arrested, difficulties arise in showing the seriousness of the crime, i.e. the organised and systematic procedure. This is why organised crime patterns risk to remain undiscovered. Consequently, the extent of this type of crime will remain unknown and is perhaps not receiving the right resources. (Lindh, 2019; Persson, 2014; Trygghetskommissionen, 2018)

INTERNATIONAL CRIME ORGANISATIONS

International organised crimes in Sweden are characterised by high efficiency and large volumes, this is why they are dependent on a number of functions and well-developed logistics (Trygghetskommenssionen, 2018). First of all, we have the initiator of the crime, who is located abroad and hires contractors, often countrymen, to commit the thefts. A contractor is a person who is used and/or exploited by the organised crime network to conduct criminal activities.

(Aftonbladet, 2017; Vesterhav & Korsell, 2016; Trygghetskommissionen, 2018) After entering Sweden, the contractor gets help from an anchor person, often a countryman that are established in Sweden. The anchor's role is to organise practical tasks such as identifying suitable crime sites, arrange accommodation for the contractor and storage location for the stolen goods while waiting for it to be sent abroad or to be sold within Sweden. (Aftonbladet, 2017; Ekéus, 2018; Trygghetskommissionen, 2018) Unlike traditional theft, the contractor is usually unknown to the police, since they are in Sweden for only a limited period of time. (Aftonbladet, 2017; Trygghetskommissionen, 2018)

2.2.3 Police reporting

One of the principal tasks of any government is to control crime (Goudriaan, 2006; Campbell, 2014). For this to be achieved, the government must be aware of the crime occurrence. The victim´s decision to report crime is thus essential since these reports are the main source of information for the police. Furthermore, it also acts as the basis for most subsequent actions of the justice system. (Goudriaan, 2006; Lindh, 2019)

The decision to report crimes to the police is according to Goudriaan (2006) influenced by a wide variety of attributes of a country-level social context. In particular, four aspects are stated to be of great importance; the institutionalization of the insurance business, the perceived competence of the police, the level of individualism, and the norm of conformity (Goudriaan, 2006).

Anecdotal evidence suggests that many actors in the transport- and construction industry chose not to report transport- and construction equipment thefts to the police. Mobärg (2019) and Ek (2019), mean that many of their members, i.e members of ME, find little value in reporting thefts to the police since most often the crimes are written off without investigation. The limited reporting tendency makes it difficult to get real figures of the number of thefts in the industry and in order to determine the extent of the problem (Ekwall, 2009). According to

Ekwall (2009), the tendency to report a crime in the transport industry has decreased, making the hidden statistics larger.

2.2.4 Crime prevention

Many crime preventive actions exist in order to reduce the risk of theft for organisations within the transport- and construction industry. Holtsung and Johannesson (2012) state that some means to reduce the risk in the transport industry could be a combination of; an increased information exchange, an increased risk consciousness among the supply chains practitioners, a better planning of driving routes- and refuelling routines, and better secured parking areas involving better illumination. Other security efforts for the transport- and construction industry are; strategically placed vehicles, strategic refuelling schedules, unlocked fuel tanks, video surveillance, alarm systems, fences, and security patrols. (Ekwall & Torstensson, 2011; Persson, 2014; Rolandsson & Ekwall, 2010). DNA labelling of equipment is another useful tool for the purpose of identifying and retrieve stolen property to its rightful owner (Ek, 2019; Mobärg, 2019). However, the failure to prevent crime from happening arises from a number of reasons such as; lack of resources, unwillingness to expand resources, ignorance, or because it might be more profitable, or cheaper, to allow the occurrence of crime than to invest in preventive efforts (Ekwall, 2010).

Furthermore, some organisations that are frequently exposed to theft unite in order to establish a network to prevent crime, sort of a corporate neighbourhood watch. One example of a successful association is SAFE0413, a network active in the municipality of Eslöv, Sweden. (Lindahl, 2019) However, the success rate of such an organisation is in general low, and the time and effort initially needed in order to create an organised structure of the network are believed to be two critical success factors (Johansson & Wollard, 2019; Lindahl, 2019). The funding of SAFE0413 comes partly from member fees, but the municipality as well as Länsförsäkringar, a Swedish insurance company, also contributes with financial support (Lindahl, 2019). Insurance companies and other actors, then those directly affected by the thefts, can thus be interested in investing in a network to prevent crime. This, since the results of such a network, could affect the attractiveness of a municipality or the profitability of an insurance company.

Normally, Länsförsäkringar is paying 65 percent of a premium back to its clients due to compensation for damage. Before the network in Eslöv was established, the compensation for damage was an all-time high, about 200-300 percent, but it has now decreased to normal levels. The insurance company risked putting higher requirements, deductibles and insurance premiums on their customers located in this region if no change occurred. (Johansson & Wollard, 2019) SAFE0413 is thus an example of a successful network, where actors work together in order to prevent crime (Johansson & Wollard, 2019; Lindahl, 2019).

2.3 Theoretical framework

In this section, the theoretical framework built up through the literature review is presented. The theoretical framework is the theory of which the research method, the empirics, and the analysis are based upon. The section starts with introducing the concept of theft opportunity by presenting the Routine Activity Approach. Following that, the role of the social context in the decision to report a to the police in response to criminal victimization is emphasized by presenting the Socio-ecological Model.

2.3.1 The Routine Activity Approach

In the Routine Activity Approach, it is assumed that for crimes to occur, three minimal elements must converge in time and space; a likely offender, a suitable target, and the absence of a capable guardian against crime, see Figure 1. The approach is taking the likely offender as given and instead, it focuses on the other two elements. (Felson & Clarke, 1998; Leclerc & Reynald, 2015)

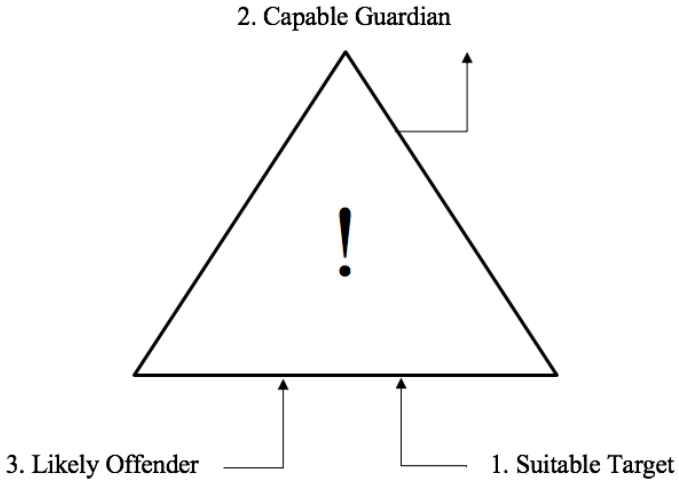

Figure 1. The basic crime triangle (Adopted from Felson & Clarke, 1998).

CAPABLE GUARDIAN

A guardian is hence not necessarily a police officer or a security guard, but rather anyone whose presence would discourage crime from happening. Therefore, a neighbour, co-worker or mail carrier could serve as a capable guardian simply by being present. According to Leclerc and Reynald (2015), the three fundamental dimensions of a capable guardianship are supervision/monitoring, availability, and intervention. Furthermore, guardianship is not always intentional, but still has a great impact against crime. When guardians are being absent however, the risk of a criminal attack of a target is especially critical. (Felson & Clarke, 1998)

SUITABLE TARGET

The owner of an object is most often not present when a burglar takes it, this is why the term target is preferred over victim in the Routine Activity Approach. Both a person and an object can be targets of crime, and it is the target's position in time or space which affects the risk of a criminal attack. Furthermore, there are four main elements that are influencing a target’s risk of a criminal attack,

presented by the acronym VIVA: Value, Inertia, Visibility, and Access. (Felson & Clarke, 1998) Attractive targets can also be defined to be CRAVED: Concealable, Removable, Available, Valuable, Enjoyable, and Disposable (Clarke, 1999).

MOTIVATION OF FRAMEWORK

The Routine Activity Approach is one out of three main theories of crime opportunity, the other two are Crime Pattern Theory and Rational Choice Theory (Felson & Clarke, 1998; Graycar & Sidebottom, 2012). Even though it is evident that the opportunity theories overlap, the focus of each theory tends to be different ranging from the larger society (routine activity) to the local area (crime pattern theory) and finally, to the individual (rational choice) (Felson and Clarke, 1998). This is one reason for why the Routine Activity Approach is of particular interest for this thesis since it consists of valuable crime theory which can be applied to the larger society and can thus be used in order to understand the thefts committed in the transport- and construction industry. The routine activity approach has already been used in literature, for example by Li et al (2016) and Freilich and Mandala (2018), in order to analyse crime prevention. Firstly, the Routine Activity Approach has been used by Li et al (2016) in order to understand and prevent financial fraud against older citizens in Chinese society. Secondly, it has been used by Freilich and Mandala (2018) in order to determine the factors that distinguish successful from unsuccessful terrorist assassination incidents. The researchers of this thesis find the routine activity approach a suitable framework for the research, in order to determine which factors that are influencing the occurrence of theft in the transport- and construction industry.

2.3.2 The Socio-ecological Model

The Socio-ecological Model as described by Goudriaan (2006) presents normative- and cost-beneficial considerations regarding a victim's police reporting behaviour on different levels of contextual aggregation, ranging from micro-, meso-, and macro-level, see Table 1.

Table 1. The socio-ecological model (Adopted by Goudriaan, 2006).

Level ***Situation vs. Context***	**Process** ***Cost-Benefit Considerations***	***Normative Considerations***
Mirco-level situation	Knowledge about offender Perceived risk of retribution by offender Severity of injury Amount of loss Means of contacting police Distance from event in time or space Perceived likelihood of police response Perceived chance to receive some sort of compensation (e.g. recovery, repair, punishment of offender, payment by insurance company) Guilt Shame	Victim offender relationship Victim precipitation Guilt Shame
Meso-level context family & friends, organisation, block, neighborhood, community, jurisdiction	Availability of (community organisations for) self-help Knowledge about area Reputation Knowledge of alternatives Private security	Attachments to family & friends, area or organisation Reputation Norms regarding self-help Policies for handling crime incidents
Macro-level context state, country	Availability of (community organisations for) self-help Police competence (responsiveness, efficiency) Social stratification Gender roles Roles of adults and juveniles Level of individualism	Legitimacy of police or government Norms regarding self-help (individualism vs. collectivism) Compliance norm Institutionalization of insurance Gender roles Roles of adults and juveniles

SITUATIONAL VERSUS CONTEXTUAL

Social entities on different geographically defined levels are also affecting the tendency to report a crime to the police. Firstly, the face-to-face interaction between the victim and the offender is referred to as the situation. Factors on this situational level, which influence reporting to the police, can also be referred to as micro-level factors. Secondly, entities such as family and friends, organisations and neighbourhoods are all factors belonging to the meso-level. Finally, entities such as states and countries belong to the macro-level. (Goudriaan, 2006)

COST-BENEFIT VS NORMS

The ecological entities behind reporting victimization to the police can be the result of either a cost-benefit calculation, based on expected expenditures (costs) and returns (benefits) for the victim, or a normative response. Furthermore, expenditures would in this context be the transaction costs of notifying the police or the potential risk of revenge if the offender found out that the victim had contacted the police. At the same time, the replacement of lost property or the substitution of something of equal value or use would act as a return. Another benefit of contacting the police could be the reduction of additional damage caused by the offender. In contrast, normative responses are triggered by norms that exist in the victim's social context, and hence not directly triggered by expected costs or benefits. (Goudriaan, 2006) Examples of possible norms that may influence crime reporting are: "a crime should always be reported to the police", "this is no case for the police", or "I can deal with this myself". (Goudriaan, 2006, p.148)

MOTIVATION OF FRAMEWORK

The Socio-ecological Model, as presented by Goudriaan (2006), is adapted to the victim of a crime and this individual's reporting behaviour. Some researchers have created and used similar models. For example, the Social Ecology Framework presented by Ménard (2003) that built on that normative processes only influence on a micro-level and Tolsma et al (2012) that have extended Goudriaan's model to include that the reporting process itself might affect the reporting tendency. From insights gained from unstructured interviews, crime in

the transport- and construction industry can be viewed as a nationwide problem. Moreover, many factors tend to influence a victim´s tendency to report a crime. Firstly, individual perceptions and beliefs of the victim have a great impact, as well as cost-benefit considerations such as the likelihood of potential compensation. Secondly, external factors also have an influential role, such as general attitudes in society or the normative perception of the police and its usefulness. Since the factors are many and its interrelations dynamic, involving various personal- and environmental factors, the researchers find the Socio-ecological Model a suitable framework for the research, in order to determine which factors are required for transport- and construction equipment theft to be reported to the police.

3. Method

In this chapter, the methods used in the study are presented and described. The research approach will be described followed by the specific research methods. Following that, the methods used for analysing and to reach the findings of the thesis are presented along with a critical evaluation of the research design.

3.1 Research approach

The purpose of the thesis is to explore the factors needed in order for a transport- and construction equipment theft to occur as well as the factors needed in order for a transport- and construction equipment theft to be reported to the police. In order to reach the purpose, an approach presented by Mentzer and Kahn (1995), see Figure 2, has been followed. The benefits of following a structured research approach are, among others, that the research will have a greater connection to theory and its findings will have a greater likelihood of being accepted by researchers (Mentzer & Kahn, 1995). The remaining sections of chapter 3 are connected to the research approach, as illustrated in Figure 2.

The iterative process begins with idea generation (Mentzer & Kahn, 1995). In order to get a better idea of the topic and the problem, unstructured interviews were held with representatives from actors in the transport- and construction industry, and a literature review was made. Unstructured interviews were performed since they, according to Merriam (1988), can be useful when the researchers have a low initial knowledge about the specific topic. Based on the idea generation the substantive justification for the research could be identified as presented in chapter 1 of this thesis. The idea generation process leading to the development of the frame of reference is further addressed in section 3.2 below. With the phenomena pinpointed, the theory related to this constitutes the frame of reference and is presented in chapter 2. The research model is presented

in section 3.3 and aims to connect the theoretical framework with the research hypotheses and constructs. For the research multiple methods are used, one quantitative survey and a qualitative case study. The case study is a longitudinal study, collecting data over a longer period of time. The qualitative method is presented in section 3.4 while the quantitative method is presented in 3.5. The case study descriptions are presented in chapter 4. The result and the analysis of the survey are found in chapter 5. Finally, the survey results are discussed, see chapter 6, in relation to literature and case study descriptions. The conclusion is presented in chapter 7.

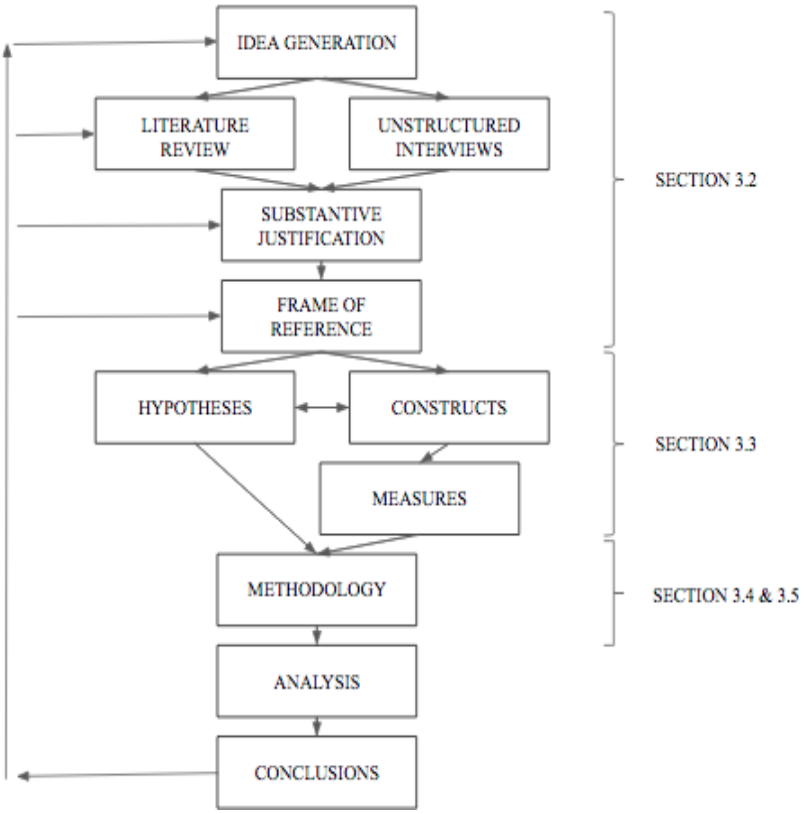

Figure 2. Research approach (Adopted from Mentzer & Kahn, 1995).

3.2 Development of frame of reference

The frame of reference was built based on the identified problem and research questions. The process was iterative, as suggested by Mentzer and Kahn (1995). The framework *Components of Engaged Scholarship Research*, as presented by Mathiassen (2017), was used in order to identify areas of knowledge the research problem related to, as well as the theoretical framework, referred to as *framing* in the framework. A literature review was used in this initial phase since it, according to Bryman (2012), can help to understand the research area, i.e. area of concerns and in turn help define the research question. The identified main areas of concern relevant for the study were determined to be crime theory, tendency to report a crime, transport- and construction equipment theft and sustainable supply chains.

Due to a lack of academic literature on the research topic, interviews were performed to complement and support the academic literature and the grey literature that do exists. In total seven interviews were performed, these are presented in Table 2 below. The interviews progressed from being held unstructured to semi-structured, as the researches gained a better understanding of the research topic and the industry. An unstructured interview is preferred when the researchers have a low initial knowledge about the specific topic. While a semi-structured interview ensures that the interviewee stays on the topic set by the interviewer but can speak more freely about each theme and emphasis on what the interviewee finds most relevant. (Merriam, 1988)

Table 2. Overview over the interviews.

Interviewee	Title	Company Name
Ek, P.	Regional manager, South Region	ME
Hultgren, J.	Operations developer, Skåne	LRF
Johansson, K. and Wollard N.	Damage preventer, Head of Business and Agriculture Insurance	Länsförsäkringar
Lindh, M.	Coordinator focused on transport security	Swedish Police, Region West
Lindahl, I.	Chairman	SAFE0413 network in Eslöv
Mobärg, H.	CEO	ME
Svensson, P.	Industry representative, South	SÅ

3.3 Research model

The research model presented in Figure 3 below shows the aim of the study and the connection between the theoretical framework, the hypotheses and the constructs that are meant to be measured. A construct represents a concept in theory that only can be interpreted when it has been measured. In order to measure an unobservable construct, a hypothesis that can be tested are developed. (Mentzer & Kahn, 1995) The constructs that are going to be investigated in this thesis are crime occurrence, police reporting tendency, and workplace conditions. The hypotheses and measures connected to these are presented in section 3.5.

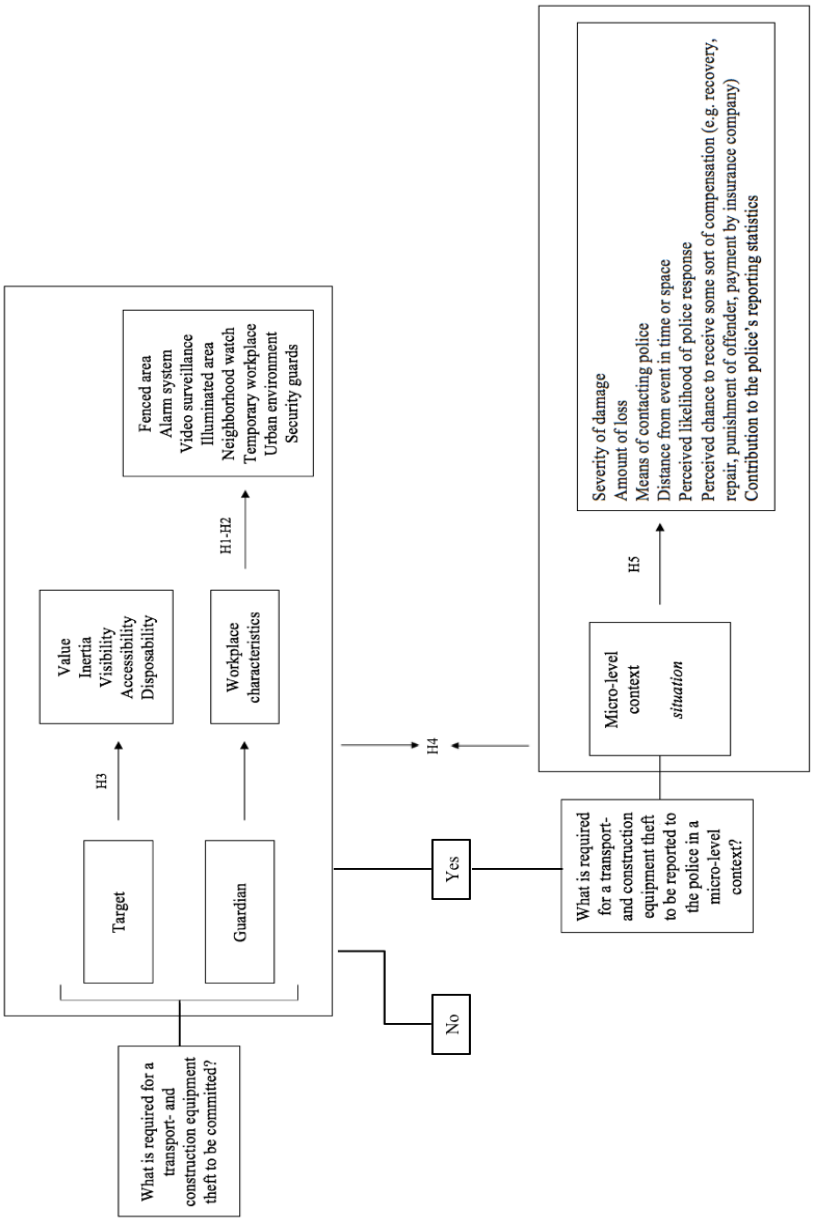

Figure 3. Research model based on the theoretical framework.

3.4 Qualitative method

Qualitative research is explorative, lacks predetermined hypotheses and has a high focus on the process. The purpose of a qualitative method is to understand the phenomenon as a whole and see how subsystems cooperate. (Merriam, 1988) The occurrence of transport- and construction equipment thefts is, arguably, a complex problem in which several variables are assumed to interact. Yin (2003) argues that for a situation in which it is difficult to separate variables from each other, like in the occurrence of transport- and construction equipment thefts, the case study is a suitable research method. The case study is performed as a longitudinal study, collecting data over a three month period. In this thesis, the case study is used to complement the quantitative survey.

3.4.1 Selection of cases

Merriam (1988) points out that in order for the case study method to be feasible a limited system, a unit, needs to be identified. The unit can vary depending on the study area but can, for example, be an event, a program or an individual (Merriam, 1988). In this research, the unit is decided to be an organisation within the transport- and construction industry.

According to Curtis et al. (2000), some criteria to consider when selecting a case are, among others, its relevance for the study, its likelihood to generate rich information and the generalisability to the entire population. Four case companies were chosen. Each of the selected case companies has historically experienced transport- and construction equipment thefts which make them of relevance for the study. The organisations can also be considered generic members of the industry in terms of business area and workplaces. However, to increase the likelihood of the case organisations to generate rich information, e.g. experience theft during the time delimitation of the thesis, a majority of larger than average organisations were chosen as case companies. An overview of the case companies is presented in Table 3 below. Case company A through C are considered larger than average based on their company size. The researchers hoped that a sample of both large and small companies would capture more details and enhance the insights from the case study.

Table 3. Overview of case companies.

Case company	*Business area*	*Number of employees*
A	*Demolishing, sheet piling and soil remediation*	*60*
B	*Transport and earth moving*	*30*
C	*Concrete, gravel, transport and recycling*	*38*
D	*Recycling and material extracting*	*1*

3.4.2 Design of case study protocol

Yin (2003) states that a well-established case study protocol will increase the reliability of the case study research since the protocol serves as a guide for the researcher. He also argues that a case protocol is especially essential if a multiple case study is performed since the procedures, general rules and questionnaires need to be the same in all cases. For these reasons, a case study protocol was made for the case studies outlined in line with the case study protocol described by Yin (2003) including a case study overview, field procedures and case study question. The case study protocol used in this thesis is found in Appendix A.

3.4.3 Collection of data

For each of the case companies, an initial meeting and interview were booked and held. The meeting took place at the company location. The interview guide presented in the case study protocol, Appendix A was followed but was held semi-structured. Having semi-structured interviews give, according to Bryman (2012), the responder the opportunity to speak more freely and put more focus on the problems their specific organisation is experiencing with regards to thefts and how to prevent it.

At the end of the meeting, the procedure for the future data collection was discussed and it was, in all four cases, decided that the researchers should contact the company representative every second week. During these checks, an update regarding any thefts that occurred was given by the company representative. In the event of at least one theft, a phone interview was held using the *interview guide in the occurrence of theft* as presented in the case protocol, see Appendix A.

The case study ran for three months, starting in February 2019. During this time all of the case companies experienced theft. A description of each case company is presented in chapter 4. The descriptions has been sectioned into five themes; workplace conditions, crime prevention activities, historic occurrence of theft, police reporting and thefts that occurred during the case study. These five themes are selected due to their relevance and connection to the research model as well as the relevance for the case companies. The descriptions were sent to each case company respectively so that errors or misunderstanding could be avoided.

3.5 Quantitative method

A quantitative method is characterised by data that can be measured numerically (Björklund & Paulsson, 2012). A quantitative method is used in this thesis since it, according to Björklund and Paulsson (2012), is a suitable method when one which to generalise the empirics. For this study, a web survey was chosen as the quantitative method. According to Björklund & Paulsson (2012), a survey methodology can generate a large data set with limited resources, which is attractive for this study due to the strict time delimitation.

3.5.1 Selection of responders

In order for a survey to be a valid research method there need to be respondents that can, and are willing, to answer the questions (Wenemark, 2017). Wenemark (2017) argues that in order for an individual responder to answer the questionnaire the perceived utility needs to be higher than the perceived cost, usually in terms of time lost. In this study, this means that the respondent needs

to understand the importance of the issue and believe that the survey will be a step in the right direction to prevent crime. Due to this the selection of relevant responders was considered critical.

Based on the frame of reference, as presented in chapter 2, three groups of professionals were identified as the main subjects for transport- and construction equipment theft; machine entrepreneurs, hauliers, and farmers. These groups of professionals constitute what Berntson et al (2016) call the target population for this survey. According to Berntson et al (2016), the target population is the population the study wishes to say something about, while the frame population is the population that is feasible to reach practically. The frame population for this survey was the three main member organisations which the three groups of professionals are members of. These are ME, SÅ and LRF. A delimitation was made to only send out the survey in the county of Skåne. This since it is a clear geographical area, covering 33 out of Sweden's 290 municipalities (SKL, 2019). In this area, the three member organisations are active and have a fair estimate over the relevant professionals and the percentage of these that are members. In order words, the delimitation help identifying the size of the target population and the frame population. Also, the delimitation increases the control of the study since it was possible to have frequent contact with the local member organisations. The member organisations are further described in section 1.3. One also needs to consider the over- and under-coverage of the populations. The over-coverage are individuals not relevant for the study but are still present in the frame population and get the survey while under-coverage are individuals that are relevant for the study but are not covered in the frame population. (Berntson et al, 2016) The over-coverage in the frame population would for this case be members of the organisations that are not active professionals but still receive the survey while the under-coverage would be relevant professionals that are not a member of any of the three member organisations. A description of the population can be seen in Figure 4. The member organisations are illustrated in a Venn diagram due to the likely overlap of members. In the intersection between the organisation are hence companies that are members in more than one of the organisations. A likely reason for this is that they are working within several business areas. This is, for example, common among farmers who work on their farms during summer and as a machine entrepreneur during the cold winter season (Hultgren, 2019).

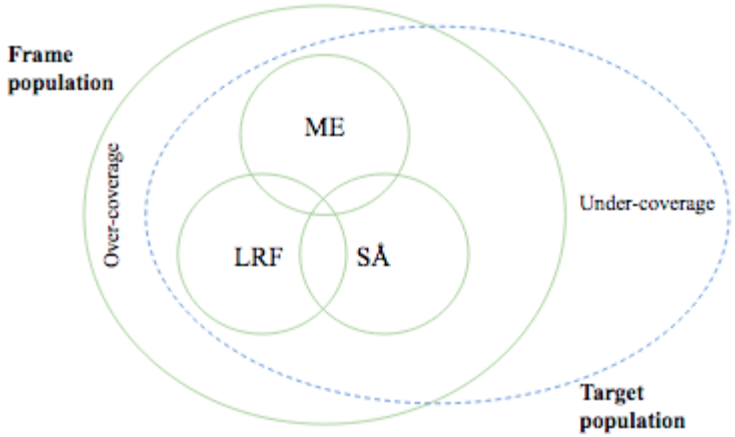

Figure 4. Description of the population (Adopted from Berntson et al, 2016).

3.5.2 Design of survey

Wenemark (2017) and Berntson et al (2016) mean that it is essential to put a lot of effort and thought into the questions the survey should contain. Survey questions can be either descriptive or analytical in its kind (Berntson et al, 2016). In this study, descriptive questions have exclusively been used since they are used to study attitudes and the occurrence of a phenomenon in a group (Berntson et al, 2016). The survey items are presented below in section 3.5.4.

Wenemark (2017) argues that communication theory can be used in order to create a successful survey and presents Grice's four principles from 1989; manner, quality, quantity, and relation. Manner refers to that the respondent should understand the question, both in terms of the language used and have clear instructions (Wenemark, 2017). This has been considered in this study by using the native language in Sweden, Swedish, and usage of terminology that the group of professionals are familiar with.

The quality principle refers to the assumption that the responder answers truthfully but also the researcher's responsibility to give the responder the

possibility to answer according to reality (Wenemark, 2017). This principle has been included in the survey by giving the respondents the option to add alternatives, in case they did not find the given alternatives relevant, and by some text answer questions in order to provide the option to add additional or other information. One example of this is item 6 in the survey.

The third principle about quantity is about giving the respondent the means to answer the question with the right level of nuance, for some question the respondent might have a vague idea of the answer while on others they are more informed and are able to give a more nuanced answer (Wenemark, 2017). In the study, this aspect was controlled by choosing the right type of question format for each question. The decision was based on what an appropriate type for the item at hand could be but also the sense of knowing the professionals could be assumed to have for that particular question. It was, for example, assumed that the responder would be able to choose the correct interval at items 4 and 5 while item 9 was left as a text answer question since the knowledge, based on the unstructured interviews, most likely was lower.

The last principle, the principle of relation, refers to the relevance of the question in the eyes of the responder and how this individual interprets the question in the context it is given in (Wenemark, 2017). To avoid misinterpretation and irrelevant questions a frame of reference was built before the construction of the survey and the survey was tested by responders from all three groups of professionals. The test procedure is presented below. Furthermore, all questions were optional, meaning that the respondent had the possibility to skip a question he/she did not find relevant or was unable to answer.

3.5.3 Test of survey

Wenemark (2017) argues that to test a survey before it is released is cheap insurance that the survey has a larger chance of being successful. In this study, the survey was sent out to four test respondents and later discussed using phone interviews. During the interviews, the survey questions were discussed, and the test respondent shared his/her view on the understanding of the questions, the

relevance for his/her organisation and the ability to answer the question. They were also encouraged to come with feedback on the content. Their answers were also reviewed to make sure that they seemed realistic and that the responder had interpreted the questions correctly. Each of the three groups of professionals was represented in order to make sure that the survey was relevant for all three professions. The comments from the test respondents and the changes made based on those are presented in Appendix B.

3.5.4 Logic of questionnaire

The section presents the final structure of the questionnaire. Every item is presented, followed by hypotheses if any linked to that particular item, as well as the motivation behind the specific item. The questionnaire is divided into three sections: (1) Company Profile, (2) Theft- and Police Reporting Experiences in 2018, and (3) Incentives behind Police Reporting. Every section has dedicated hypotheses, but they are first presented united below:

H1: Workplaces characterised by higher levels of physical security equipment will be associated with lower levels of theft.

H2a: Higher levels of temporary workplaces will be associated with higher levels of theft.

H2b: Workplaces characterised by higher levels of urban environment, security guards or neighbourhood watch will be associated with lower levels of theft.

H3: Stolen goods in the transport- and construction industry are characterised by being valuable, visible, easy to move, easy to access and easy to dispose.

H4a: The police reporting tendency varies between different types of theft.

H4b: Larger companies will be associated with higher levels of theft.

H4c: Higher levels of theft will be associated with higher levels of reported thefts.

H5: Responder's police reporting tendency is influenced by cost-benefit considerations.

Section 1. Company Profile

The first part of the questionnaire defines the respondent's company profile based on, size, memberships, as well as characteristics considering both workplaces and attractive targets of crime.

1. *Company name*

The company name is stated in order to get hold of the participants for research purposes, if this is agreed upon, see item 12. The item also acts as insurance in order to detect multiple answers from the same company. This is especially critical for companies that have multiple relevant memberships, see item 3.

_____

2. *Number of employees*

The number of employees is one way of distinguishing company size among machine entrepreneurs. The turnover was used to determine the order of magnitude among farmers and for hauliers, the number of vehicles on the transport permit was used. The company size is used as a descriptive variable in the hypotheses below.

_____

3. *Beyond your membership in Maskinentreprenörerna AB, do you hold a membership in any of the following organisations?*
    a. *Sveriges Åkeriföretag*
    b. *Lantbrukarnas Riksförbund*
    c. *No*

The membership of every participant is of importance in order to understand the overlap within the industry, as well as the type of operation that is being considered.

4. *How many of your workplaces are characterised by the following physical security equipment?*

   Likert scale (1-5) from (1) 0-20 % to (5) 80-100 %.

   a. *Fenced area*
   b. *Alarm system*
   c. *Video surveillance*
   d. *Illuminated area*

H1: Workplaces characterised by higher levels of physical security equipment will be associated with lower levels of theft.

Many workplaces for the professionals are assumed to be characterised by some type of physical security equipment. The question aims to identify what type of security is present at a general workplace for the responder and see how this affects the occurrence of crime.

5. *How many of your workplaces are characterised by the following conditions?*

   Likert scale (1-5) from (1) 0-20 % to (5) 80-100 %.

   a. *Temporary workplaces*
   b. *Urban environment*
   c. *Security guards*
   d. *Neighbourhood watch*

H2a: Higher levels of temporary workplaces will be associated with higher levels of theft.

H2b: Workplaces characterised by higher levels of urban environment, security guards or neighbourhood watch will be associated with lower levels of theft.

Many workplaces for the professionals are assumed to be characterised by conditions presented in item 5. The question aims to identify what type of conditions that are present at a general workplace for the responder and see how this affects the occurrence of crime.

The workplaces are seldom characterised by only one of the explanatory variables presented in items 4 and 5. Seeing that security equipment can be expensive investments for an organisation it is of great interest to analyse their efficiency. Moreover, it is interesting to know if some of the security efforts are particularly efficient against theft and if some workplace conditions influence the crime occurrence.

_____

6. *Are your workplaces characterized with other circumstances than those mentioned above?*

In line with Wenemark (2017), it is important to give the responder the possibility to answer a question according to reality. Hence, this question creates an opportunity to capture responders who do not feel that their business is described through items 4 or 5. This is also relevant in the aspect of making the survey feel relevant for the individual responder, which is important in order to achieve a high response rate (Wenemark, 2017).

_____

7. *To which extent do you agree to that the characteristics of the tools, machines, and resources that are exposed to theft in your organisation affect the thief's propensity to steal?*

   Likert scale (1-4) from (1) strongly disagree to (4) strongly agree.

   a. *Valuable*
   b. *Visible*

c. *Easy to move*
d. *Easy to access*
e. *Easy to dispose*

H3: Stolen goods in the transport- and construction industry are characterised by being valuable, visible, easy to move, easy to access and easy to dispose.

The item and the hypothesis aim to investigate if the stolen goods within the transport- and construction industry are characterised by the attributes presented in Felson and Clarke (1998) and Clarke (1999).

Section 2. Theft- and Police Reporting Experiences in 2018

8. *Estimate how many times your company experienced the below-stated type of theft and how many of these were reported to the police?*
    a. *Diesel theft from a vehicle tank*
    b. *Diesel theft from a larger tank (not attached to a vehicle)*
    c. *Theft of entire vehicle (for example truck, trailer or excavators)*
    d. *Theft from vehicle (for example tools, electronics or cargo)*
    e. *Burglary theft from temporary barracks, carriages etc. at a construction site.*

H4a: The police reporting tendency varies between different types of theft.

H4b: Larger companies will be associated with higher levels of theft.

H4c: Higher levels of theft will be associated with higher levels of reported thefts.

The purpose of the item is twofold; firstly, it aims to identify the estimated numbers of unknown cases among the police reporting statistics related to different types of transport- and construction equipment thefts. Secondly, the theft occurrence can be analysed in relation to the conditions of each responder's workplaces, identified in items 3 and 4 above. The item is also interesting to investigate due to that the real number of thefts are expected to differ significantly from the number of reported thefts. The gap is however expected to differ between different types of thefts, for example, due to that insurance companies often require police reports in order to distribute compensation for a theft that exceeds the excess (Johansson & Wollander, 2019). The item also aims to investigate whether a relationship between theft occurrence and company size exists and if the reporting tendency depends on the number of thefts.

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9. *Please estimate the financial impact an average theft has on your business in SEK.*

The financial implications of theft can be many for a business, for example, the cost of reparation, downtime, and replacement of stolen goods. This question aims to estimate the total financial impact of a theft and how this average cost may vary depending on type of theft.

Section 3. Incentives behind Police Reporting

10. *Which factors are crucial to you while deciding whether to report a theft to the police or not?*
    a. *The severity of injury (vandalism)*
    b. *The amount of loss (value and volume)*
    c. *Means of contacting police*
    d. *Distance from the event in time or space*
    e. *Perceived likelihood of police repose*

f. Perceived likelihood to receive some sort of compensation

g. Contribution to the police's reporting statistics

H5: The responder's police reporting tendency is influenced by cost-benefit considerations.

This item aims to investigate if the considerations, as presented by Goudriaan (2006), can be reflected in the transport- and construction industry and which of these factors influence the professionals the most. Attribute 10g is not included in Goudriaan's model. It was added by the researches since it was a commonly mentioned factor during the unstructured interviews and the case study.

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11. Which actions do you think are necessary in order to increase the tendency to report crimes to the police

This item gives the responder the possibility to contribute his/her own thoughts on what would increase the tendency to report thefts to the police. As described by Wenemark (2017) this type of text answer questions can increase the relevance of the survey for the responder.

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12. Do you agree to possibly be contacted in search purposes?

a. Yes

b. No

This item was included in order to give the researcher's the possibility to investigate the responder's answers and their experiences further if necessary.

3.5.5 Collection of data

The survey was sent out by representatives from the three member organisations; ME, SÅ and LRF, to their members in the county of Skåne. The survey was sent out in Swedish, see Appendix C. All three organisations also marketed the study in either the organisations' newsletter or in their magazine. A reminder to fill out the survey was sent out approximately three weeks after the first send out. In the case of few responders a back-up plan was established that included the use of paper surveys at the organisations' regional meetings and to contact responders that answered *yes* on survey item 12 for further questions for research purposes. This was not considered for the members of LRF since the organisation was extra concerned about the integrity of their members due to previous threats and harassments. The number of responses for each member organisation is presented in Table 4. The target population is calculated under the assumption that the estimated coverage figures provided by the member organisations are consistent with the real figures and the true coverage in Skåne.

Table 4. Overview of the number of responses.

Member organisation	Target population	Frame population	# of responses first send out	Total # of responders	Percentage of Target population	Percentage of Frame population
ME	724	489	63	105	14.5%	21.5%
SÅ	960	600	45	74	7.7%	12.3%
LRF	10000	7500	198	391	3.9%	5.2%
TOTAL	11684	8589	306	570	4.9%	6.6%

After the data collection, it was discovered that many of the respondents had failed to submit complete answers on item 8. 62% had provided complete answers on the question. In hindsight, this was likely due to that the question was twofold, i.e. the responder was asked to state the number of thefts they experienced in 2018 and how many of these they reported to the police. Seeing that item 8 is critical for some of the thesis hypotheses phone interviews were

held with responders that had misinterpreted the question. During the interview, the responder was asked to complement their answer vocally to the researchers that in turn updated the answers. After the phone interviews, 73% of all the responses on item 8 were complete.

3.5.6 Data analysis

The data collected through the survey was analysed in order to investigate the hypotheses stated above. Hypotheses H1, H2, and H4 were analysed using regression models and t-tests in order to see if there were significant evidence to prove the hypotheses. The analysing tool that was used to perform these was R-Studio. The other hypotheses, H3 and H5 were due to their more descriptive nature analysed and calculated in Excel.

3.6 Critical evaluation

3.6.1 Validity and reliability

The validity of a study refers to if the study captures the phenomenon that it was created to research (Björklund & Paulsson, 2012) and the reliability of a study concern the consistency of the instruments used for measuring (Björklund & Paulsson, 2012; Bryman, 2012). Berntson et al (2016, p.222) state that "Validity is about whether you can do correct interpretations and draw reasonable conclusions based on the result of the study". Validity can be fractionated in internal validity and external validity. Internal validity refers to how well the result captures the cause-effect relationship while external validity relates to how well the result can be used to generalise beyond the specific study. (Bryman, 2012) Berntson et al (2016) argue that the validation process is essential throughout the study and not something that only should be considered in hindsight. The internal validity has had a central role in this research for example by the use of a research model with a clear connection to the theoretical framework the research aims to study. The research also consists of both a qualitative and a quantitative method. This improves the internal validity and the reliability of the research according to Merriam (1988). The survey structure and

item formulations were discussed with supervisors, experts in their field, in order to make sure that the content was understandable and relevant for the research. The survey was also tested on test responders which, according to Bryman (2012), enhances the internal validity. For the case study, a case study protocol was used to make sure that all four case companies were asked the same questions. Yin (2003) means that this increases the reliability of the study.

To achieve an external valid study, it is critical to consider how the participants of the study are chosen (Bryman, 2012). In this study, this was considered identifying the target population and the frame population as described by Berntson et al (2016) and presented in section 3.5.1. The distribution of the survey was made with the help of the three member organisation which resulted in a total of 570 responses, increasing the validity of the study and indicating engaged respondents. It has also been argued that the organisations who are members of ME, SÅ or LRF represent the target population well, see section 3.5.1, which has a positive effect on the external validity, i.e. the result can be generalised to the target population.

3.6.2 Objectivity

Objectivity refers to the degree to which values affect the result of the study (Björklund & Paulsson, 2012). The objectivity of this study has been considered by upholding a neutral language and present referenced material as it was intended by the referenced authors. This is, according to Björklund and Paulsson (2012), ways to improve the objectivity of a study.

3.6.3 Ethical aspects

The ethicality of a study refers to how the study has been planned with regard to the frame population (Wenemark, 2017). In this thesis ethical aspects have been considered in several aspects. In the survey contact information to the researchers were provided. This gave the responders the opportunity to contact the researchers with questions or concerns about the survey and its content. However, the researches have not received any questions or concerns from the

frame population. This, for the researchers, indicate that the survey items were not considered sensitive for the frame population.

The needs of different professional groups were also considered. Members of LRF had full anonymity. Some of their members had earlier experienced harassment and threats from the public which have likely made them more careful (Hultgren, 2019). Members of ME and SÅ had the option of filling in the company name and whether or not they agreed to be contacted in the future for research purposes. A large majority of the respondents from ME and SÅ choose to fill in the company they represented and around half of the respondents agreed to be contacted for research purposes in the future.

4. Case study descriptions

In this chapter, the case study is presented and analysed with regard to the hypotheses. The information collected from each case company is presented in sections 4.1 to 4.4 and summarised in section 4.5.

4.1 Case company A

Case company A work within the business areas of demolishing, sheet piling and soil remediation and have 60 employees ranging from operators, repairmen, and administrators. Usually, the company is at 20-30 sites simultaneously, with a high concentration of sites in the south of Skåne. A typical project stretches for three to four weeks. The case company is a member of both ME and SÅ.

Workplace conditions

The company's workplaces are often characterised by low security. The site is often fenced, but the CEO thinks this does little to stop the thieves. Investing in more security equipment on a workplace would require more resources, both in man-hours and cost, than it would be worth for a project only active for three to four weeks. The low level of security is also due to the business areas of the company. The CEO explains that his company often arrives at the site and demolish and flatten the ground before the construction process, performed by other organisations, can begin. About half of Case company A's workplaces are shared with other organisations.

Historic occurrence of theft

The company has historically experienced a lot of theft. The CEO means that the total number of thefts varies between 50 and 100 thefts per year. Most common are diesel thefts, both from a vehicle tank and a larger tank. However, theft of larger equipment from vehicles, for example, concrete crushers and machine buckets, as well as burglary in temporary barracks are also common.

A general theft occurs during the night and often result in downtime and reparation. If the theft causes damage that needs repairing the downtime is on average one day. To exemplify, a day of downtime for an excavator would cost the company between 8000 to 12000 SEK. This is a cost that is not reimbursed by the insurance company. The CEO estimates that the thefts cost the company 1000000 SEK per year in the extent to what is covered by the insurance company.

Crime prevention action

The company has taken some precautions in order to make it harder for thieves. On a day to day basis, they work with making it harder to access their tanks, machines, and equipment. For example, by strategic placement of machine buckets over tanks and block equipment with containers and machines. The CEO means that the insurance company requires that equipment is chained before operators leave the workplace at night.

The company has used blue dyed diesel in their tanks for about six years. This helps the police identify if diesel is stolen or not if they perform checks on vehicles. The CEO also explains a fueling strategy that is common among smaller companies. The strategy consists of never refuel the machine or vehicle more than needed to cover that working day and then have a portable tank on a pick-up truck. If the tank is empty at night the company leaves the tank unlocked in order to prevent damage and reparation which could be the case if a theft attempt was to be made. This, the CEO means, is not sustainable for a larger company with heavy machines such as his own. Some of his machines require

up to 50 litres of diesel per hour, which would require a huge portable tank to refuel for a day of work.

The member organisation ME have historically tried to start and maintain crime preventing networks among their members. However, the CEO of Case company A means that many initiatives, unfortunately, die out after a while due to that the member engagement decreases.

Police reporting

Case company A tries to report all thefts to the police. The reasons for this are not a belief that it would make a difference in the specific case, instead, it is done to contribute to the official statistics and with the hope that it will help the situation in the transport- and construction industry in the long run. For larger high-value theft, that exceeds the insurance excess, the insurance company requires that a police report is made. An administrator reports to the police by email, which they found to be more time efficient than before when you had to call and there were several calls before you.

The company's confidence in the police is very low as they witness theft after theft being non-prioritised and the investigations are written off. It is clear to the CEO that the resources the police have are very limited. The CEO feels a big frustration towards the police since it is clear to him, and many other entrepreneurs, that a high percentage of these thefts are organised crime and connected to international networks.

Thefts that occurred during the case study

In Table 5 below the thefts that occurred during the length of the case study are presented. Case company A experienced two thefts during the time, which is well below average for the company.

Table 5. Crime events Case company A.

	Event	Financial impact	Reporting
February 8th 2019	The operator arrived in the morning to discover that the lock of the portable diesel tank had been broken up and 100 litres of diesel were missing. The workplace was temporary, located in the countryside and fenced.	The value of the diesel lost is estimated to 1600 SEK, no other damages needed to be repaired. In total, this theft cost the company 1600 SEK.	The operator discovered the crime, notified the administrator who then reported the event to the police by mail.
March 4th 2019	The operator arrived on Monday morning and discovered that a crime had occurred during the weekend. The thieves had broken into a temporary barrack and sabotaged it. A container containing tools had been opened and several tools had been stolen. The workplace was temporary, located in an urban environment and fenced.	The value of the stolen tools is estimated to 5000 SEK. The cost to repair the barrack and container was estimated to 15000 SEK. The theft had little effect on daily operations. It took one hour for the operator to identify what was missing and make the call to the office, equivalent with 1500 SEK. In total this crime cost the company 21500 SEK.	The procedure was identical with the description stated in the row above. The CEO means there was no point of reporting this event to the insurance company due to the fact that the event consisted of multiple crimes and with that, multiple excesses.

4.2 Case company B

The business of Case company B is twofold, acting as both a machine entrepreneur and a haulier. 50% of the business is hence dedicated to earth moving, including excavation work and rentals of construction machinery in southern Sweden. A project can last for one week up to multiple years, but on average, a typical project lasts for 3 months. The other half of the operations are dedicated to the hauling business. The case company has nine trucks registered on their transport permit but, in addition to these, external hauliers are also driving for them. The product offering is trailer- and special transports such as transportation of goods that cannot be transported in a normal way, ranging from heavy- or over-dimensioned goods. The trucks are mostly operating in Sweden, Norway, and Denmark but Case company B also offers transports all over Europe.

Workplace conditions

Today, Case company B has an electric fence surrounding the courtyard and security guards patrolling in the industry area by night. Regarding the construction sites, physical security equipment is installed to some extent. For example, some workplaces are characterised by fenced and illuminated areas. For the transport side, however, the situation is different. Sometimes, an overnight stay in the vehicle might be necessary. Then the driver should try to park at a secured parking area, characterised with higher security efforts than other rest areas. However, the secured parking areas are sometimes crowded, and then other rest areas are chosen. Also, it is not always possible to select a secure resting area since hauliers need to consider the rules and regulations that exist with regard to their driving time. Case company B has also identified shorter time windows in connection with the loading and unloading of goods. Hence, the driver is forced to come in advance and wait in order to make sure that the time slot will not be missed. This increases the vulnerability of theft since the driver and the vehicle are more exposed to the risk of an attack.

Historic occurrence of theft

Historically the company has experienced theft, first and foremost from machines. On the earth moving part of the business, common types of resources that are stolen are compactors and GPS equipment as well as diesel. The CEO mentioned that at some occasions the thieves have stolen whole diesel tanks (not attached to a vehicle) by lifting them on to a trailer. However, on the transport side of the business, there are almost no diesel thefts. Instead, chains for the vehicle are frequent targets of theft as well as aluminium ramps due to the attractiveness of metal. Case company B has experienced that the police do not seem too interested in physically come and visit the crime scene. Only a few times have the police come and investigated the crime scene. One time they found DNA from cigarette fags found at the crime scene, this led to that the thieves could be identified and prosecuted. Furthermore, the CEO state that it is not the cost of the stolen goods itself that poses the biggest problem, but the sabotage, which leads to downtime, repair, and other additional costs.

In general, the CEO mentions a frequency of 1-2 thefts a month but emphasizes the fact that there is a lot of variation with higher and lower frequencies over the years. When the interview was held on February 5th, the company had not experienced any theft since November 2018. The CEO also believes that some of the thefts are not identified by the machine operators. If the tank is not empty and no damages on the machine can be seen, then it is hard to know exactly how much diesel the tank consisted of the day before and hence no diesel will be missing. This is a problem that he believes affect the official police statistics, contributing to the number of unknown thefts within the industry.

Crime prevention action

The case company never locks the fuel caps on the machines when they are left behind in the workplace, this to decrease the expenditures in the case of theft since the repair is costly. However, they have tried to reduce the accessibility by using wire baskets of metal in the tanks in order to make it more difficult to bring down a hose in the tank. This has unfortunately caused even more vandalisation. The CEO also mentioned that they try to leave the machines empty on diesel at the end of the day, i.e. only refuel as much as is required for the day.

Case company B also works with strategic placement of vehicles when leaving the workplace for the day, however, this is not always possible due to the limitations of the workplace. The CEO of Case company B is, however, considering investing in service vehicles for the employees with a mobile tank which they could bring with them on the end of the day instead of leaving it for the night and risk exposure of theft. Moreover, the CEO finds it difficult to approach the thefts since they are mainly occurring during the night when few people are present, and the police are rarely seen.

A couple of years ago, Case company B also utilised blue dyed diesel. The machines and trucks that had blue dyed diesel were marked with stickers and the company experienced less diesel theft due to this. The CEO means that the interest for this has decreased over the years. This because the police had to have a warrant in order to legally check trucks suspected to drive on stolen diesel.

Police reporting

Case company B has the policy to report every theft, regardless of the amount of loss. Hence, even smaller thefts are being reported. The knowledge that the police's resources are assigned in line with the reporting statistics is motivating the company to report every theft. The introduction of a crime code dedicated to diesel only is motivating the business further. However, the crimes are written off directly which the CEO believe to be causing motivation problem among actors within the industry.

Furthermore, the CEO thinks that the police could have a greater impact on the theft occurrence only by emphasising the problem and visualising both the problem and the actions implemented in order to face it. He means that the police could attack the problem with diesel thefts by investigating where the stolen diesel is sold and get the thieves that way.

Thefts that occurred during the case study

In Table 6 below the thefts that occurred during the length of the case study are presented. Case company B experienced three thefts during the time.

Table 6. Crime events Case company B.

	Event	**Financial impact**	**Reporting**
March 4th 2019	The operator arrived in the morning to discover that the lock of a steel box, positioned close to the main tank, had been cut opened. 25 litres of washer fluid and 20 litres of AD-Blue had been taken and poured out. Moreover, 20 litres of hydraulic oil was missing. The workplace was temporary, located in an urban environment and fenced.	The value of the stolen fluids was approximately 900 SEK. The reparation of the lock and the replacement of goods was estimated to take 2 hours. In total, the financial impact was estimated to cost 8000 SEK.	The crime event was notified to the office by the operator and then reported to both the police, and to the insurance company, even though the limit of the deductible (5000 SEK) was not reached. The reason behind notifying the insurance company was mainly due to the risk that the offenders might have poured other fluids in the fuel tank which would only be noticed later on if the machine broke down. This time, the event was not reported to ME since the CEO was convinced that the offenders were a teenage gang and not an organised theft league.
March 25th 2019	The operator discovered that 150 litres of diesel were stolen from a vehicle tank when he came to work a Monday morning.	The machine could still be used but the fuel tank could not be locked properly. A new lock had to be ordered and replaced, the estimated cost and installation of a new	The operator called and notified the event to the office, who then reported to the police by using the website for police reporting.

	The workplace was temporary, located in the countryside and fenced.	tank is 2000 SEK. The value of the stolen diesel was 2400 SEK. Bringing a total of 4400 SEK for the crime.	
April 8th 2019	The operator discovered a theft attempt on a large diesel tank when he started work Monday morning. The thieves cut the tank open and discovered that the tank was empty. They had first made a small hole at the side of the tank container to see if there were a diesel tank inside of it and then a larger hole at the side to cut it open to retrieve the diesel. Fortunately, the tank was empty and was scheduled to be refilled the next day. The workplace was temporary, located in an urban environment and fenced.	The crime event did not cause delays in the operations, except for the initial phone call. The cost to repair the tank was estimated to be 10000 SEK.	The operator notified the office, who then conducted a police report. The CEO was not sure whether the crime event was going to be reported to the insurance company or not, it depends on the final cost of the reparation.

4.3 Case company C

Case company C is a subsidiary to a bigger construction company, which is operating nationwide. However, the business differs depending on location and it is therefore divided into regions. The parent company has four main business areas wherein Case company C is active in one of those, namely Transport and Machine. Moreover, Case company C is active in the south region of Sweden,

with a high concentration of the operations in the county of Skåne. The company often works with other actors on larger projects. Often the client is a company in the same company group.

Workplace conditions

All of the company's workplaces are temporary. The company's workplaces are characterised with equipment such as fences, illumination, video surveillance, and alarm system. About 50% of Case company C's workplaces are characterized by these types of surveillance, while the rest of the workplaces are more or less unprotected. This is partly due to that the company performs a lot of work on road sites that can range from 3 km to 30 km in geographical spread. It is hence impossible to keep guard of these workplaces. In these less secure workplaces, the operators are instructed to place the machine under street lights or other illumination if possible.

Historic occurrence of theft

Case company C claims the theft procedure to be organised, emphasizing the usage of powered generators in order to get through containers and steal what is stored inside them. Furthermore, it seems like the thieves always come when the tanks have been refilled. They have a theory that the offenders are circulating in the area and are thus well aware of the operations at the workplace.

The company means that a large majority of the thefts are not covered by insurance. They do however keep a close eye on the cost related to each theft and how it affects the revenue of the targeted machine. Over the past ten years, Case company C has suffered from 10 damages that have become so expensive that it has been worth paying the deductible of 90000 SEK. In 2018, the company experienced 16 thefts, three of these were so severe so they reached the level of deductibles.

Crime prevention action

Case company C is working with strategical placement of vehicles and machines. For example, they try to park the machines in hard-to-reach places, i.e. put a tank next to the machinery door and the bucket above it. Almost all the company's vehicles have mobile tanks, so-called IBC containers. This is necessary for vehicles that are more difficult to move, such as an excavator. This allows the operators to put just enough fuel in the vehicle tank for the day but needs to store the mobile tank at the workplace during the night.

Some equipment is very expensive and easy to dispose, such as the components needed for a GPS receiver. The hardware consists of a physical computer and sensors that are attached to the unit. The stick, boom, and bucket are then connected with a computer and then you have a GPS receiver that costs approximately 350000 SEK. Sometimes, parts of this equipment are stolen, such as the computer. Case company C tries to protect the equipment as much as they possibly can by locking doors, remove things that are easy to unscrew, such as antennas, or things that are visible in the cabin for example monitors.

Police reporting

There is one part of the organisation which only works with insurance matters. Furthermore, police reporting is made centralised by the administration staff. The procedure is standardised and whoever discovers crime is told to call administration, who then takes care of the mail reporting to the police. As a policy, all thefts are reported to the police.

Thefts that occurred during the case study

Case company C experienced two thefts during the period of the case study, these are presented in Table 7.

Table 7. Crime events Case company C.

	Event	**Financial impact**	**Reporting**
April 1st 2019	A diesel theft of 150 litres was discovered by the operator Monday morning since he saw that the lid to the fuel tank was not properly attached. The workplace was temporary and located on the countryside. No security equipment was present.	The value of the stolen diesel was 2400 SEK. No damage was made to the machine. The total cost of this crime event summarised to 2400 SEK.	The operator reported to the site responsible that in turn contacted the administrative staff in the office. They then reported the event to the police and insurance company using an internal digital portal.
April 18th 2019	A diesel theft of 1600 litres from a mobile tank was discovered in the morning when the operator arrived. A chain had been attached and the tank had been pulled open. The thieves also broke into a machine and stole a few additional litres of diesel. The workplace was located in a rural area close to highway E6. The workplace was quite new, so security equipment was yet to be installed.	The value of the diesel was 26000. The cost to repair the tank and to remediate the soil, due to spilt diesel, was 20000 SEK. The total cost of this crime event summarised to 46000 SEK.	The theft was reported to the administrative staff that in turn reported to the police and the insurance company using an internal digital portal.

4.4 Case company D

The business of Case company D is twofold. Firstly, the entrepreneur sells services to larger contracting companies that are engaged within the crushing- and material extracting industry. Secondly, the entrepreneur has also, besides the parent company, recently started an affiliated business related to machinery and recycling. In order to run this business efficiently, some haulage operations are necessary since it includes transport of materials. The haulage operations are however only a complementary service for the internal businesses and not a service offered on the open market. The work with the extraction of materials is carried out during the weekdays in another city while the recycling business is up running during the weekends in the industrial area of the machine entrepreneur's hometown. No other employees other than the entrepreneur himself are hired in neither of the companies, hence the apparent division of working days.

Workplace conditions

The workplaces of the parent company are characterised by a high level of security, financed and installed by the contracting company. The extraction operations are also carried out on lower levels, making it more difficult for thieves to steal. The industry area is however extremely exposed to theft but not characterised by any security equipment besides one camera for video surveillance. The entrepreneur has tried to unite other entrepreneurs located in the same industry area with the purpose of starting a network to prevent crime as the one successfully implemented in Eslöv (SAFE0413). However, the interest is low even though everyone in the area is suffering from a lot of thefts. Even the ones who have invested heavily in security equipment are frequently subjected to crime. The entrepreneur is planning to set up a fence around the area.

Historic occurrence of theft

The operations allocated to the industry area are frequently targeted for theft. Last year, the entrepreneur experienced eleven diesel thefts from a vehicle tank and two thefts from a vehicle. The frequency has escalated this year with theft

events every second week. Attractive targets of crime are batteries, diesel, and cables. The latter because of their content of attractive materials such as copper. The entrepreneur has also experienced a lot of sabotage related to this business. For example, all glass windows were once crushed on a machine. This is the reason why the windows now consist of plexiglass in order to minimize the financial impact of a crime event. Since the entrepreneur operates elsewhere during the weekdays, the thefts in the industry area are usually discovered during the weekends.

Crime prevention action

The entrepreneur is working with strategically placed vehicles, strategic refuelling schedules, and unlocked fuel tanks, however, the district is extremely vulnerable to theft and fences are planned to be implemented. Historical crime events have influenced the entrepreneur's daily operations in the industry area to such an extent that batteries for the machine cannot be left in the machine during night time. Hence, a workday always includes the effort of carrying in and lifting out the batteries which is both a time-consuming process as well as heavy work. Decals and crime preventive labels are also in usage, but the entrepreneurs' belief is that the only thing really preventing crime is the presence of people in the industry area. Hence the suggestion of a crime prevention association.

Police reporting

The entrepreneur is not reporting thefts to the police due to the long telephone queues and the time-consuming process. However, after sharing and discussed an anecdotal story from a crime event considering a damaged hydraulic pump in rainy weather, the entrepreneur got a reminder that if future problems would have occurred, which were not obvious during the time of discovery, the insurance company would have required a police report in order to motivate why the machine is no longer functioning properly. From this point, the machine entrepreneur promises to report every theft. Not only in order to visualise the thefts in the official statistics, but in case of sabotage of tanks which cannot be detected directly. Alternative reporting processes were also discussed, and the internet platform was suggested in case of future crime events.

Thefts that occurred during the case study

Case company D experienced seven thefts during the period of the case study, these are presented in Table 8.

Table 8. Crime events Case company D.

	Event	**Financial impact**	**Reporting**
February 9th 2019	The entrepreneur arrived in the industry area a Saturday and discovered that 75 litres of diesel had been stolen.	The cost of the stolen diesel was 1200 SEK.	No.
February 24th 2019	The entrepreneur arrived in the industry area a Sunday and discovered that 50 litres of diesel had been stolen.	The cost of this crime event was 800 SEK due to the value of the stolen diesel.	No.
March 2th 2019	The entrepreneur arrived in the industry area a Saturday and discovered that 65 litres of diesel had been stolen.	The cost of this crime event was approximately 1040 SEK due to the value of the stolen diesel.	No.
March 23th 2019	The entrepreneur arrived in the industry area a Saturday and discovered that 100 litres of diesel had been stolen.	The cost of the stolen diesel was 1600 SEK.	No.
April 14th 2019	The entrepreneur arrived in the industry area a Sunday and discovered that 150 litres of diesel had been stolen.	The cost of this crime event was 2400 SEK due to the value of the stolen diesel.	No.
April 27th 2019	The entrepreneur	The total cost of this	No.

	arrived in the industry area a Saturday and discovered that 40 litres of diesel had been stolen.	crime event was approximately 640 SEK due to the value of the stolen diesel.	
May 4th 2019	The entrepreneur arrived in the industry area a Saturday and discovered that 150 litres of hydraulic oil were stolen, one of the excavators' windows was removed and 75 litres of diesel had been stolen.	The value of the stolen hydraulic oil was 3750 SEK and the diesel 1200 SEK. The entrepreneur managed to reinstall the window. However, it took 5 hours to repair and replace everything. The total cost of this crime event was hence 9200 SEK.	No.

4.5 Summary of case study descriptions

The case study descriptions are summarised in Table 9. All case companies have experienced theft during the time period of the case study. The level of security at the case companies targeted workplaces varied but everyone works with some sort of crime preventative actions. Three of the case companies, A, B and C, report thefts to the police, through administrative staff which constitute a centralised role in the company. Case company D has historically found the cost of conducting a police report to outweigh the benefit of doing so.

Table 9. Summary of case study descriptions.

Case company	Workplace conditions	Crime preventative actions	Police reporting	Amount of theft during case study	Average cost per theft
A	Temporary, often fenced.	Blue dyed diesel and strategic placement.	Most thefts are reported to the police, through the office staff.	2 thefts	12350 SEK
B	Temporary usually fenced and illuminated.	Strategic placement, unlocked fuel tanks and refuelling strategy.	Report all thefts, through the office staff.	3 thefts	7467 SEK
C	Temporary, 50% have fence, illumination, alarm system and video surveillance. Other 50% no security.	Strategic placement, and removal of expensive parts from equipment.	Report all thefts through administrative staff.	2 thefts	24200 SEK
D	Temporary 50%, other 50% in the industry area. No security equipment yet.	Unlocked fuel tanks, fueling strategy, removal of expensive equipment from machines.	Have given up reporting thefts, the phone lines are too long.	7 thefts	2411 SEK

5. Result and analysis of the survey

This chapter of the thesis presents the results of the survey and test the hypotheses by analysing the result and examine if there is any statistically significant difference between or within different groups of respondents. The logic of this chapter follows from the sections of the survey: (1) Company Profile, (2) Theft and Police Reporting Experiences and (3) Incentives behind Police Reporting. Finally, a summary of the result and the analysis of the survey is presented.

5.1 Company profile

This section of the survey investigated the characteristics of each responder's organisation when it comes to company specific attributes. Hence, items 2-7 will be presented below and the above stated hypotheses will be tested using the results of the survey.

1. Company name

This item was introduced in order to identify which company the respondent of the survey belongs to. In order to have the possibility to get hold of companies who agreed to be contacted for research purposes, see item 12, the inclusion if this item in the survey was necessary but the results will not be presented.

2. Company size

The item was, as previously mentioned, adjusted for each member organisation. The mean company size for members of ME were 12 employees, excluding the entrepreneur. The median company size was two employees. The company size for members of SÅ were measured by the number of trucks the organisations have on their transport permit, with a mean of 15 trucks and a median of four trucks. The company size for members of LRF were determined based on their yearly turnover, with a mean turnover of 500000 SEK per year and a median of 400000 SEK. This indicate that, in general, the majority of the members are quite small in size which is consistent with the information provided by the member organisations.

3. Beyond your membership in Maskinentreprenörerna AB, do you hold a membership in any of the following organisations? (SÅ, LRF, NO)

The question identified that there was an overlap of memberships between the member organisations, in total 48 of the respondents are members of more than one of the member organisations. This correspond to 8.5 % of the total number of respondents. The most common combination was to be a member of both ME and LRF (56.2%), in total 26 of the 48 organisations had this combination. The second most common combination was to be a member of both ME and SÅ (29.2%). The third most common combination was to be a member of both SÅ and LRF (14.6%). Two of the 48 organisations (4.2%) were members of all three of the member organisations. The multiple memberships were not unexpected seeing that many practitioners in the industry work within different business areas. One example of this is Case company B that work both with earth moving and as a haulier. That ME and LRF is the most common combination is expected, due to the season dependent agriculture in Sweden and in line with the information provided by the member organisation LRF.

4. How many of your workplaces are characterised by the following physical security equipment? (illuminated area, fenced area, video surveillance, and alarm system)

The question was answered on a Likert scale from 1(0-20%) to 5(80-100%) of the workplaces. The mean value for each security equipment and member organisation is presented in Diagram 1 below. The diagram shows that members of SÅ in general had more workplaces characterised by the listed security equipment, while both members of ME and LRF had less.

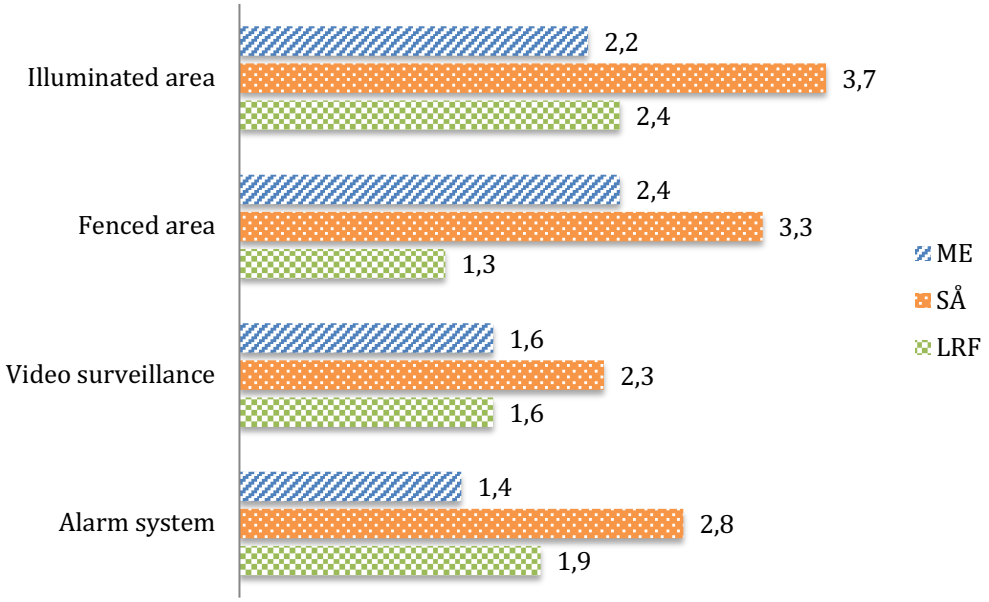

Diagram 1. Mean value of physical security equipment.

5. How many of your workplaces are characterised by the following conditions? (neighbourhood watch, security guards, urban environment, and temporary workplaces)

The question was answered on a Likert scale from 1(0-20%) to 5(80-100%) of the workplaces. The mean value for each investigated condition and member organisation is presented in Diagram 2 below.

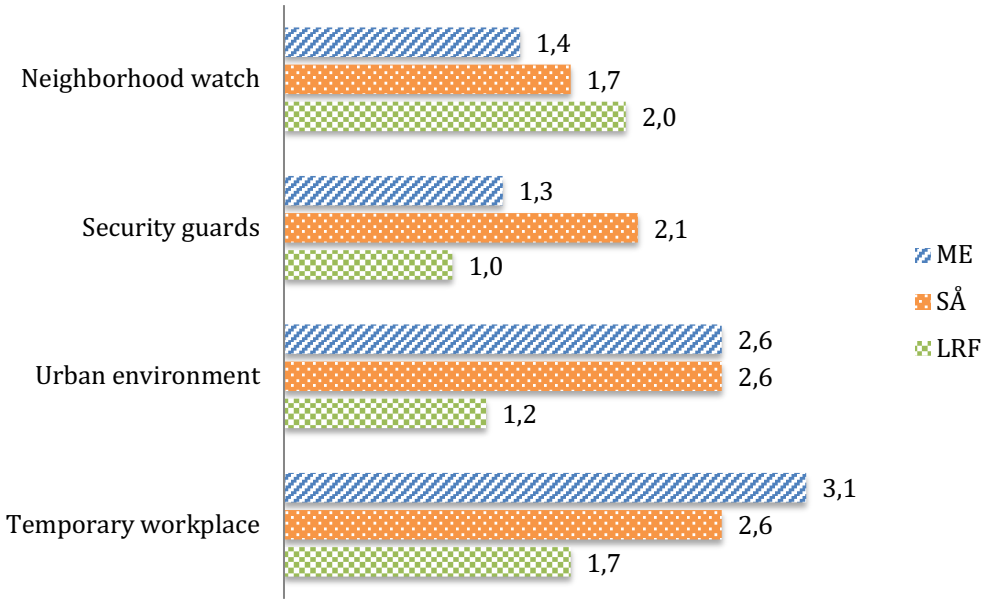

Diagram 2. Mean value of workplace conditions.

The workplace conditions in items 4 and 5 were used to investigate hypotheses **H1**, **H2a** and **H2b** i.e. if workplaces characterised by higher levels of physical security equipment, urban environment, security guards or neighbourhood watch will be associated with lower, or temporary workplaces higher, levels of theft. A multiple linear regression, see Table 10, shows that one of the hypotheses is fulfilled, H2a, since higher levels of use of temporary workplace is associated with higher levels of theft on a significance level of 0.1. In other words, working on temporary workplaces increases the likelihood of theft occurrence.

Hypothesis H1 cannot be accepted seeing that some of the explanatory variables are non-significant and others prove not to be true. Workplaces characterised by higher levels of a fenced area is associated with higher levels of theft on a significant level of 0.05 instead of lower levels as expected in H1. The result

indicates that working on fenced areas increases the likelihood of theft occurrence.

Hypothesis H2b cannot be accepted seeing that some of the explanatory variables are non-significant and others prove not to be true. Workplaces characterised by higher levels of urban environment is associated with higher levels of theft on a significant level of 0.01 instead of lower levels as expected in H2b. The result indicates that working on urban environments increases the likelihood of theft. Moreover, workplaces characterised by higher levels of security guards is associated with lower levels of theft on a significant level of 0.1. This is in line with H2b. Hence, hypothesis H2b is accepted for security guards. These findings are also supported by other models, see Appendix D.

Table 10. Result of the multiple regression for dependent variable theft experience.

F	***p*-Value**	R^2	**Variable**	β	**Std. error**	**t-value**	**Pr(>|t|)**
5.145 on 8 and 358 DF	4.355e-06	0.083	(Intercept)	0.219	1.227	0.178	0.859
			Alarm system	-0.457	0.392	-1.166	0.244
			Video surveillance	0.429	0.441	0.973	0.331
			Fenced area	0.819	0.401	2.041	0.042 *
			Illuminated area	0.0805	0.330	0.244	0.808
			Temporary workplace	0.579	0.295	1.966	0.050 '.'
			Urban environment	1.162	0.423	2.748	0.006 **
			Security guards	-1.153	0.619	-1.863	0.063 '.'
			Neighbourhood watch	-0.486	0.334	-1.456	0.146

Significant level: *** 0, ** 0.01, *0.05, '.' 0.1 ' ' 1

6. Are your workplaces characterized with other circumstances than those mentioned above?

Few respondents chose to add circumstances on this question (4.9%). The low response rate may indicate that most responders felt that their workplaces could be described by the provided alternatives in items 4 and 5. Those that answered the question did use the question to inform about their specific situation, that explained their answers on items 4 and 5, instead of providing *other* circumstances. Two of the responses are presented below.

Responder from ME, "We rent out material to temporary workplaces, but our own properties are fenced and have alarm systems."

Responder from LRF, "I have tenants on the farm, which provides movement at odd times."

7. To which extent do you agree to that the characteristics of the tools, machines and resources that are exposed to theft in your organisation affect the thief's propensity to steal? (easy to dispose, easy to access, easy to move, visible, valuable)

The question was answered on a Likert scale from 1(Strongly disagree) to 4(Strongly agree). The responders find each of the explanatory variables to be important attributes for stolen goods. On average, no member organisation disagree with any of the attributes. The most frequently agreed upon variable is easy to dispose, followed by valuable. The mean value for each variable and member organisation is presented in Diagram 3 below.

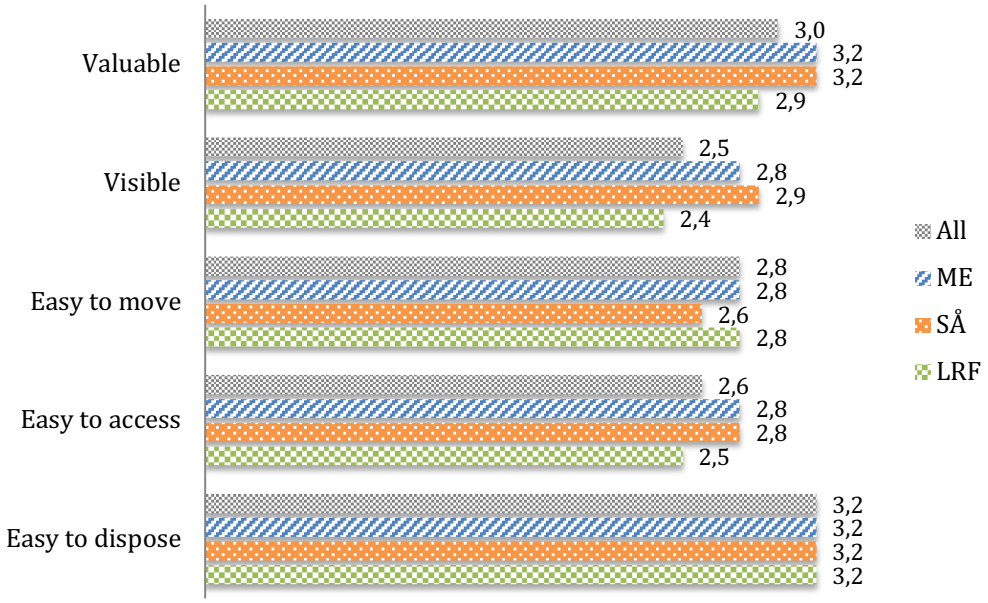

Diagram 3. Mean value of the extent to which the respondents agree that the attributes are important characteristics for stolen goods.

Hypothesis **H3** (i.e stolen goods in the transport- and construction industry are characterised by being valuable, visible, easy to move, easy to access and easy to dispose) can thus be accepted seeing that the aggregated mean values range between 2.5 (easy to access) to 3.2 (easy to dispose) on the Likert scale.

5.2 Theft and police reporting experiences

In this section of the survey, five different types of theft were investigated. In particular, historical theft experiences and police reporting actions were asked for as well as the financial consequences of a theft. Hence, items 8-9 will be presented below and the findings related to the above stated hypotheses will be discussed.

8. Estimate how many times your company experienced the below stated type of theft and how many of these were reported to the police? (diesel theft from a vehicle tank, diesel theft from larger tank (not attached to vehicle), theft of entire vehicle, theft from vehicle, burglary theft from temporary barracks)

The most common crime the responders experienced was diesel theft from a vehicle tank (9823), constituting the majority (53%) of all thefts, followed by 0822, burglary theft from temporary barracks (20%) and 9804, theft from vehicle (16%). Diagram 4 below illustrates the number of thefts the respondents experienced in 2018 separated after membership.

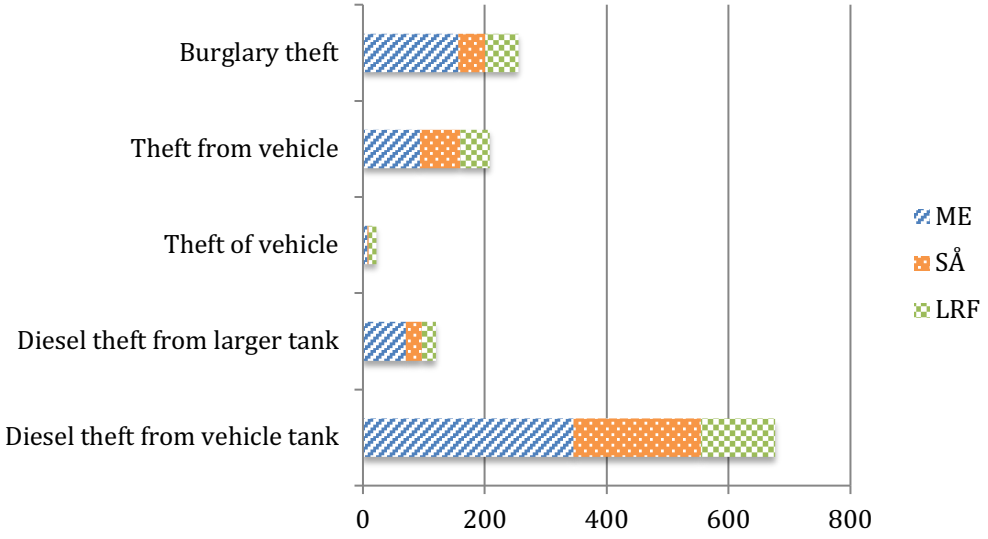

Diagram 4. Theft experiences in 2018, sorted by member organisation.

ME had the highest percentage of members that experienced theft in 2018. Two out of three members of ME stated that they had been subjected to theft in 2018 and their total number of thefts corresponds to an average of 9.5 thefts per targeted organisation. Assuming an even distribution of theft among the members of ME, the average number of thefts was 6.4 thefts in 2018.

Three out of five members of SÅ stated that they experienced some type of theft in 2018 and their total number of thefts corresponds to an average of 7.8 thefts per targeted organisation. When assuming an even distribution of theft among the members of SÅ, the average number of thefts per member was 4.7.

For members of LRF, two out of five organisations stated that they experienced some type of theft in 2018, corresponding to 1.7 thefts per targeted organisation. Assuming an even distribution of theft among the members of LRF, each organisation would have experienced 0.7 thefts in 2018.

The targeted respondents did not report all the thefts they experienced to the police. A comparison between theft experiences and reported thefts is presented in Diagram 5 below. The overall tendency to report crime was found to be 60%. It was found that three out of five thefts had been reported to the police in 2018. Two types of thefts had higher reporting tendencies, i.e. 9803 (entire vehicle) with 100% and 9824 (diesel from larger tank) with 83.7%. The lowest reporting tendencies were identified to be for crime code 0822 (burglary from temporary barrack) with 60.2%, 9824 (diesel theft from vehicle) with 57.4% and 9804 (theft from vehicle) with 52.3%. The police reporting tendency was different for the three member organisations. ME had the highest average reporting tendency (62.6%), followed by SÅ (57.9%) and LRF (53.6%).

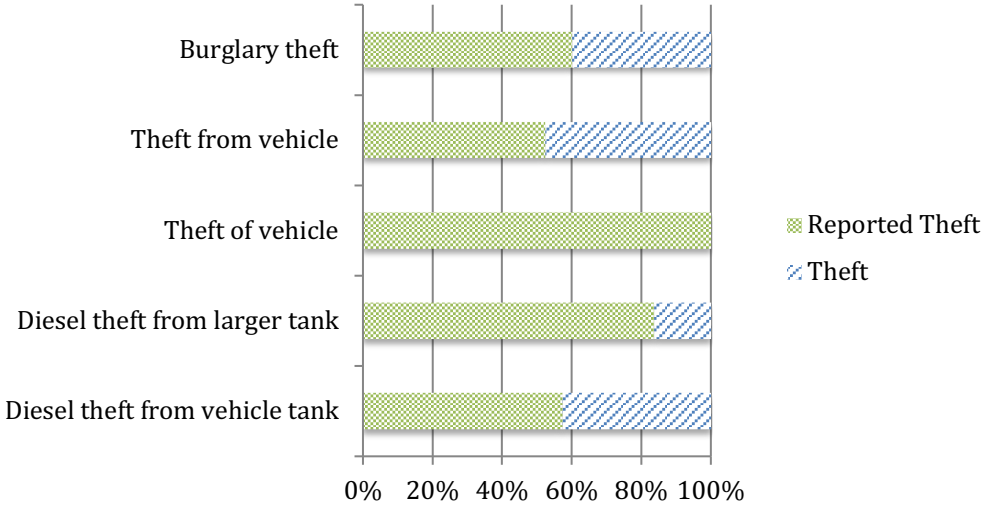

Diagram 5. Percentage of thefts in 2018 that was reported.

Seeing that the report tendency is different for different crime codes hypothesis **H4a** (i.e. the police reporting tendency varies between different types of theft) can be accepted. Hypothesis **H4b** (i.e. larger companies will be associated with higher levels of theft) was investigated using a single linear regression for each member organisation since the definition of company size (CS) differ between the organisations. The regressions show that the $\boldsymbol{\beta}$-value for ME is significant on a 0-level, while the others are not significant. The results for each regression are summarized in Table 11 below. The result indicate that higher levels of number of employees are associated with higher levels of theft. Hence, hypothesis H4b can be accepted for ME but not for SÅ and LRF.

Table 11. Single regressions with the dependent variable theft experiences.

	F	*p*-Value	R^2	*Variable*	β	Std. error	*t*-Value	Pr(>|t|)
ME	19 on 1 and 96 DF	3.287e-05	0.1565	(Intercept) CS	4.32864 0.19407	1.29370 0.04453	3.346 4.358	0.001 ** 3.29e-05 ***
SÅ	0.0005738 on 1 and 69 DF	0.981	-0.01448	(Intercept) CS	4.34543 0.00138	1.72745 0.05762	2.516 0.024	0.014 * 0.981
LRF	2.397 on 1 and 321 DF	0.1226	0.004319	(Intercept) CS	0.42376 0.09881	0.28653 0.06382	1.479 1.548	0.140 0.123

Significant level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Hypothesis **H4c** (i.e. higher levels of theft will be associated with higher levels of reported thefts) examine the relation between theft experience (TE) and dependent variable, reported thefts (RT), in a single regression model. The model, as seen in Table 12, show that higher levels of theft are associated with higher levels of reported thefts on a significance level of 0.001 and a $\boldsymbol{\beta}$-value of 0.599. The linear regression has a $\boldsymbol{R^2}$-value of approximately 0.82. This indicates that a linear model explains the relationship between reported thefts and theft experiences well. In other words, the model indicates that the likelihood that a theft being reported is 60% independent of respondents' theft history. Hence, hypothesis H4c can be accepted seeing that the number of reported thefts increases with the number of theft experiences, even though the likelihood per se is unchanged.

Table 12. Single regression with the dependent variable reported theft.

F	*p*-Value	R^2	Variable	β	Std. error	*t*-Value	Pr(>|t|)
1884 on 1 and 421 DF	2.2e-16	0.817	Intercept TE	-0.055 0.599	0.125 0.0138	-0.441 43.408	0.659 <2e-16 ***

Significant level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

9. Please estimate the financial impact an average theft has on your business in SEK.

According to the respondents, an average theft has a financial impact on their business. Out of all the respondents, 45 reported that they had been exposed to diesel theft from a vehicle tank exclusively. The financial impact of an average diesel theft from a vehicle could thus be estimated to be approximately 11000 SEK. Moreover, a diesel theft from a larger tank was estimated to be almost 6 times as expensive than a diesel theft from a vehicle tank. The number of respondents only targeted to one type of theft varied between the different crime codes, diesel theft from a vehicle tank being the most common one. Table 13 present a summary of the average cost and the number of respondents for each crime code.

Table 13. Average financial impact for each crime code.

Crime Code	Average Cost (SEK)	Number of Respondents
9823	11060	45
9824	60000	3
9803	805000	5
9804	33860	12
0822	43060	13

5.3 Incentives behind police reporting

This section of the survey investigated the incentives behind crime reporting to the police and the actions needed in order to increase this tendency. Hence, items 10-12 will be presented below and the findings related to the above stated hypotheses will be discussed.

10. Which factors are crucial to you while deciding whether to report a theft to the police or not? (severity of injury, amount of loss, means of contacting police, distance from event in time or space, perceived likelihood of police response, perceived chance to receive some sort of compensation, contribution to the police's reporting statistics)

The three factors that were found to be the most important when deciding whether to report a crime or not were the *amount of loss (value and volume), severity of injury (vandalism)* and *perceived chance to receive some sort of compensation*. All the attributes were mentioned in a range from 12.1% (distance from event in time or space) to 77.5% (amount of loss). Considering hypothesis **H5** (i.e. the responder's police reporting tendency is influenced by cost-benefit considerations) all the attributes can to some extent influence the responder's tendency to report a crime. Hypothesis H5 can, therefore, be accepted. The percentage of responders that found each factor influential is presented in Diagram 6 below.

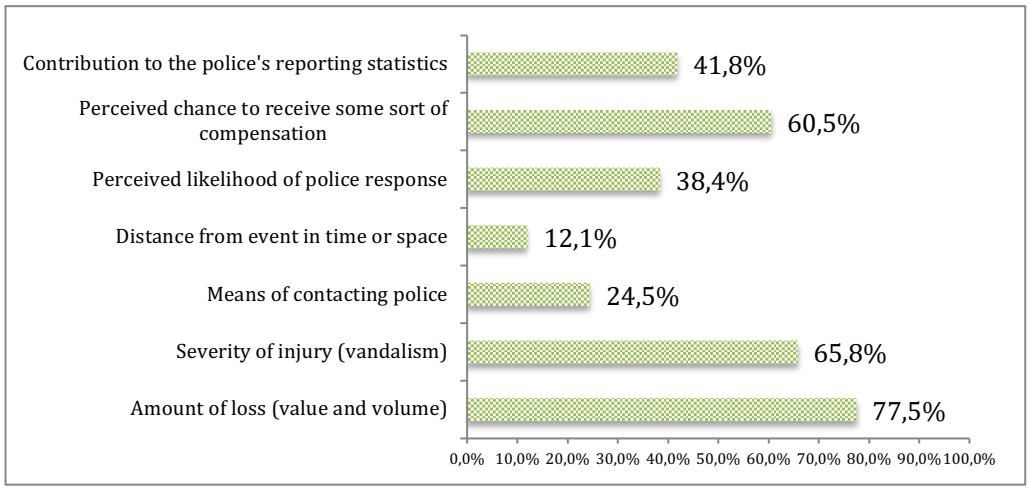

Diagram 6. Respondents perception of important factors while deciding to summit a report.

11. Which actions do you think are necessary in order to increase the tendency to report crimes to the police?

The two most frequently mentioned answers among the respondents were; *the crime should be investigated and not written off directly* and *a higher degree of solved crimes and greater confidence in the police.* The practitioners have a very similar idea about which actions are needed in order to increase the tendency to report a crime to the police. This is illustrated in Table 14 below, presenting all actions and the aggregated number of mentions for each action. Please note that every responder did not answer this question or mentioned statements such as "I do not know" which are not being counted for in this table. Individual responses that state a suggestion are counted for among "Other", one concrete example is presented below.

Responder from SÅ, "Insurance companies should require a police report."

Table 14. Most common responses on how to increase the tendency to report crime.

Action	Number of mentions
The police should physically visit the crime scene	41
Allocate more resources to the police	31
The investigations should not be written off directly	81
Higher degree of solved crimes and greater confidence in the police	72
Stricter punishment for the offender and greater authority to act on crime	38
Increased understanding of the problem. Educate the practitioners about the importance of reporting	25
Make the police reporting process more efficient and accessible	28
Other	53

5.4 Summary of the result and analysis of the survey

The result of the survey is both positive and negative. The negative is that the results are not always significant and can thus not be statistically supported and

are hence not further discussed. It would be interesting to compare the workplace conditions to an even greater extent than what has been possible in this thesis, due to non-significant results. The great majority of the hypotheses has however been accepted. The asterisk (*) imply that the original hypothesis is only true for the stated variable.

H2a: Higher levels of temporary workplaces will be associated with higher levels of theft.

H2b*: Workplaces characterised by higher levels of security guards will be associated with lower levels of theft.

H3: Stolen goods in the transport- and construction industry are characterised by being valuable, visible, easy to move, easy to access and easy to dispose.

H4a: The police reporting tendency varies between different types of theft.

H4b*: Higher levels of the number of employees (ME) will be associated with higher levels of theft.

H5: Responder's police reporting tendency is influenced by cost-benefit considerations.

Two of the explanatory variables presented in hypotheses H1 and H2 (i.e. fenced area and urban environment), ended up having the opposite effect on the occurrence of theft than initially stated in the hypotheses. Workplaces characterised by higher levels of a fenced area or an urban environment are associated with higher levels of theft.

6. Discussion

In this chapter, the main findings of the survey will be discussed based on the insights gained from the literature and the case study. The factors influencing the occurrence of theft will be discussed in the first two sections, followed by the financial impact of theft and the police reporting tendency. Finally, the methodology used will be discussed.

6.1 Why do some practitioners experience theft while others do not?

The result from the survey indicates that not all practitioners in the industry were equally affected by theft. Comparing the three groups; machine entrepreneurs, hauliers, and farmers differences were found both in the percentage of targeted organisations, but also the number of times a targeted practitioner had been subjected to theft. The most targeted group in the industry was identified to be the machine entrepreneurs, followed by hauliers and farmers. In order to understand why this is, one needs to understand how the workplace conditions and attractive targets of crime may differ between the three groups of professionals. Seeing that the result show that all three groups of professionals have attractive goods to steal, see Diagram 3, the difference between the groups should thus, according to crime theory, be related to the absence of a capable guardian i.e. the workplace conditions.

In line with theory, the transport- and construction industry is on an aggregated level found to be characterised with changing workplaces and a low level of security, see Diagram 2 and Diagram 1. The result does, however, show that the workplace conditions differ between the groups of professionals. One difference

being that machine entrepreneurs and hauliers tend to have more temporary workplaces and more often work in an urban environment than farmers. This finding is no surprise, seeing that many farmers would work in the countryside on their own land. Another difference between the workplace conditions was that hauliers' workplaces were characterised with security equipment to a higher extent than for machine entrepreneurs and farmers. That hauliers have workplaces with more security equipment than machine entrepreneurs and farmers are consistent with the literature review and descriptions from the case study, saying that hauliers aim to find secure parking for their resting time. This is however not always possible due to low availability and driving time restrictions, which causes hauliers to stop at non-secure parking lots or on the side of the road. These non-secure locations might be one reason why three out of five hauliers were exposed to theft.

Based on the above-mentioned results, machine entrepreneurs' workplaces are more often, than for hauliers and farmers, characterised by being temporary, located in an urban environment and have a lower degree of security. Comparing the machine entrepreneur's workplace conditions with the likelihood of theft, see Table 10, it can be seen that a higher level of temporary workplaces and urban environment is associated with higher levels of theft. This would explain why machine entrepreneurs have a greater likelihood of being exposed to theft than hauliers or farmers, with two out of three machine entrepreneurs being exposed to theft.

The lack of security among machine entrepreneurs' workplaces due, according to interviews and case study descriptions, comes back to cost concern. Entrepreneurs mean that the equipment itself is expensive but also requires man-hours to install that instead could be used to move the project forward. Based on the case study descriptions, factors that influence a machine entrepreneur's decision to put up security equipment are the length of the project, the characteristics of the project and whether or not other actors are involved in the project. The situation differs for hauliers, seeing they pay a premium fee if they prefer secure parking, and for farmers that have fewer temporary workplaces, increasing the likelihood of security investments.

The researchers, therefore, argue that the reason for that some practitioners in the transport- and construction industry is more subjected to theft than others is related to the conditions of the practitioner's workplaces.

6.2 Could security efforts enhance the risk of theft?

Intuitively, many would probably think that security equipment would decrease the likelihood of being subjected to theft or at least not increase the likelihood. The result does, however, show something different, namely a positive correlation between a workplace being fenced and the occurrence of theft, see Table 10. How can it be that the fence increases the likelihood of theft? The phenomenon has a feasible explanation in crime theory. Having security equipment might tell a likely offender that a suitable target is kept inside, and the only thing preventing a crime to occur is a capable guardian. The positive correlation between fence and theft might, therefore, indicate that a fence is not a capable guardian by itself. The case study descriptions witness about that putting up a fence first and foremost is to protect pedestrians and the surrounding and do little to stop motivated thieves.

Another interesting aspect is the location of the workplace, whether it is located in an urban environment or in the countryside. One could argue that a workplace located in an urban environment would have a more sufficient capable guardian, due to that there are more people in motion, compared to the countryside. However, the result shows that a workplace located in an urban environment have a greater likelihood of experiencing theft. Might it be because of the same reason as stated above? That a suitable target is discovered by the offender and the guardian is not capable enough to stop a motivated offender. Videos and images captured by the case companies also suggest that offenders often wear high visibility clothing of the kind you expect to see at a workplace, making it harder for the public to realise that the individuals are not authorised to be there. This can further explain why the urban environment with a lot of people in motion is not considered a capable guardian.

6.3 What is the financial impact of theft?

The case study descriptions show that theft has a large impact on the practitioners' business and the entrepreneur behind it. The descriptions and the survey answers witness of entrepreneurs that are feeling a great deal of hopelessness and frustration caused by the thefts and the financial impact on their business.

The financial impact of theft is usually far from just the loss and replacement of the stolen goods, as seen in the case study. Often downtime occur as a result of sabotaged machines and equipment that needs repairing. This is a cost in itself considering lost man hours, but might also cause delays, affecting the margin of the project. Operational costs such as lost man hours and delays are seldom covered by the insurance company, it is therefore the case companies experience that most thefts exceed the excess of the insurance. In order words, for many thefts, the company carries the full cost of the event.

The financial impact of theft can be estimated by considering the target population, Table 4, the number of theft experiences in 2018, Diagram 4, and the average cost of theft, Table 13. Assuming that the same types of theft occur in the same frequency to the entire target population, the total financial impact of theft can be estimated to 727 million SEK per year in Skåne County alone. The number of thefts that occurred in Skåne 2018 was estimated to be 15800 thefts, corresponding to 44 thefts per day. Considering the three groups of professionals in the target population, farmers carry 60.3% of the cost, machine entrepreneurs carry 22.4% of the cost and hauliers carry 17.3% of the cost. The number of practitioners vary greatly between the groups, farmers constituting 85.6% of the target population, followed by hauliers (8.2%) and machine entrepreneurs (6.2%). All three groups of professionals are thus targeted by theft. However, one can see that machine entrepreneurs and hauliers carry disproportionately large parts of the total financial impact.

The occurrence of theft is unfortunately not limited to Skåne, it is a problem in the entire country. In 2018, 15.3% of the reported thefts of interest for this thesis,

occurred in the county of Skåne (BRÅ, 2019). Under the assumption that the police reporting tendencies are the same throughout Sweden, the financial impact of thefts in the transport- and construction industry can thus be estimated to be 4.7 billion SEK every year. The total number of thefts in 2018 was estimated to be 102900 thefts, which corresponds to 290 thefts per day. Calculations are presented in Appendix E.

6.4 What is required to increase the reporting tendency?

The police statistics for some types of crimes in the transport- and construction industry has long been suspected to be flawed, the real number of crimes being higher than the reported. This is confirmed by the survey result, see section 5.2, which shows that the overall reporting tendency is in average 60% for the investigated crime codes. It was also discovered that a linear relationship exists between theft and police reported thefts, see Table 12. This means that the reporting tendency is constant and independent of historical theft. The phenomenon can be explained with the individual practitioner's considerations when choosing to report a theft or not, in line with Goudriaan's model. The result shows that the practitioners are considering several factors when choosing to report a theft, see Diagram 6.

For most practitioners, the amount of loss, the damage caused by the theft and the perceived likelihood to receive some sort of compensation, for example, insurance payment or punishment of the offender, are the most crucial in order for them to report a theft. The high importance of these factors explains that some type of theft, characterised with a higher value, have a higher reporting tendency than others, see Diagram 5. The case study descriptions reveal that thefts that exceed the excess of the insurance tend to be reported, due to that most insurance companies require a police report. The theft that does not fulfil these factors for the individual practitioner has hence a lower likelihood of being reported. Practitioners do consider other factors when reporting, as seen in the result, and for some, the benefits of these are greater than the cost of reporting. Some base the decision on factors from the meso-level. This could be practitioners that believe that the only way of visualising the thefts and to find a

solution to the problem long-term, is to report the crime and contribute to the police statistics. This is in line with the case study descriptions were the practitioners mean that they report thefts out of principle and to contribute to the official statistics without believing that the police will investigate the crime or catch the offender.

The frequent theft occurrence is causing frustration among the practitioners, influencing their trust in the Swedish legal system and in the police. The results from the survey, see Table 14, show that many practitioners believe that the tendency to report crime would increase if the police investigated and solved more crimes, which is also a factor in Goudriaan's model. This, in turn, is related to what is prioritised within the justice system causing a vicious cycle of the sort, in which the crimes in this industry receives less attention from authorities since the problem is not visualised through the reporting statistics.

6.5 Critique of the methodology used and limitations

There are some methodological limitations to this thesis. Firstly, the generalisability of the results could potentially be better if more than three types of practitioners in the concerned industry were to be included in the frame population. Other practitioners might be targeted to the same type of thefts and are hence not being counted for. Secondly, it might also be that practitioners who took the time and answered the survey have a greater personal interest in the subject if they themselves have been targets of crime. If this is the case the result could be overestimated with regard to theft experiences, which again influence the generalisability considering the whole industry. Then again, many of the respondents stated that they had not experienced any thefts in 2018 which reduces the magnitude of this concern. Finally, control items could be used in the survey to improve the reliability further. In this case, control items were deprioritised in favour of a shorter survey that likely would generate more responses.

7. Conclusion and research contribution

This chapter states the purpose of the thesis, presents a conclusion for each of the research questions and the research contribution. At the end of the chapter, future research suggestions are presented.

7.1 Fulfilment of research questions

7.1.1 RQ1: What is required for transport- and construction equipment theft to occur?

The result indicates that workplaces in the transport- and construction industry often have suitable targets consisting of attractive goods and often lack a capable guardian. The combination of these two elements makes the transport- and construction industry vulnerable to theft. Furthermore, the size of the companies within the industry was not found to be an efficient crime predictor.

Sub-RQ1.1: *Do the conditions of the practitioners' workplaces influence the occurrence of theft?*

The occurrence of theft is influenced by the conditions of the practitioners' workplaces. Four crime predictors were identified in the thesis. The workplaces that are found to be most vulnerable to theft are those that are characterised by either an urban environment, a fence or to be temporary. Workplaces that are characterised by security guards are found to be less vulnerable to theft.

Sub-RQ1.2: *Does the company size of the practitioners' influence the occurrence of theft?*

The company size was not found to influence the occurrence of theft in the industry. However, the statement is true for machine entrepreneurs. For these companies, an increase of five employees would result in one additional theft each year.

Sub-RQ1.3: *What characterise the stolen goods?*

The stolen goods within the transport- and construction industry are characterised by the same elements presented in crime theory; value, inertia, visibility, access and disposability. The two most agreed upon attributes are that the stolen goods are valuable and easy to dispose.

7.1.2 RQ2: What is required for a transport- and construction equipment theft to be reported to the police in a micro-level context?

The result indicates that in order for a theft to be reported to the police the targeted practitioner needs to feel that the benefits from reporting outweigh the inconvenience. Today many practitioners in the industry consider the inconvenience to be greater than the benefits, causing a low tendency to report a crime. In order to increase the reporting tendency within the industry, higher confidence in the police is needed. This could be established by more crimes being investigated and solved.

Sub-RQ2.1: *What influence a practitioner's tendency to report a crime to the police?*

Cost-benefit considerations influence the practitioner´s tendency to report a crime to the police. The three factors found to be of major importance when deciding whether to report a crime or not are the amount of loss, the severity of the injury and the perceived chance to receive some sort of compensation.

Sub-RQ2.2: *Does the tendency to report crime depend on the type of theft committed?*

The tendency to report crime depends on the type of theft committed. Thefts characterised by a higher police reporting tendency tend to involve greater losses than those characterised by a lower reporting tendency. This is also connected to the perceived chance to receive some sort of compensation. An example of

compensation could be insurance payments if the cost of the theft exceeds the excess.

Sub-RQ2.3: *Does the tendency to report crime depend on the number of theft experiences?*

The tendency to report crime does not depend on the number of theft experiences. Instead, a linear relationship was found meaning that the tendency to report crime is independent history of theft.

7.2 Research contribution

This thesis contributes to research since its explorative approach is a necessary fundamental step for future normative approaches within the areas of crime theory and supply chain for the studied industry. The thesis supports the practitioners' belief that thefts in the transport- and construction industry is a big problem and helps to visualise the extent of the problem. The data gathered increases the knowledge within the field by exploring factors that influence the theft occurrence in the transport- and construction industry as well as factors that influence the decision making behind the police reporting tendency in the same industry. By applying theoretical frameworks for crime incentives and crime reporting in the studied industry, the findings presented in this paper support their legitimacy and aid further research in the transport- and construction industry. Moreover, this thesis contributes not only to academia but to the studied industry by supporting decision makers such as policymakers, practitioners and scholars about the cause and effect of crime in the transport- and construction industry.

7.3 Future research

This exploratory thesis can act as a basis for future normative studies and can be seen as the first step towards a systematic approach to fight theft in the transport- and construction industry. In order to visualise the problem further, it would be of relevance to study how much tax revenue is likely to be lost due to crimes

committed within the industry. This could be estimated by including lost revenue from practitioners subjected to crime and the secondary market for stolen goods. In addition to this, it would be interesting to study how much police resources this loss of revenue would be equivalent to and how an increase of resources would influence the prevention of theft, as well as the number of solved crimes. Higher levels of solved crime would, in line with the results of this thesis, increase the police reporting tendency within the studied industry and hence help to visualise the thefts even further.

The reporting tendency might also be increased by the introduction of industry-specific police reporting forms, developed through a collaboration involving both representants from the industry and data analytics from BRÅ. In this thesis, some practitioners requested a police reporting form specialised for their industry. Maybe both the police reporting tendency and the quality of the micro-data could benefit from such an introduction.

Furthermore, it is not only important that theft is being reported to the police. The micro-data, the reports constitute of, also need to be of sufficient quality. It would hence be interesting to analyse the micro-data behind the official police statistics and investigate whether this is of a lacking quality or not. If so, it would be of importance to find ways in order to increase this quality and pave the way for future analysis based on higher data quality. Before further actions can be taken in this direction, the police reporting statistics must be comprehensive and better reflect reality. Researchers in the next step will then have the opportunity to demonstrate movement patterns, highlight organised crime or predict theft.

Another way to visualise the thefts could be done by conducting a real-time collection of data together with practitioners within the industry. For example, a user-friendly app could be developed where practitioners easy could document a theft by filling out a form adapted to the specific industry. This app could also conduct a police report for every received notification, contributing to the official statistics. The received information could otherwise be compared to the official statistics gathered under the same time period. This would visualise the gap in the number of theft experiences and the number of reported thefts. Moreover, it would also be of interest to do a replication study covering other

geographical regions and investigate whether the results emphasise the same crime predictors as those found in this thesis.

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Appendix

Appendix A Case study protocol

Below is the case study protocol for the case study conducted in this thesis presented. It contains the following parts: case study overview, data collection plan and questionnaire.

Case Study Overview

Purpose

The purpose of this thesis is to relate the areas of crime theory and supply chain to the transport- and construction industry by exploring factors that influence the occurrence of theft as well as factors that influence the decision making behind the police reporting tendency in the same industry. The thesis is intend to support decision makers such as policymakers, practitioners and scholars in the transport- and construction industry. It is the researchers' hope that this case study strengthens the research and help visualise the holistic problem.

Case Study Questions

The purpose of the case study was to help answering the two research question of the thesis and work as a complement to the quantitative survey.

RQ1: What is required for transport- and construction equipment theft to occur?

> *Sub-RQ1.1: Do the conditions of the practitioners' workplaces influence the occurrence of theft?*
>
> *Sub-RQ1.2: Does the company size of the practitioners´ influence the occurrence of theft?*

Sub-RQ1.3: What characterise the stolen goods?

RQ2: What is required for a transport- and construction equipment theft to be reported to the police in a micro-level context?

Sub-RQ2.1: What influences a practitioner's tendency to report a crime to the police?

Sub-RQ2.2: Does the tendency to report crime depend on the type of theft committed?

Sub-RQ2.3: Does the tendency to report crime depend on the number of theft experiences?

Data Collection Plan

Three case companies have been selected and for each of the companies the following procedure should be followed.

Table A1. Contact information of the participants in case study.

Case Company	Contact Person	Company location
A	CEO	Trelleborg, Skåne
B	CEO	Eslöv, Skåne
C	Business Area Manager	Malmö, Skåne
D	CEO	Hörby, Skåne

Initial interview

- Approximately 1 hour per case company
- Took place on the company location with someone very familiar with the company and the theft history of the company.
- Semi-structured in order for the interviewer to be able to lift the perspective from their unique situation.

Status meeting

- Check in with case company every second week by phone or email.
- In case of a theft, a phone interview will be performed on approximately 10 minutes.

Preparation

In order to make as fruitful case study as possible an understanding of the problem was obtained through a literature review and unstructured interviews.

Interview guide for initial interview

Introduction

- Presentation of the researchers
- Presentation of the purpose of the master thesis
- Explanation of how the data collection will be used

Case company

- Please tell us about your company and your role
    - Business area, number of machines etc.
- Collaboration with member organisation

Occurrence of thefts

- What are your organisation's experience with thefts?
    - What items/machines/equipment are commonly stolen?
    - Sabotage

    - Frequency
- What characterise your workplaces?
    - Physical safety equipment
    - Temporary, urban environment etc.

Reporting

- Do you report thefts to the police?
    - In percent of total number of thefts
- Why do you choose to report/not to report?
- What usually happens after a report is made?
    - Investigation or not
- How is the organisation's trust in the police?

Introduce case study

- Show case study question
- Explain case study procedure
    - Agree upon status meetings every second week

Interview guide in the occurrence of theft

The following interview guide was used during the status meetings every second week in the event of a theft. In a situation where several thefts occurred during the two weeks the guide was used for every theft event separately and consequently was filled out several times.

Event description

- What has happened?
    - Connected to crime codes

    - Specify items stolen and the value if known
- When did the event occur?
- How was the crime discovered and by whom?

Financial impact

- What was the financial impact on your business?
    - Downtime
    - Reparation and spare parts
    - Transport time

After discovery

- What happened after the discovery?
    - Reparations etc.
- Was the crime reported?
    - By whom
    - To whom
- Why were these report action chosen?
    - Insurance claim

Appendix B Test of survey

This appendix contains the test of the survey consisting of test respondents comments and changes made based on these.

Before the test, the survey consisted of 16 items, compared with 11 items in the finished survey. This due to that items 8-12, as seen in the table below, was later combined in new item 8. The item that was tested were;

1. Company name
2. Number of employees
3. Beyond your membership in Maskinentreprenörerna AB, do you hold a membership in any of the following organisations?
4. How many of your workplaces are characterized by the following physical security equipment? (Fenced area, alarm system, video survellience and illuminated area)
5. How many of your workplaces are characterized by the following conditions? (Urban environment, security guards, temporary workplace, neighbourhood watch)
6. Are your workplaces characterised with other circumstances than thoes mentioned above?
7. To which extent do you agree to that the characteristics of the tools, machines and resources that are exposed to theft in your organisation affect the thief's propensity to steal?
8. During 2018, how many times did your company experience diesel theft from a vehicle tank and how many of these were reported to the police?
9. During 2018, how many times did your company experience diesel theft from larger tanks (not connected to vehicles) and how many of these were reported to the police?
10. During 2018, how many times did your company experience theft of trucks or trailers and how many of these were reported to the police?
11. During 2018, how many times did your company experience theft from trucks or trailers and how many of these were reported to the police?

12. During 2018, how many times did your company experience burglary theft from temporary barracks, carriages etc. at the construction site.
13. Are you aware of the financial impact of an average theft from your company, if so please state this number in SEK.
14. Which factors are crucial to you while deciding whether to report a theft to the police or not?
15. Which actions do you think are necessary in order to increase the tendency to report crimes to the police?
16. Do you agree to possibly be contacted for research purposes?

Item	**TR's comment**	**Changes made**
1	-	-
2	-	-
3	-	-
4	-	-
5	TR3 requested a clear definition on what is meant with *Temporary workplace*. While answering the survey, TR3 made a delimitation where projects that lasts for one month or shorter is characterized as a temporare workplace.	It was decided not to define *Temporary workplaces* further since this differs significantly between different organisations and it is thus better to let each respondent make an individual definition. This will make more sence since it is more aspects than a projects scheduled time that affects this micro item.
6	TR3 asked for a clarification of this item and it's relation to the questions stated above.	It was clarified that the purpose of this item is to adress other circumstances which had not yet been stated in the previous questions.
7	-	-
8-12	TR4 commented on the structure of the questions asked in section 2 since the formulation was very similar and could lead to misintepretation. A rephrasement of the question was thus discussed as well as further clarifications for each individual question.	The questions got aggregated by phrasing one leading question which is then followed by five subquestions. This helps distinguish the differences between each type of crime by presenting them in a shorter and more concise way.
8	-	-

9	-	-
10	-	-
11	TS4 commented the similarity of items 10 and 11 and asked to rephrase the questions in order to distinguish their difference.	This item was clarified by mentioning examples of frequently stolen goods from vehicles in line with the police statistics related to this type of crime: 9804.
12	-	-
13	TR3 responded "yes" on this question and in order to avoid a "yes" or "no" answer the question needs to be rephrased. It was also discussed that the respondent should be encouraged to estimate this cost, otherwise there is a risk that the respondent skip this question.	The respondent is now asked to estimate the financial impact in the head question. No "awareness" question was added since an analysis of the responses could better answer this question.
14	-	-
15	-	-
16	-	-

TRX = Test respondent X
- = No comment

Appendix C Questionnaire in Swedish

In this appendix, the survey that was sent out to the responders is presented in Swedish, the native language in Sweden, along with the introductory text of the survey.

Hjälp till att uppmärksamma stölderna!

Bidra till att öka anmälningsbenägenheten och således även allmänhetens, medias och polisens intresse för de brott som Er organisation utsätts för. Er medverkan i denna studie är av yttersta vikt för att en positiv förändring ska ske!

Denna enkätundersökning bygger huvudsakligen på stölderfarenheter under år 2018 och riktar sig till Er som är verksamma i Skåne län. Studien sker på uppdrag av Maskinentreprenörerna AB samt i samarbete med region Södra, Lunds Universitet och University of Iowa med handledning av Henrik Sternberg; transportforskare samt uppfinnare bakom Cabotagestudien.

Kontaktpersoner:
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Lantbrukarnas Riksförbund: Jan Hultgren (jan.hultgren@lrf.se)
Sveriges Åkeriföretag: Peter Svensson (peter.svensson@akeri.se)

1. Företagsnamn

Ditt svar

2. Antal anställda i berörd verksamhet

Ditt svar

3. Utöver medlemskap i Maskinentreprenörerna AB, innehas medlemskap i någon av följande organisationer?
Markera ett eller flera svarsalternativ.

- [ ] Sveriges Åkeriföretag
- [ ] Lantbrukarnas Riksförbund
- [ ] Nej

4. Hur många av Era arbetsplatser kännetecknas av följande fysisk skyddsutrustning?

	0-20%	20-40%	40-60%	60-80%	80-100%
Alarmsystem	○	○	○	○	○
Videoövervakning	○	○	○	○	○
Inhägnat område	○	○	○	○	○
Upplyst område	○	○	○	○	○

5. Hur många av Era arbetsplatser kännetecknas av följande yttre omständigheter?

	0-20%	20-40%	40-60%	60-80%	80-100%
Tillfälliga arbetsplatser	○	○	○	○	○
Stadsmiljö (folk i rörelse)	○	○	○	○	○
Patrullerande väktare	○	○	○	○	○
Grannsamverkan	○	○	○	○	○

6. Kännetecknas Er arbetsplats av andra omständigheter som inte framgått ovan?

Om ja, vänligen lista dem nedan.

Ditt svar

7. I vilken utsträckning instämmer Ni med att följande egenskaper hos de stöldbenägna föremålen i Er organisation påverkar tjuvens benägenhet att stjäla dem?

Observera att frågan betonar den potentiella gärningsmannens tankegång och därmed inte det operativa värdet för Er verksamhet. Med föremål menas t.ex. maskiner, verktyg och diesel.

	Instämmer inte alls	Instämmer delvis	Instämmer i hög grad	Instämmer helt
Värdefull	○	○	○	○
Väl synlig	○	○	○	○
Lätt att förflytta	○	○	○	○
Lättåtkomlig	○	○	○	○
Avyttringsbar	○	○	○	○

Stöld och polisanmälan år 2018

I denna del presenteras fem typer av stölder vilka är av särskild relevans för studien.

8. Vänligen uppskatta hur många gånger Ni utsattes för respektive stöld under år 2018 och hur många av dessa som polisanmäldes.

Stöld av diesel ur fordonstank

Vänligen observera att frågan kräver två svar.

Ditt svar

Stöld av diesel ur större tankar (ej kopplade till fordon)

Vänligen observera att frågan kräver två svar.

Ditt svar

Stöld av helt fordon (entreprenadmaskin, lastbil och/eller släp)

Vänligen observera att frågan kräver två svar.

Ditt svar

Stöld ur fordon (verktyg, gods, elektronik etc.)

Vänligen observera att frågan kräver två svar.

Ditt svar

Inbrottsstöld på byggplats, i bod (tillfällig barack, vagn eller dylikt)

Vänligen observera att frågan kräver två svar.

Ditt svar

9. Uppskatta den finansiella effekten en genomsnittlig stöld har på Er verksamhet.

Vänligen uppskatta den genomsnittliga kostnaden, inklusive alla omkostnader (reparation, stillestånd etc.) förutom de administrativa kostnaderna.

Ditt svar

Drivkrafter bakom polisanmälning

Denna del syftar till att förstå problematiken bakom varför en polisanmälan uteblir i samband med stöld samt hur detta hade kunnat förbättras.

10. Vilka faktorer är huvudsakligen avgörande för att Ni ska polisanmäla ett stöldtillfälle?

Vänligen markera ett eller flera alternativ.

- [ ] Stöldgodsets volym och värde
- [ ] Den eventuella skadans omfattning
- [ ] Nödvändig resursåtgång för att polisanmäla
- [ ] Avstånd från händelse i tid eller rum
- [ ] Upplevd sannolikhet för att polisen ska agera
- [ ] Upplevd möjlighet att få någon form av ersättning (t.ex. återfå stöldgods, straffad gärningsman, utbetalning av försäkringsbolag)
- [ ] Bidragandet till polisens anmälningsstatistik
- [ ] Övrigt: _____

11. Vad tror Ni krävs för att anmälningsbenägenheten till polisen ska öka?

Nämn gärna ett eller flera egna förslag.

Ditt svar

12. Samtycker Ni till att eventuellt bli kontaktad i forskningssyfte?

- ○ Ja
- ○ Nej

Appendix D Regression models

This appendix contains eleven regression models with different independent variables but with the same dependent variable, the number of theft experiences. This, in order to support the findings considering the crime predictors presented in the report.

Variable	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
(Intercept)	0.219	-0.388	-0.851	0.73552	0.654	-1.121	-0.199	-1.32	-2.941	-0.421	-2.20
Alarm System (AS)	-0.457	-0.041	0.643	-0.430		-0.466		-0.425		-0.458	
Video surveillance (VS)	0.429	0.411		0.436		0.465		0.431		0.436	
Fenced area (FA)	0.819 *	0.825*		0.435	0.022	0.763 '.'		1.749 *	3.952 ***	0.997	2.535 ***
Illuminated area (IA)	0.0805	0.064		0.0705		0.074		0.562	0.864	0.0870 '.'	
Temporary workplaces (TW)	0.579 '.'	0.928 '.'	1.682 ***	0.301	0.111	1.262 *	1.986 ***	0.545 '-'		0.567 '.'	
Urban environment (UE)	1.162 **	1.138 **		1.132 **		1.123 **		1.125 **		1.143 **	
Security guards (SG)	-1.153 '.'	-1.197 '.'		-1.013		-1.02103		-0.908		-0.526	1.956
Neighbourhood watch (NW)	-0.486	-0.480		-0.490		0.276	0.194	-0.544		-0.492	
TW x AS		-0.195	-0.353 *								

TW x FA				0.146	0.430 *						
TW x NW						-0.407 '.'	- 0.421 '.'				
FA x IA								- 0.276	-0.665 **		
FA x SG										-0.148	- 0.712 '.'
R2	0.083	0.083	0.044	0.082	0.069	0.088	0.052	0.085	0.0604	0.081	0.048
Number of observations	362	367	426	367	405	367	423	367	405	367	387
F distribution probability	5.145 on 8 and 358 DF	4.665 on 9 and 357 DF	7.466 on 3 and 422 DF	4.624 on 9 and 357 DF	10.91 on 3 and 401 DF	4.911 on 9 and 357 DF	8.725 on 3 and 419 DF	4.757 on 9 and 357 DF	9.66 on 3 and 401 DF	4.572 on 9 and 357 DF	7.424 on 3 and 383 DF

Significant level: *** 0, ** 0.01, *0.05, '.' 0.1

Appendix E Calculated findings on different level of aggregation

This appendix contains the calculations made in order to estimate the theft experienced in 2018 as well as the financial impact of these thefts in the transport- and construction industy.

E.1 Theft experiences in 2018

PERCENTAGE OF TARGET POPULATION		
ME	LRF	SÅ
0,14502762	0,0391	0,07708333

SURVEY RESPONDENTS				
Crime Code	ME (# of thefts)	LRF (# of thefts)	SÅ (# of thefts)	**Survey (# of thefts)**
Code9823	346	121	209	676
Code9824	70	23	27	120
Code9803	7	13	2	22
Code9804	94	48	66	208
Code0822	156	54	45	255
TOTAL AMOUNT OF THEFT				*1281*

SKÅNE				
Crime Code	**ME (# of thefts)**	**LRF (# of thefts)**	**SÅ (# of thefts)**	**Skåne (# of thefts)**
Code9823	2385,752452	3094,629156	2711,351469	8191,733076
Code9824	482,666681	588,2352941	350,2702854	1421,172261
Code9803	48,2666681	332,4808184	25,94594707	406,6934336
Code9804	648,1524002	1227,621483	856,2162532	2731,990137
Code0822	1075,657175	1381,074169	583,783809	3040,515153
TOTAL AMOUNT OF THEFTS				***15792,10406***

SWEDEN				
Share of the theft experiences in 2018 allocated to Skåne (BRÅ, 2019) = 0,15343				
Crime Code	**ME (# of thefts)**	**LRF (# of thefts)**	**SÅ (# of thefts)**	**Sweden (# of thefts)**
Code9823	15549,45221	20169,64841	17671,58619	53390,6868
Code9824	3145,842932	3833,900112	2282,932187	9262,67523
Code9803	314,5842932	2166,98702	169,1060879	2650,677401
Code9804	4224,417651	8001,182842	5580,500901	17806,10139
Code0822	7010,735676	9001,330697	3804,886978	19816,95335
TOTAL AMOUNT OF THEFTS				*102927,0942*

E.2 Financial impact of theft in 2018

SURVEY RESPONDENTS								
Crime Code	**Cost**	**ME (# of thefts)**	**ME (SEK)**	**LRF (# of thefts)**	**LRF (SEK)**	**SÅ (# of thefts)**	**SÅ (SEK)**	**Total Survey (SEK)**
Code9823	11060	346	3826760	121	1338260	209	2311540	7476560
Code9824	60000	70	4200000	23	1380000	27	1620000	7200000
Code9803	805000	7	5635000	13	10465000	2	1610000	17710000
Code9804	33860	94	3182840	48	1625280	66	2234760	7042880
Code0822	43060	156	6717360	54	2325240	45	1937700	10980300
TOTAL AMOUNT IN SEK								***50409740***

SKÅNE				
Crime Code	**ME (SEK)**	**LRF (SEK)**	**SÅ (SEK)**	**Total Skåne (SEK)**
Code9823	26386422,12	34226598,47	29987547,24	90600567,83
Code9824	28960000,86	35294117,65	21016217,13	85270335,63
Code9803	38854667,82	267647058,8	20886487,39	327388214
Code9804	21946440,27	41567263,43	28991482,33	92505186,03
Code0822	46317797,95	59469053,71	25137730,82	130924582,5
TOTAL AMOUNT IN SEK				***726688886***

SWEDEN				
Share of the theft experiences in 2018 allocated to Skåne (BRÅ, 2019) = 0,15343				
Crime Code	**ME (SEK)**	**LRF (SEK)**	**SÅ (SEK)**	**Total Sweden (SEK)**
Code9823	171976941,4	223076311,4	195447743,2	590500996,1
Code9824	188750575,9	230034006,7	136975931,2	555760513,8
Code9803	253240356	1744424551	136130400,8	2133795308
Code9804	143038781,7	270920051	188955760,5	602914593,2
Code0822	301882278,2	387597299,8	163838433,3	853318011,3
TOTAL AMOUNT IN SEK				***4736289422***

Appendix F Work distribution and time plan

This appendix explains the contribution of each of the researchers to this master thesis as well as the time plan that was followed for the length of the project. The researchers' own reflections about the process are also presented. The section is mandatory for master theses written at the Faculty of Engineering at Lund University.

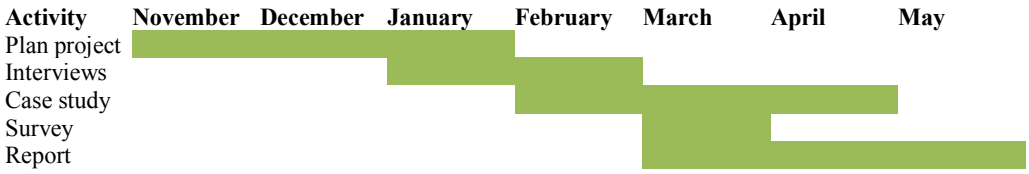
F.1 Work distribution

Bengtsson and Simonsson have both studied Industrial Engineering and Management, with a specalisation in Supply Chain Management and Logistics, at the Faculty of Engineering at Lund University. The researchers similar backgrounds have enabled an equal contribution to the project. The tasks have often been shared and done together. However, due to personal intrests and efficiency of the project Bengtsson have had a greater focus on the analysing aspects of the project while Simonsson have had a greater focus on the methodology. Both researchers have taken an active part in all interviews to increase the usefulness of these. It is the researchers' belif that the workload have been evenly distributed between them.

F.2 Project plan and outcome

The project was planned on a general level focusing on critical activites. Critical activites were considered to be; plan the project; perform interviews,

send out the survey; start the case study; start the report; finish the report and present the report. The project plan was set on an ambitous level but with the time delimitation in consideration. The project plan is presented below.



The researchers' were able to follow the project plan well with the expection of the survey taking longer time than expected. This was due to that complementary information from some respondents needed to be gathered through phone interviews.