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Effectiveness of Measures for Level Crossings

A Study About the Use of Experience Feedback in Packaged Projects at Trafikverket

Master's thesis in Infrastructure and Environmental Engineering

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Abstract

On behalf of the Swedish government, The Swedish Transport Administration (Trafikverket) will increase the safety for 350 level crossings in the Western Region of Sweden during the years 2018 to 2029. This will entail multiple and similar measures which can be packaged into large projects including several measures, i.e. packaged projects. To be able to conduct these projects, Trafikverket has a desire to find efficient ways of working with these measures. Therefore, this Master's thesis aimed to identify how Trafikverket can work with packaged projects in a more efficient and optimised way with a focus on measures for level crossings. Another goal was also to identify how Trafikverket works with experience feedback and how this can be developed to facilitate all types of projects. The geographical scope is mostly the Western Region of Sweden and the efficiency part of the thesis is mainly focused on the project planning process. To achieve these goals, 16 interviews have been conducted with employees from Trafikverket. All the interviewees possess knowledge concerning the project planning process and have been involved in a packaged project. The results from the interviews were analysed through an information and effect analysis. Additionally, a literature review has been conducted to strengthen the findings of the thesis.

The thesis concludes that experiences from similar projects should be exchanged before starting a new project, that the packaging of measures should be done geographically and that especially level crossing projects could benefit from starting with performing some measures in a packaged project as a pilot project. Further, the project planning process needs to be clearer by presenting governing documents, but also be more agile and flexible to promote the development of project management. Regarding packaged projects, some documents should be used for each sub-project and others for the whole package to ease the administrative work. The experience feedback should be made more systematic and become part of Trafikverket's culture to entail that employees set aside time for reflection and experience documentation. A good initiative within this area is the recently started workroom with final reports and cost accounting. Packaged projects provide mostly positive effects in terms of time, resources and money. Conclusively, the findings of this thesis is connected by the three concepts; culture, communication and administration.

Keywords: Packaged project, Level crossing, Experience feedback, Project planning process, Business development, Trafikverket, Semi-structured interview

Effektiviserade plankorsningsåtgärder

En studie om användningen av erfarenhetsåterföring i paketerade projekt på Trafikverket

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Sammanfattning

På uppdrag av den svenska regeringen kommer Trafikverket att öka säkerheten för 350 plankorsningar i Region Väst i Sverige under åren 2018 till 2029. Detta kommer att medföra flera och liknande åtgärder, som sedan kan paketeras i stora projekt innehållande flera åtgärder, dvs. paketerade projekt. För att kunna genomföra dessa projekt har Trafikverket en önskan om att hitta effektiva sätt att arbeta med dessa åtgärder. Därför var syftet med detta examensarbete att identifiera hur Trafikverket kan arbeta med paketerade projekt på ett mer effektivt och optimerat sätt med fokus på åtgärder för plankorsningar. Ett annat mål var också att identifiera hur Trafikverket arbetar med erfarenhetsåterföring och hur detta kan utvecklas för att underlätta för alla typer av projekt. Den geografiska omfattningen är mestadels Region Väst i Sverige och effektivitetsdelen i examensarbetet är främst inriktad på projektplaneringsprocessen. För att uppnå målen har 16 intervjuer genomförts med anställda från Trafikverket. Alla intervjuade besitter kunskap om projektplaneringsprocessen och har varit inblandade i ett paketerat projekt. Resultatet från intervjuerna analyserades genom en informations- och effektanalys. Dessutom har en litteraturstudie genomförts för att styrka resultatet i arbetet.

Examensarbetet drar slutsatsen att erfarenheter från liknande projekt bör utbytas innan ett nytt projekt påbörjas och att paketering av åtgärder bör göras geografiskt. Dessutom dras slutsatsen att plankorsningsprojekt kan ha nytta av att börja med att utföra vissa åtgärder i ett paketerat projekt som ett pilotprojekt. Vidare måste projektplaneringsprocessen bli tydligare genom att klargöra styrande dokument, men också vara mer smidig och flexibel för att främja utvecklingen av projektledning. När det gäller paketerade projekt bör vissa dokument användas för varje delprojekt och andra för hela paketet för att underlätta det administrativa arbetet. Erfarenhetsåterföringen bör göras mer systematisk och bli en del av Trafikverkets kultur för att medföra att anställda avsätter tid för reflektion och dokumentation av erfarenheter. Ett bra initiativ inom detta område är det nyligen startade arbetsrummet med slutrapporter och efterkalkyler. Paketerade projekt ger mestadels positiva effekter när det gäller tid, resurser och pengar. Sammanfattningsvis kan resultaten från detta arbete anknytas till de tre koncepten; kultur, kommunikation och administration.

Nyckelord: Paketerade projekt, Plankorsning, Erfarenhetsåterföring, Projektplaneringsprocess, Företagsutveckling, Trafikverket, Semi-strukturerad intervju

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Abbreviations

APT - Workplace meetings - Arbetsplatsträff .

BEST-work - Works of Tracks, Electrification, Signal and Telecommunication - Arbeten relaterade till Bana, El, Signal och Tele .

GDPR - General Data Protection Regulation- Dataskyddsförordningen.

GÅ-process - The Project Planning Process of Implementing Measures - Projektplaneringsprocessen Genomföra åtgärder .

IVpp - The Section Planning at Business Area Investment - Avdelning Planering på Investering .

LOU - The Public Procurement Act - Lagen om offentlig upphandling.

PBL - The Planning and Building Act - Plan- och bygglagen.

PP - Project Portal- Projektportalen .

TKI-securing - Securing of time, cost and content for a project - Tids-, kostnads- och innehållssäkring för ett projekt.

ÄTA-work - Amending, Supplementary and Outgoing work - Ändrings-, Tilläggs- och Avgående arbete.

Glossary

Actor, a common word for the people involved in a project - *Aktör*, ett gemensamt ord för de personer som är involverade i ett projekt.

Basic safety-device, specifically for level crossings - *Grundskyddsanordning*, specifikt för plankorsningar.

Consultant, temporary hired person from another company who produces project documents - *Konsult*, tillfälligt inhyrd person från ett annat företag som tar fram projektdokument.

Contractor, temporary hired person from another company who implements the project - *Entreprenör*, tillfälligt inhyrd person från ett annat företag som utför projektet.

Design-build contract, project delivery method where the contractor has responsibility for the design phase and the production phase - *Totalentreprenad*, entreprenadform där entreprenören har ansvar för projekteringen och produktionen.

Design phase, designing work about the implementation of a project - *Projekteringsfasen*, projekterande arbete om utförandet av ett projekt.

Experience feedback, learning lessons and exchanging experiences during and after a project - *Erfarenhetsåterföring*, ta lärdomar från och utbyta erfarenheter under och efter ett projekt.

Final report, informative report concluding the project - *Slutrapport*, informativ rapport som sammanfattar projektet.

Flyover, crossing with railway and road on two separate levels - *Planskild korsning*, korsning i olika plan mellan järnväg och väg.

Level crossing, crossing with railway and road on the same level - *Plankorsning*, korsning i samma plan mellan järnväg och väg.

Measure, effort or action that is implemented in a project - *Åtgärd*, insats eller aktion som utträttas i ett projekt.

Ordering business area, the business area internally responsible for ordering the project - *Beställande verksamhetsområde*, verksamhetsområdet som är internt ansvariga för beställningen av ett projekt.

Packaged project, multiple sub-projects with similar measures packaged into one larger project - *Paketerat projekt*, delprojekt med liknande åtgärder ihopslagna till ett större projekt.

Performance contract, project delivery method where the contractor produces what has been ordered - *Utförandeentreprenad*, entreprenadform där entreprenören utför det som beställts.

Performing business area, the business area internally responsible for performing/ implementing the project - *Utförande verksamhetsområde*, verksamhetsområdet som är internt ansvariga för utförandet/ implementerandet av ett projekt.

Planning phase, preparing work about the planning and content of a project - *Planeringsfasen*, förberedande arbete om planeringen och innehållet av ett projekt.

Procurement, process for contracting consultants and contractors - *Upphandling*, process för att kontraktera konsulter och entreprenörer.

Production phase, implementing work of a projekt - *Produktionsfasen*, utförande arbete av ett projekt.

Program, packaged projects with a common steering - *Program*, paketerade åtgärder med gemensam styrning.

Project delivery method, the way projects are designed and performed considering responsibility - *Entreprenadform*, sättet ett projekt projekteras och utförs på enligt ansvar.

Project unit, part of business area Investment who are implementing projects - *Projektenhet*, del av verksamhetsområde Investering som utför projekt.

Safety-device, passive or active arrangements of controlling the safety in a level crossing - *Skyddsanordningar*, passiva eller aktiva anordningar som kontrollerar skyddet i en plankorsning .

Stakeholder, people affected in some way of the implementation of a project - *Intressent*, de personer som blir påverkade på något vis av att ett projekt utförs.

Sub-project, one smaller project in the larger packaged project - *Delprojekt*, ett mindre projekt i det större paketerade projekt.

Supplementary safety-device, specifically for level crossings - *Tilläggskydd*, specifikt för plankorsningar.

Tender documents, documents from the consultant or contractor as a response to the procurement - *Anbudsdokument*, dokument från konsult eller entreprenör som ett svar på upphandling.

"Times in track", the in beforehand applied for times where the railway line is temporary shutdown for implementing railway measures - *Tider i spår*, de i förväg sökta tiderna för helavstängt spår för att utföra järnvägsåtgärder.

Tollgate decision, the project sponsor must approve this decision before the project can continue - *Tullbeslut*, projektchefen måste godkänna beslutet innan projektet kan fortsätta.

1

Introduction

An intersection between a road and a railway on the same level is called a level crossing (Trafikverket, 2019b). In Sweden, there are around 6500 level crossings and 3000 of these are equipped with some kind of crossing gates, light and/or sound signals. The other 3500 level crossings are uncontrolled with, or without, a crossing sign. Every year between 12 and 22 people are killed in accidents related to level crossings, 60% of these are suicide (Trafikverket, 2019b). These accidents occur due to lack of safety, limited visibility and vehicle problems. Measures for level crossings reduces the amount of accidents, but the costs are high and the need exceeds the resources available.

The Swedish Transport Administration (Trafikverket) will increase the safety for level crossings on behalf of the Swedish government by investing three billion SEK from 2018 to 2029 (Trafikverket, 2020e) in projects regarding level crossings. The investment is made in areas of technical development, research, communication, guidelines and will particularly focus on physical measures to increase the control of existing level crossings (Trafikverket, 2019a). During 2019, Trafikverket started a systematic investigation to map level crossings with a high risk of accidents (Trafikverket, 2019e). This resulted in a list of approximately 1000 level crossings that will be examined further and 350 of these are located in the Western Region. When these investigations are completed, the measures are added to Trafikverket's economic plan to be implemented. Around 100 level crossings are estimated to be executed annually until 2025.

Trafikverket, which is a governmental authority in Sweden, are responsible for the infrastructural planning and construction, operation and maintenance of public roads and railways (Trafikverket, 2019f). Trafikverket has about 9000 employees and was formed in 2010 through the merge of Banverket and Vägverket. Geographically, Trafikverket is divided into six regions; Northern, Central, Western, Eastern, Stockholm and Southern.

Overall, the development of the Swedish transport system is guided by the transport policy goals which is also what Trafikverket works with according to Rådbo (2019). These goals help guide the way of working for the authority. On this basis, Trafikverket has some specific goals regarding works with level crossings. The aim is to make level crossings safe, enable road users to cross the railway safely, reduce the number of killed and injured people connected to level crossings and ensure that the implemented technology is operationally reliable. These goals are divided into two different objectives regarding function and consideration. The function objective aims to implement several safe possibilities to cross the railways, this also includes

functionality for disabled people. It even strives to have as short waiting time as possible for both road and railway traffic. The consideration objective aims to reach Vision Zero meaning that no deaths or injuries should occur in the traffic. Further, the consideration objective also includes environmental and human health aspects.

To maximise the efficiency of these upcoming measures for level crossings, and thus the effect, there is a desire to study how these can be done more efficiently. This involves making use of already existing knowledge inside the authority on how projects with multiple and similar measures should, or should not, be done. These types of projects are referred to as packaged projects, meaning that there are multiple smaller projects packaged into one larger project (Löfgren, 2018). Helpful experiences regarding these packaged projects can be collected from previous packaged projects. Trafikverket has for example other, both ongoing and finished, packaged projects regarding bus stops, pedestrian and cycle paths and train stations to name a few.

Increasing the safety of these level crossings is in line with Trafikverket's Vision Zero which aims to eliminate deaths and injuries occurring in the traffic (Rådbo, 2019). A part of the preventive work comprises reducing the number of level crossings and thus accidents caused in relation to level crossings. Collecting experiences from other projects can consequently contribute to more efficiently planned and completed projects. Thus, the effectiveness of these measures can have positive effects in terms of time, resources and money. With measures of this quantity, it is of high interest to streamline these projects and make use of the resources available. The issue regarding experience feedback is usually that the experience already exists inside the organisation, but may not be used in the best way possible (Milton, 2010). Investigating this can help Trafikverket make use of their existing experience in the most effective way and at the same time develop the use of feedback experience inside the authority.

1.1 Aim

The aim of this Master's thesis is to identify how Trafikverket can work with packaged projects in a more efficient and optimised way, especially with focus on measures for level crossings. Now every level crossing that needs reconstruction is a separate project which is neither time, resource nor economically efficient. Therefore, this thesis will look into a way of making these projects more efficient by examining the project planning process and identifying where optimisations can be made. This will be done by examining other packaged projects with measures done similarly. Another goal of this Master's thesis is to identify how Trafikverket works with experience feedback and how this can be developed to facilitate for packaged projects and other projects.

Geographically, the thesis will focus on level crossings in the Western Region of Sweden, but it will also have a national connection. The focus will be on level crossings as a case study. The expectation is to use the findings to give general recommendations that can be used in other similar projects at Trafikverket in multiple regional areas. Therefore, the findings and recommendations of this report will

be both specific for projects about level crossings and also general for projects on Trafikverket.

1.2 Objectives

The following objectives are the research questions to be answered with this thesis:

1. What previous experiences from packaged projects should be used in level crossing projects?
2. What changes should be done in the project planning process to optimise measures for packaged projects?
3. How should the experience feedback be done efficiently within Trafikverket?
4. What effect will the effectiveness of measures bring in terms of time, resource and money?

1.3 Scope

This thesis is limited to the previously mentioned objectives. It is also limited to studying projects at Trafikverket and the geographic scope is mainly the Western Region of Sweden. The level crossings involved are those where roads and railways cross and does therefore not involve other modes, such as public transport via tram. The main focus is on the project planning phase of the measures, not necessarily the production phase. The results found may be used for other areas. The effect analysis is limited to look into time, resource and money.

1.4 Structure of the Report

- **Chapter 1 - Introduction:** An introduction to the thesis is presented and followed by the aim, objectives and scope of the thesis.
- **Chapter 2 - Background:** Presents information about the history and definition of level crossings, the project planning process, business development and experience feedback.
- **Chapter 3 - Methodology:** Describes the methodologies used for this thesis. This includes research approach and design, case study, data collection, analysis, validity and reliability and lastly research ethics.
- **Chapter 4 - Results:** Highlights the results collected from the data collection and obtained from the information and effect analysis.
- **Chapter 5 - Discussion:** Compares and discusses the findings from the primary results with the secondary results. Also presents suggestions of how further research could be conducted to develop the findings in this thesis.
- **Chapter 6 - Conclusion:** Summarises conclusions of the thesis and answers the stated objectives.

2

Background

The information presented in this chapter gives a theoretical framework to this Master's thesis through a literature review. An introduction to the different subjects handled in this thesis is theoretically explained to provide essential background information. The subjects presented are the history and definition of level crossings, the project planning process, business development and experience feedback.

2.1 The History and Definition of Level Crossings

Sweden's first railway was opened for traffic in the year 1856 and ran between Örebro and Nora (Trafikverket, 2019d). Today, the Swedish railway system consists of 15 600 kilometre railway and Trafikverket is the governmental authority responsible for 14 200 of these kilometres railway. About 80% of the railway system is electrified. Throughout time, railway crossings have been built in multiple ways to enable traffic to cross the railway safely and to not separate the landscape. These railway crossings can either be built as flyovers (road and railway on separate levels) or as level crossings (road and railway on the same level), where the first type is much safer than the second. As mentioned earlier, there are around 6500 level crossings in Sweden (Trafikverket, 2019b). Of these, 3000 are considered to be controlled with some kind of safety-device while 3500 are uncontrolled. According to Rådbo (2019), a level crossing always has basic safety-devices that can be completed with supplementary safety-devices according to specific guidelines. This basic safety-device is some kind of crossing gates, light signals, sound signals and crossing signs. The supplementary safety-device is, for example, a stop sign or a guard.

Nowadays, when major maintenance works are carried out, existing level crossings are removed if possible (Rådbo, 2019). This can be done through building a diversion road to another level crossing, reducing the traffic or building a separated railway crossing. However, it is of the greatest importance that the new measures do not create new risks larger than the existing risks with the removed level crossing. Sometimes, removed level crossings can cause issues for pedestrians and thus unwanted trespassing if the pedestrian considers the detour to be too long. One alternative can thus be to keep the level crossing but only for pedestrians. The remaining level crossings, that can't be removed in any way, gets increased control in terms of crossing gates, light signals and sound signals. New railways are built without level crossings and instead built with separated railway crossings, such as flyovers.

2.2 Project Planning Process

Projects, as a way of working, are common in all types of businesses with a strong focus on the results of the project (Tonnquist, 2018). The methodology of projects is based on models and tools described in a project model or project process. Through projects, the business also can steer their work towards the business goals and to realise the functional strategies. Another typical thing for a project is that it has a temporary project organisation that exists only during the process of the project. Usually, the project organisation is lead by a project manager working on direct orders from the project sponsor. Other roles in the project organisation can be project engineers, project designers, constructors, communicators and quality controllers to name a few.

Often a project is described as a process with a start and an end (Tonnquist, 2018). The purpose is to make sure that the management of each project is steered to achieve the desired results. Working this way enables the development of common working methods and favours communication within the project organisation. The life cycle of a project starts with an idea that the business wants to realise. A pilot study is then started to eliminate insecurities and analyse the prerequisites for implementing the project. The content of the project is defined together with the choice of solution and an economic plan. When the pilot study is finished and the base of the project is decided, the project enters the planning phase where the project is planned in more detail. A plan for how the project will reach its goals is presented together with an activity plan of e.g. resources, time and costs. Thereafter, the project enters the implementation or production phase where the result is produced. During the production, the project is continuously monitored and compared with the activity plan while deviations are analysed and handled. Finally, the project is finished after an evaluation of the project and the effect it will have. Also, experiences from the project are utilized and then the project is usually concluded with a final meeting.

The project planning process used at business area Investment at Trafikverket is called the GÅ-process (Trafikverket, 2020d). GÅ stands for "*Genomföra åtgärder*" and means "*Implementing measures*". This process describes the implementation of measures on the public roads and railways Trafikverket is responsible for. The purpose of the process is to deliver new and/or improved infrastructure that is accessible and reliable with the correct functionality and quality. The GÅ-process is built in the same way as the more general project process presented above where projects are planned, implemented and finished. Important to mention about the process at Trafikverket is that the projects are often ordered and performed by different business areas. The ordering business area, usually Market and Planning or Maintenance, is responsible for creating a document describing the measures which are then ordered. The performing business area, usually Investment, is then responsible for securing that the document describing the measures maintains a good quality and that the time plan and cost estimations are reasonable to go through with. This part of the process is called TKI-securing (securing of a project's time, cost and content). When the ordering business area and the performing business

area agree, the TKI-securing is approved and the detailed planning of the project can start.

During the planning, implementation and finishing phase, there are milestones with activities that need to be completed before each tollgate decision is passed (Trafikverket, 2020d). For each milestone, there is a plan for the activities required to ensure that every important and critical activity is carried out before each tollgate decision. Each tollgate decision is made by the project sponsor and thus allows the project to continue. For example, the second tollgate decision comprises approved project planning and enables the project organisation to continue with the implementation of the project. The last tollgate decision confirm that the project is finished and closed. This means that the project has had a final meeting, reported the project in all systems, produced a final report containing experiences and information about the project and lastly produced a cost accounting. The project has also archived or passed on relevant project documentation to enable future maintenance. Thereafter, the project is also delivered administratively to the relevant managers who are then responsible for the maintenance of the project's result.

2.3 Business Development

To understand why it is advantageous to put time into improving the routines and processes of a business, it is of utmost importance to comprehend the term business development and what it means. Due to the rapidly changing modern business, it is essential for all companies in all areas to make use of business development (Kohne, 2019). Nowadays, the digitalisation and globalisation change the market in a way the world has never seen before. With this changed market comes changing customer requirements and price structures. To enable the business to keep up with this transformation, there is a need to improve and develop internal processes and ways of working. Therefore, business development focuses on permanent change and to align the business in a customer-oriented and forward-looking way. This is done in different ways depending on the type of business. It could be through product innovations or through adapting business models. Depending on how the market is changing, short-term actions can help in some cases while other times, strategic long-term changes are needed to keep the business going. Since the development of the market never ends, it is also important to permanently integrate business development into the daily work to ensure that the business is successful.

Business development is highly valued at Trafikverket. The division of Strategic Development works with supporting the executive team at Trafikverket with the long-term and strategic management of the authority (Trafikverket, 2019c). This division follows changes and trends regarding societal development and customer demand, both nationally and internationally. Furthermore, this knowledge is converted into proposals for the orientation of the authority and goals for the development of the transport system as a part of the social structure. An important task for this division is to lead the overarching business development and to coordinate with the operative divisions of the authority. The division of Strategic Development delivers

situational analyses, plans for strategic challenges and plans for research and innovation to enable business development. The operative divisions are then performing these different types of development projects that have been pointed out to be of importance.

2.4 Experience Feedback

Learning from experiences is a basic human activity, but when it comes to learning in business, it suddenly is more difficult (Milton, 2010). The process of experience feedback, which also is called lessons learned, is a part of the life cycle of a project. During a project, lessons are continuously learned and the project organisation discovers opportunities for improvement. If these experiences are documented, it can help the responsible business discover both strength and weaknesses with both the project, but also the process itself (White and Cohan, 2018). Learning from previous experiences helps to avoid doing the same mistake multiple times and can make the project process more effective. When learning a lesson, there are three main steps - identification, action and institutionalisation (Milton, 2010). Firstly, the lesson is identified to be reviewed and analysed. This is done to determine the cause of the lesson and what should be done to avoid it if it is something negative or to repeat it if it is something positive. Secondly, an action is assigned to the lesson. This may imply a new or better way of doing something. Thirdly, the action followed by the lesson learned needs to be implemented. This change must then be communicated to the rest of the organisation to make sure employees learn from this lesson. Doing these steps effectively can transform trial and error into trail and success.

According to White & Cohan (2018), there are three approaches to learning lessons in projects based on a similar lesson identification as described above. The first approach is an integrated lessons learned process where experiences are reported early, regularly and consistently during the project. Thus, capturing and analysing lessons learned is embedded in the project management plan and usually carried out by the project manager. Further, these lessons are distributed to a coordinator who spreads them further through either a website, newsletter or workshops. This is suitable for a small business. The second approach is more detailed and complex which is a thorough review of the project post-facto. This is usually done for large and long-term projects. A specific team is usually responsible for this process and goes into more details of the lessons learned through either interviews or workshops with people involved. In summary, this method brings experiences from multiple partners but is at the same time more resource-intensive. The identified lessons learned are then analysed, verified, stored and disseminated like in the first approach but on a larger scale. The third approach is a combination of the integrated and post-facto method of capturing lessons learned. It is preferred to start with the integrated method to enable capturing lessons during the whole project, but to finish with the post-facto method to include several stakeholder's opinions and to store the experiences efficiently for the organisation.

However, implementing structured experience feedback can be difficult and espe-

cially for larger organisations or companies according to Milton (2010). The value of learning lessons from previous projects needs to be prioritised to reach their potential. The process of experience feedback needs to be considered in every step of the project and learning from previous lessons should be natural. Additionally, it is of utmost importance that employees value the use of experience feedback which helps to develop the organisation. Most organisations learn over time, but focusing on using already existing knowledge and spreading experiences can accelerate the learning process. This creates value for the business and has a positive effect on time and money spent on projects. Involving every employee in the process of experience feedback is a way of including personal opinions in the business development.

2.4.1 Experience Feedback Systems at Trafikverket

There are multiple ways to perform experience feedback at Trafikverket. As previously mentioned, one of the last steps in the GÅ-process is to produce a final report for the project (Trafikverket, 2020d). One chapter in the template for the final report is called "*Experiences and Observations*", where the project should sum up both negative and positive experiences that has been observed during the project and what observations that have been made. The project should describe the encountered challenges and problems together with how these issues have been solved. This is also a place where advice can be given to colleagues for similar future projects. Also, the project is encouraged to evaluate steering of the project from the ordering business area, the project management and the project implementation. Additionally, there is a chapter called "*Suggestions for Improvements*", where the project should list their suggestions for improvements that have been developed during the project. If it is suitable, descriptions of suggested measures to develop processes, working models, methods and tools could be attached. These final reports are then uploaded to the project's page in the project portal (PP) together with the final cost accounting. Further, a recently updated routine is that every project's final report and cost accounting should also be sent to the calculator coordinator, which is the person responsible for following up the calculation work of projects, who then uploads the documents to a common internal workroom. This workroom aims to meet the identified need of gathering existing knowledge and to make it accessible for everyone at Trafikverket.

For some projects at Trafikverket, usually large and unique projects, an in-depth experience feedback is done according to a specific routine (Dymmel, 2018). This approach is based on four steps. The first step is the selection of which function areas within the project that should be further analysed. These function areas are usually where successes and adversities have appeared during the project which can be of interest to others. The second step is gathering information about the selected functional areas. This can be done through anonymous interviews with key members from the project organisation, e.g. project manager, contractors or stakeholders. Afterwards, the interviews are compiled and converted into recommendations. The third step is to have experience feedback days where a target group has been invited to. During these days there are workshops within different functional areas where the experiences from the project are discussed. These discussions aim to agree

on specific recommendations which are then summarised during an end discussion. The fourth and final step is writing a report summarising the experiences from the in-depth experience feedback. This report should highlight the most important experiences and recommendations from the discussion about the project.

There is also a routine document at Trafikverket describing how systematic feedback exchange from implemented measures should be done (Kalander, 2016). The document presents in what way, in what system, and who is responsible for the types of feedback exchange. For example, improvement proposals should continuously be reported into the system C2 which is a digitised support system where proposals, problems and deviations can be reported. The aim of the C2 system is to more effectively manage improvements inside the authority. Additionally, the final documentation containing improvement proposals should be produced by the project organisation and then delivered to the receiving responsible manager of the produced result. For the improvement proposals, the responsibility of updating governing documents and routines is up to the respective document manager.

In addition to the C2 system which mainly handles administrative proposals, there is a digital forum called DigiTräff. This forum was implemented in 2018 to enable employees to share experiences and discuss with each other across the internal business borders (Trafikverket, 2018). The forum has a structure with categories where anyone can start a discussion or continue an already existing discussion. In this forum, the floor is open for everyone, provided they have a professional manner and respect for their colleagues. It is, therefore, a good opportunity to continue discussions but in digital form.

3

Methodology

This chapter presents the methodology used in this Master's thesis. Firstly, a section about the research approach and design of this thesis is described, followed by sections about the case study, the data collection, the analysis, the validity and reliability of the thesis, sustainable development and lastly, research ethics.

3.1 Research Approach and Design

When conducting a research study, there are five different main process steps to perform (Bryman and Bell, 2015). These steps include presenting a comprehensible aim and objectives of the study, finding willing participants, collecting and interpreting data, writing a report with all previous steps, and lastly disseminating the results of the study. The research approach and design need to be clear to accomplish these process steps.

The aim of this thesis is to identify how Trafikverket can make their way of working with packaged projects more effective, which makes this thesis an action research. The purpose of an action research is to find, through both theoretical and practical knowledge, measures to change, develop and improve e.g. a company, an organisation or a society (Rönnerman, 2019). Also, the participants in an action research should benefit from the research themselves. To achieve the desired result of this action research, the thesis is based on a case study. This research design is applied when the researcher has the most interest in a specific case (Bryman and Bell, 2015). The next packaged project that will be conducted by Trafikverket is measures for level crossings, which was therefore seen as a suitable case study for this thesis and is further described in Section 3.2 Case Study.

With a clear aim and a determined research design, it was time to choose a research approach. Two frequently used research methods are quantitative and qualitative research (Bryman and Bell, 2015). Quantitative research is considered to be an appropriate approach for data and results which can be quantified. Such data can, for example, be found through surveys with answer options, where the dominating answer often can be stated as the result. Qualitative research, such as interviews, values getting as much information as possible to provide more general and broader answers than quantitative research. Thus, qualitative research promotes people to spread their thoughts and knowledge while quantitative research often wants a more objective point of view. For this thesis, when a company process would be improved, the qualitative research method with interviews was most suitable and is further described in Section 3.3.1 Primary Data Collection. According to Bryman

and Bell (2015), it is common to include interviews in a case study to get personal opinions and knowledge from involved people.

Due to the choice of doing qualitative research, information on how to achieve quality in such research is needed. Brinkmann and Tanggard (2020) have defined seven different statements to consider in order to achieve quality in qualitative research. These statements are; define the perspective of the research, anchor the participants, give examples, perform controls of the trustworthiness, achieve coherence, differentiate between general and specific purposes/phenomena and lastly strive to achieve understanding from the reader. The meaning of defining the perspective is to clearly present the aim, method choices and the researchers' expectations of the study. It should also be presented how and why the participants were chosen and how the interviews were done. To ensure that the reader understands the study, it is advantageous to provide examples that link data to reality. Further, trustworthiness controls should be conducted to ensure that data from interviews have been handled correctly. This can be done by analysis methods, a new discussion with the interviewees or comparisons with external and qualitative data. It is also important to achieve coherence in the study, which means that there should be a link between all choices and methods throughout the study. All purposes/phenomena should be described in a clear and fair extent with existing limitations presented. Finally, the report should be written in an understandable way.

These statements are followed as much as possible throughout the thesis. After the interviews were conducted, they were transcribed and analysed, which is further described in Section 3.4 Analysis.

3.2 Case Study

Trafikverket is a continuously developing governmental authority striving to make use of the assigned Swedish tax money in the best way possible. They have several ongoing packaged projects with project organisations that have a lot of experience and knowledge. These packaged projects cover several areas such as bus stops, train stations and pedestrian- and cycle paths, but are also spread out geographically throughout Sweden. Most of these packaged projects have their own project organisation and are thus not connected. This leads to a process lacking efficient experience feedback which, if done the right way, could lead to increased efficiency in terms of money, resources and time.

It was suitable to choose a case study for this thesis which would be one of the upcoming packaged projects at Trafikverket. The choice fell on projects regarding measures for level crossings because these level crossings are packaged project which will be accomplished in the near future at Trafikverket. Since these level crossing projects have just started, information was gathered from other, both previously made and ongoing, packaged projects mentioned earlier in this section. The findings were then applied to the case study for a more in-depth analysis to be able to thereafter present how the process of packaged projects at Trafikverket should be improved.

3.3 Data Collection

Collection of data is an essential part of the process when conducting research (Bryman and Bell, 2015). There are many different methods for collecting data e.g. surveys, interviews, observations, tests and report reading. In this Master's thesis, the collection of data is divided into primary and secondary data collection to gather information from multiple sources.

3.3.1 Primary Data Collection

The primary data collection consists of data that is collected by a researcher from first-hand sources and thus called primary data (Hox and Boeije, 2015). Collection of primary data can be fit to suit the specific research problem to better answer the objectives. When this data is collected, it creates new data added to the common social knowledge and later, when this material is published and available for other researches, it evolves to secondary data.

In this Master's thesis, qualitative primary data has been collected through the interviews described in the following section.

3.3.1.1 Interviews

To be able to answer the objectives of this Master's thesis, several interviews have been conducted. According to Brinkmann and Tanggard (2020), interviews are appropriate when it comes to gathering information based on personal experience. This enables the interviewer to personally connect with the interviewee and get a better understanding of their real-life experiences. Interviews also allow the interviewer to gather data that is difficult to obtain through written responses or other written records (Phillips and Stawarski, 2008). Since the aim of this thesis was to collect personal experiences based on previous packaged projects, the choice of interviews as primary data collection seemed suitable.

The chosen interview method was a semi-structured interview, which is a qualitative research method. These interviews are usually conducted based on a guide with topics (Bryman and Bell, 2015). The task of the interviewer is to discuss all topics from the guide with the interviewed person, but not in a specific order. The questions raised during the interviews may vary due to the flexible approach where the interviewer can ask any supplementary question that is relevant. Therefore, every semi-structured interview can give significant results on different questions. The topics discussed during the interviews are presented below, while questions formed during the interviews based on the topics are presented in Appendix A. The topics were:

- Positive and negative experiences from packaged projects.
- The working process used in packaged projects.
- The project planning process at Trafikverket Investment.
- Experience feedback at Trafikverket.

Further, all interviews were conducted during the spring term 2020 and the interviewees work at Trafikverket or as consultants for Trafikverket at business area Investment in the Western Region of Sweden. The interviews were divided into two different groups which were conducted during different time periods of the work. The first group included people who work or have worked with packaged projects at business area Investment, while people in the second group work or have worked with level crossings or at the section Planning at business area Investment. All interviewees in the first group were selected by the method *"selection by purpose"*. This selection method is used when the researcher chooses people based on their experience and knowledge of subjects treated in the research (Denscombe, 2014). The selection method *"snowball selection"* was used to choose people to the second group. Already interviewed people from the first group helped to recommend suitable people to interview for the research. This process creates a snowball effect and makes it easy for the researcher to find new people to interview. Table 3.1 presents the interviewees' working title, the number of years they have worked at or for Trafikverket and which packaged project they have been involved in.

Table 3.1: Working years and working title of all interviewees and which packaged project they have been involved in.

Interviewees		
Working Years	Working Title	Packaged Project
1.5	Project Manager	Train Stations
1	Project Manager	Bus Stops
2.5	Project Manager and Program Manager	Walk & Bicycle Paths
3.5	Project Engineer	Bus Stops
1.5	Project Engineer	Train Stations
8	Project Manager and Program Manager	Bus Stops
8	Consultant as Project Manager	Bus Stops
1	Consultant as Project Manager	Bus Stops
9	Consultant as Project Manager	Train Stations
10	Consultant as Assistant Project Manager	Train Stations
3	Project Manager	Bus Stops
13	National Planner and Program Coordinator	-
8	Planner at Investment	-
4.5	Project Manager	Walk & Bicycle Paths and Train Stations
14	Head of Project Unit	Walk & Bicycle Paths
14	Project Manager	-

When no new or relevant information is added after a number of interviews, the theoretical saturation is reached (Bryman and Bell, 2015). The theoretical saturation of this thesis was reached when 16 people had been interviewed. The first five interviews were conducted face-to-face but due to the situation with the Coronavirus, the rest of the interviews were conducted via Skype. With the technology

of today, when it is possible to communicate with people all over the whole world, an interview by telephone or email can be as trustworthy as an interview face-to-face (Brinkmann and Tanggaard, 2020). However, one observation was that the researcher could not see facial expressions and gestures from the interviewee when the interviews were conducted via Skype, which could have been significant but not necessary to conduct this thesis. Further, all interviewees were contacted with the same information about the research via email before the interview. The researchers of this thesis have also ensured that one researcher would lead all the interviews and that the other researcher would take notes, write and transcribe all interviews so all interviews were conducted as equally as possible. Transcription means compiling and interpreting interviews to be able to present and analyse the results (Brinkmann and Tanggaard, 2020). When the transcription was complete, it was time to analyse the results of the interviews which is described in Section 3.4 Analysis.

3.3.2 Secondary Data Collection

The secondary data collection consists of data from secondary sources (Phillips and Stawarski, 2008). In contrast to primary data, this means that secondary data is collected through studies made by other people and for other research projects. Finding suitable qualitative secondary data can although be problematic since the aim of the research differs. It is therefore important to first locate the data, secondly retrieve relevant data and thirdly to evaluate the quality of the data and how it suits the research.

In this Master's thesis, the secondary data was collected through reading reports and other documents which concerns the objectives of this thesis. Both internal documents from Trafikverket and external from other organisations and businesses have been read and used. However, one limitation has been that many libraries were closed, e.g. Chalmers library, during most of the work period for this thesis, due to Coronavirus. This resulted in that nearly all secondary data and even theory for background and method were found online at the internet.

3.4 Analysis

To analyse something means to break it down into smaller parts (Brinkmann and Tanggaard, 2020), and the evaluation of qualitative data is a systematic assessment of the outcome. This outcome is the purpose of the analysis, which will later play a role in practical situations. When performing qualitative content analysis, the interpretation perspective is important in relation to what the desired outcome is (Esaiasson et al., 2017). For this thesis, the information analysis was performed on the collected data from the interviews. To get another dimension to the qualitative data, an effect analysis was performed where the most mentioned events or suggestions are further analysed.

3.4.1 Information Analysis

After the interviews had been conducted, the analysis of the gathered information was initiated. Actually, the analysis of the interviews has already begun while the interviews are performed since the interviewer starts to form a perception of the studied situation based on the answered questions (Brinkmann and Tanggaard, 2020). The first step of the qualitative content analysis according to Esaiasson et al. (2017) is to summarise the collected material. "*Concentration*" is a method used in qualitative analysis which means shortening long expressions. The main purpose of the expression should not be lost but this technique enables to reform long expressions to a few sentences or even a few words. Another way of structuring the material is to use the method "*categorising*" which is similar to quantitative content analysis. The categorising can either be done by dividing the information into categories or by marking if the expression agrees or disagrees to the main question. This first step of the qualitative content analysis can be seen as a basis for discovering patterns. The following second step of the qualitative content analysis is to make the material more general. This is where the material goes from individual opinions to expressions in a plural form representing several of the interviewees. Further, the material can be mapped and structured to visualise the qualitative data depending on what it consists of. When the material is more general and concentrated, patterns are visible and thus the discussion about what these patterns mean can start.

In this thesis, the collected material consisted of 16 transcribed interviews. Since the interviews were semi-structured, the material was sorted to remove irrelevant data and to connect the answers to the most suitable question. The answers from the interviews were merged for the respective question since it is not relevant who said what for this thesis. Doing this also ensured anonymity for the interviewees. The concentrating method was used to shorten expressions and bring out the main purpose. Additionally, the categorising method was used and for most questions, the answers were sorted into four categories; administratively, resources, project planning process and economy. These were the subjects that were most commonly referred to and also connects to the objectives. For some questions, the answers were categorised into positive and negative aspects instead. To make the material more general, a number was added at the end of the sentence if the same thing was mentioned several times. Thus, the data was both generalised and quantified. Before the discussion phase started, the opinions that were often mentioned or said to be of high value was highlighted to distinguish patterns. This selected data then became the primary results from the interviews which was later also discussed to analyse what it means for the authority.

3.4.2 Effect Analysis

To further add another dimension and analyse the consequences of events in projects, an effect analysis was performed. In this thesis, the Business Impact Analysis (BIA) was used to understand what effect the way of working with packaged projects has on time, resources and money. Where time is the total time of the project, resources

is human resources and manpower, and money is the total cost of the project. The main aim of the Business Impact Analysis is to understand and determine the impact events can have on the business (Snedaker and Rima, 2014). Further, the results are used to develop systematic methods to reduce risks and the impact of events. This method is used to identify weak spots in a business and to develop preparedness to when needed.

In this thesis, BIA was used to further analyse what effect some events have in projects. The analysed events were the most mentioned and seemingly most important opinions observed during the interviews. This resulted in a total of 18 events with impact on time, resource and money. Since this thesis investigates several types of effects, the pointed out events were divided into positive and negative effect analyses. Further, the events were individually connected to the type of effect, whether it was an effect on time, resource or money. To visualise the results, a type of mapping method was used which was previously mentioned in Section 3.4.1 Information Analysis. The events were visualised with shapes and the type of effect was visualised with colors.

3.5 Validity and Reliability

To assess if research is trustworthy, it is important to inspect the two criteria; validity and reliability (Bryman and Bell, 2015). Validity deals with the concept of whether conclusions from the research can be connected to each other or not. The concept of reliability concerns the question if the results of the research had been the same if it were conducted twice. A control should be done to see if the events during the research are fixed or random and temporary occurrences.

There are divided opinions if validity and reliability are good criteria when conducting qualitative research as the results are not often quantified. Hence, Lincoln and Guba (1994) has stated other alternatives for these criteria; trustworthiness and authenticity. Authenticity concerns the fact whether the research gives a fair and appropriate view of the selected interviewed persons opinions. Also, whether the participants are affected by their participation in the research in a positive way. While trustworthiness is divided into four different criteria; credibility, transferability, dependability and confirmability.

To ensure that the thesis will reach a high degree of authenticity, data was collected from multiple sources to ensure that the result would be justified and correct. Credibility was created by interviewing several persons with different professions. This created a multi-dimensional view of the subject and was conducted throughout the qualitative research. To ensure that a high level of transferability was reached in the thesis, the procedure of the research has been described as clearly as possible. Furthermore, to establish a high level of dependability, most of the data which conducts the basis for this thesis was gathered, stored and visualized in the most accessible way. The performed work was continuously discussed and reviewed by supervisors from both Chalmers as well as Trafikverket. Finally, confirmability was also reached through continuous auditing of the thesis.

3.6 Research Ethics

To make a research study ethically correct, there are some guidelines which the researcher should be aware of. These guidelines, introduced by Diener and Crandall (1978), reads as follows:

- Whether there can appear any harm for the participant to attend.
- Whether it can appear any lack of consent from the participant.
- Whether it can appear any intrudes on the participants personal life.
- If there are any fraud, false pretences or withholding of important information.

In addition to these guidelines, it is important that the interviewees are anonymous according to the General Data Protection Regulation (GDPR) (European Union, 2020). Personal data of the interviewees are not allowed to be presented and can only be used for research purposes. The interviewees must participate voluntarily in the study and can interrupt their participation whenever they want to.

When the research study is complete, it should be published to let other people be able to read the study (Bryman and Bell, 2015). If the research is in collaboration with a company, they need to give their approval before the work is published. Further, if the research concerns topics which cannot be spread outside the company due to confidentiality, some parts may need to be removed from the research before it is published.

However, this Master's thesis has followed the guidelines and rules mentioned above. Which means that the interviewees are anonymous and that recordings of the interviews have only been done with permission. The aim of the thesis and how the information is used has been clearly communicated to avoid misunderstandings. In agreement with Trafikverket, this Master's thesis is published at the Chalmers Publication Library.

4

Results

This chapter presents the results of this Master's thesis. Firstly, the primary results are presented which are based on the conducted interviews. Secondly, the secondary results are presented which are based on varying types of literature.

4.1 Primary Results

The following primary results presented are based on the 16 conducted interviews with employees at Trafikverket, except for some additional sources in Section 4.1.1 below. The results are structured according to the questions asked during the interviews, see Appendix A, starting with packaged projects at Trafikverket, and followed by experiences from packaged projects, the project planning process, experience feedback at Trafikverket to be finished with effects on time, resource and money.

4.1.1 Packaged Projects at Trafikverket

Packaging of projects is a way of working that is used at Trafikverket for multiple and similar measures (Löfgren, 2018). These measures are then coordinated simultaneously to reach synergy effects. The four packaged projects from which information was collected are presented below.

4.1.1.1 Bus Stops

The measures for bus stops is a national program called "*Bus Stops for Everyone*" aiming to make every bus stop accessible for everyone (Trafikverket, 2020c). The overarching aim with this strategy is to create a nationwide public transportation network that is accessible for everyone. This would enable more people to travel by public transportation rather than by car, which would contribute to reducing the environmental impact. For the Western Region, 350-400 bus stops are to be rebuilt. The measures differ for the bus stops, but it is mainly to build platforms and guide paths for people with disabilities to make the bus stops accessible. These bus stops are divided into six areas, each with a project manager, with a common goal of being finished in 2022. The projects in Värmland are currently in the production phase where measures are being implemented for eight bus stops with a planned finish in September 2020. The projects in Halland are also in the production phase and are implementing measures for 34 bus stops divided into three groups with a planned finish in November 2020. The projects in the remaining areas; Bohuslän-Dalsland, Gothenburg North & East, Gothenburg and Sjuhärad-Skaraborg are in the planning

phase. In the beginning of the summer of 2020, the projects in the area of Sjuhärads-Skaraborg will go into production of implementing measures for 47 bus stops in one package. Similar measures have and will also be implemented in other regions in Sweden.

4.1.1.2 Walk and Bicycle Paths

Another ongoing packaged project is the planning and building of walk and bicycle paths (Trafikverket, 2020b). As a cooperation between the region of Västra Götaland and the region of Halland, a common investment is put into expanding the network of walk and bicycle paths. The demand for these paths is large since the possibility to travel by walking or biking need improvements. Additionally, the safety for unprotected road travellers is improved. Investing in walk and bicycle paths contribute to increased cycling tourism, promotes health and reduces the environmental impact. In the Western Region, there are 32 new walk and bicycle paths that are to be built with an aim that most of the projects will be finished in 2021 or 2022. The sub-projects are geographically divided into four contracts. This is a recurrent type of packaged project performed each fourth or fifth year with finances from the municipalities. The current project organisation has the ambition to rationalise and streamline these packaged projects even more until next time.

4.1.1.3 Train Stations

The measures for train stations are also a project which aims to make the stations accessible by everyone (Trafikverket, 2020f). Initially, this was a nationwide packaged project called "*Train Stations for Everyone*", but it is not coordinated this way anymore. Now the measures are done as separate projects or smaller packaged projects with a few train stations in each. What is done to make the train stations accessible is to build guide paths for people with disabilities and improving existing signs, lighting, stairs and seating places. The safety zone closest to the railway is also either improved or built. In the Western Region, there are 14 train stations divided into two projects with one project manager respectively. One of the projects is in the production phase for two of the train stations during 2020 while the remaining are in the planning phase aiming to be produced in 2021. The other project is in the planning phase. Similar measures have and will also be implemented in other regions in Sweden.

4.1.1.4 Level Crossings

The packaged projects for level crossings are rather new compared to the previously mentioned projects. Recently, Trafikverket has started investigations of level crossings nationwide on behalf of the Swedish government, although increasing the safety of level crossings is a continuously ongoing project (Trafikverket, 2019e). The type of measure that is implemented depends on the current level of protection for the level crossings. It can either be to remove the level crossing, to build a separated level crossing or to implement supplementary protection. All of the projects have a common goal which is to increase the protection for level crossings and ensure safe

passage for everyone. Due to the magnitude of these measures and impossibility of implementing all measures directly, a more systematic way of working is underway. Therefore, the production is planned continuously during the period 2020-2025 for around 1000 level crossings. In the Western Region, there are 350 ongoing level crossing investigations.

4.1.2 Experiences From Packaged Projects

This section presents the primary results that answer the first objective, "*What previous experiences from packaged projects should be used in level crossing projects?*". To answer this objective, the interviewees were asked questions about their positive and negative experiences with packaged projects, their opinions about packaged projects compared to separate projects, what experiences to use before starting a packaged project and what project delivery method that has been used in their projects. The interviewees who are involved in level crossing projects were asked about experiences specifically from level crossing projects and their thoughts on possibilities and challenges for the upcoming packaged projects with level crossings.

4.1.2.1 Positive Experiences

Packaging of projects is perceived to be useful and contributes to a more effective and rationalised way of working in projects. The attained effectiveness and higher quality of what is produced saves time, resources and money. It is a repetitive way of working, with similarities to the industry and its assembly line principle. Due to the resemblances in these projects, it is possible to copy documents and share material between different project organisations to use in several sub-projects within the packaged project or program. This information is usually shared through the project manager. Thus, many steps only need to be performed once in each project. A positive experience is also to put in time into finding good routines and administrative forms for meetings, deliveries and processes. It is worth thinking strategically from the beginning. A good way of starting is to do a few sub-projects as a pilot project. For example, if there are 50-100 level crossings that are to be built, start with 2-3 of these as a pilot project. This will help to make a template containing administrative documents, ways of working and to identify challenges within the projects. Then, this way of working can be adjusted and applied to the rest of the projects. Working with these positive experiences contributes to synergy effects in packaged projects.

Regarding manpower, a positive experience is that the project organisation is continuously learning throughout the whole project. Mainly since it is repetitive work and enables people to specialise on these packaged projects. This contributes to a higher quality of what is produced and also better cooperation within the group. The competence of each individual increases continuously and experiences can be brought between their projects which leads to more efficient experience feedback. Mainly, the experience feedback occurs inside the project organisation, but it is also spread within the Western Region to other projects of the same type through the program manager. It then becomes another type of project organisation compared

to when working with separate tasks, which often is done in teams of two people. Working in larger teams increases cooperation, especially when working towards a common goal. This increases the feeling of group affiliation and there is always someone to discuss thoughts with, both positive and negative. Also, since these types of projects are performed for a long time, there are large possibilities to develop good relations with the suppliers and thus receive a better result.

Regarding the project process, a positive experience is that the more well-defined and detailed the tender documents are, the better the result of the projects will be. Thus, it is justified to put time into the tender documents. The packaged project itself is not really affected by the geographical location in the design phase, but it can have a significant effect in the production phase. Therefore, it is preferred to divide the sub-projects geographically to enable multiple site visits at the same time and to avoid long travel times. Considering the administrative parts, the sub-projects can advantageously be divided into the types of measures to make efficient use of specialists in the project. With that said, it is not needed to divide the projects into sub-projects in the same way for the design phase and the production phase. For example, one packaged project with measures for bus stops did the design phase with one consultant and then the production phase with three different contractors. This divided delivery enabled them to correct mistakes between the procurement of contractors and to reduce the number of errors significantly. Concerning consultants and contractors, they also increase their knowledge about packaged projects throughout their involvement in such a project. Since packaged projects are recurrent and usually go on for a long period of time, they can also specialise in packaged projects. During production, a positive experience regarding railway projects is to use prefabricated material. This decreases interference and reduces the amount of *"times in track"* that is needed for the production. These *"times in track"* refers to the in advance planned times where the railway traffic is temporarily shutdown to enable safe railway works.

Positive experiences touching the economy of the packaged projects are mainly about the procurement. Packaged projects that are of attractive sizes for contractors are prioritised by the market. There is a fine line between when the project is too small (less attractive on the market) and when the project is too large (fewer companies can afford to do the project). To make the total cost of the packaged project as precise as possible it is recommended by an interviewee to do the procurement with fixed prices as much as possible. This requires a well-defined project and detailed tender documents. Having multiple sub-projects packaged enables the possibility for the project organisation to alter between sub-projects to keep the overall progress of the packaged project. It is possible to spread the use of human resources and costs since the sub-projects use the same financial code.

4.1.2.2 Negative Experiences

Just like with most projects, a negative experience is that the administrative work is time-consuming although it is necessary, especially the documentation of the projects. With these packaged projects, there are also a lot of stakeholders involved

which has distinct opinions and routines for documentation. This complicates the administrative documentation and the TKI-securing for the project organisation. The magnitude of the packaged project also makes it difficult to stay administratively organised in several systems, such as in the Project Portal (PP) which is an internal system at Trafikverket with information about projects.

The majority of the interviewees has stated that the feedback exchange with other regions doing similar projects is limited. The experiences often stay within the smaller project organisations. Sometimes the problem lies with the unawareness that similar projects previously have been done or are ongoing at the same time. If these projects were known, both positive and negative experiences from these could be used from the start of the packaged project. Another negative experience that is a consequence of a large authority like Trafikverket, is the turnover of employees. This affects the projects since competence, knowledge and continuity disappears. In addition, the projects take longer time to produce and the cost also increases due to the turnover of employees.

Regarding the project organisation in programs, the responsibility has been a bit unclear in some programs. Especially what separates the role of a program manager from the role of a project manager. Clarifying this could make better use of both roles, otherwise, there are roles in the project organisation that have no vital purpose and instead just becomes an intermediary. One experience is that people are usually motivated by large and complicated projects rather than seeing the other type of complexity in these types of projects containing multiple small and quite simple measures.

The major negative experience regarding the project process for packaged projects is that the orders business area Investment receives are not possible to carry into effect through a packaged project. Thus, these orders must be done as separate projects anyway and forces the project organisation to reinvent the wheel each time. Also, poorly made documents, whether it is from the ordering or the performing business area, does more harm to a package project than a separate project since the damage is multiplied. For example, poorly done orders will require a more detailed TKI-securing and poorly done tender documents will bring more contract variations (ÄTA-works). Both of these consequences cost time and money and the damage is thus multiplied by the number of sub-projects. Another insecurity is that the knowledge about packaged projects in this sector is limited. This applies to most roles in the project process; the clients, the consultants and the contractors. Packaged projects hold another dimension and complexity regarding time and resource planning for multiple sub-projects simultaneously. This is a challenge for most involved roles and requires lots of time to make a detailed procurement. How the packaging of the project is done also affects how attractive the project is for consultants and contractors. If the sub-projects are geographically located with long distances between, it is less interesting due to longer travel times, but it is sometimes unavoidable. The number of sub-projects can also be a challenge and can give the project organisation a tough time. As was mentioned as a positive experience is that contractors can specialise themselves on these packaged projects, but this can

also be a negative consequence since other contractors thus have it harder to place bids on these projects.

A negative experience regarding railway projects is the *"times in track"*-process. This process is not so flexible since it is needed for the project to apply for times in advance to temporarily shutdown the railway traffic. A larger shutdown needs to be applied for two years in advance. Also, the more busy the railway line is, the harder it is to successfully get these times for a temporary shutdown. This process makes it more difficult for railway projects to work in an assembly line-way, which would require already confirmed *"times in track"*.

As previously mentioned, a negative economic consequence for packaged projects is if the documents are poorly made and if the projects changes after the TKI-securing has been completed. Late changes causes contract deviations which are more expensive to handle further into the project. Some parts of a sub-project could also go wrong and this would thus affect the whole packaged project. If this problem occurs in all of the sub-projects it will have a magnified impact. This could be avoided by dividing the sub-projects into smaller packages, but this will require more time and most of the synergy effects will be lost. When planning for large package projects, the total cost increases with the number of packaged measures and thus the project is needed to be approved higher up in the authority. This affects the project negatively by increasing the lead time while waiting for approval of the project.

4.1.2.3 Opinions About Packaged Projects

All of the interviewees who have worked with packaged projects believe that it is a predominantly positive way of working with multiple measures. The work method is said to be effective and cheap, positive with experiences, repetitive and instructive during the project time. The knowledge about how packaged projects most efficiently should be performed also increases during the project time, which can be instructive for future projects. Since packaged projects are often large, there is always something to do in any part of the project. Further, it is said that packaging these measures into a larger project is the only reasonable way of producing them. Doing these measures separately would not be rational.

A positive outcome of packaging multiple measures is that what is produced is more uniform compared to if they were done separately. To avoid different performed projects due to various project managers, it is important that someone is responsible for the program (or the type of measures) and thus enables feedback exchange between project managers. On the other hand, doing these projects differently could lead to finding the most effective solution and thus the project organisations could learn from each other. The main purpose with increased experience feedback is therefore to avoid making the same mistakes multiple times.

The measures that are involved in these packaged projects are usually not technically difficult and thus makes them suitable to package. As previously mentioned, the challenge rather lies in the time and resource planning. If the project organisation

puts time and effort into making a concept that uses the same base, it will make the implementation of the other sub-projects more efficient and cheaper. There will always be unique adaptations for some sub-projects, but then the effort can be put into these unique parts instead of reinventing the wheel for each sub-project.

4.1.2.4 Experiences to Use Before Starting a Packaged Project

Several recommendations about experiences to use and things to consider before starting a packaged project have appeared during the interviews. As already mentioned, several administrative documents can be copied or based on earlier projects. Some of the documents that were mentioned to be shareable were procurement documents, tender documents, risk analyses, administrative regulations, project specifications, work environment plans and delivery plans. It is also suggested from an interviewee to put time and effort into a good structure of the project in the Project Portal (PP). One suggestion to facilitate a good structure is to use metadata in PP as a way of sorting the documents according to the sub-projects.

Regarding human resources and manpower, good internal support already exists both from seniors and previous project managers in packaged projects. Therefore, interviewees recommend to make use of as much information as possible from previous packaged projects. Start early with contacting other employees with experiences from these types of projects and discuss possibilities and challenges. This internal bank of knowledge should be utilised since consultants and contractors do not yet have this type of experience. A new initiative is to, as a part of the TKI-securing, show that the project organisation has exchanged experiences with two other projects of the same type before starting the project. This is done to force projects to increase the experience feedback and thus utilise already existing knowledge, but also to avoid making the same mistakes again.

The biggest challenge during the project process of packaged projects is to do the packaging of measures in the most effective way. A smart packaging from the start is beneficial, but how it is done differs and depends for example on the type of measures, number of measures and the content of the project. Also, packaging of projects can be done differently depending on the phase in the project process. As a previously mentioned example, the number of measures in each package does not need to be the same for both the design phase and the production phase. Neither does the whole package need to be delivered at the same time. Separate deliveries enable feedback exchange between the deliveries. Another way of packaging is according to the type of measures. A packaged project with measures for bus stops divided the package into two groups with respect to the Planning and Building Act (PBL). The first group contained measures of road planning process type one (smaller measures which do not claim land) and the second group contained measures of road planning process type two (larger measures which do claim land and need a longer planning process). Accordingly, the measures could be prioritised and the smaller measures were carried into effect firstly thanks to a less complicated road planning process. Another bus stop project also combined regional and national measures, although they needed to be reported economically separately. It was more worthwhile to

spend time separating the economic reporting afterwards than doing these measures separately as they were closely located geographically.

It is of great importance that the time plan for a packaged project is not too short. The project organisation needs time to plan the project and to focus on achieving high quality rather than a quick solution. Short project times can lead to forced and bad decisions. The best solution would be if there was time to do some of the sub-projects as a pilot project. Doing that would show what is needed for this type of packaged project. It is also important to have a clear plan for the project based on the TKI-securing. To achieve this, it is important to put effort into having a more clear dialogue with the ordering business area, which usually are Market and Planning or Maintenance. The project organisation at business area Investment should preferably be able to take part in the packaging of projects and bring their experiences to the table before the project is ordered. This would simplify the TKI-securing and especially increase the cooperation between different business areas. This also applies to the project organisation, the consultant and/or the contractor who performs the project. Better cooperation leads to better results, higher quality and a good work environment. Regarding the procurement process, the choice of project delivery method and how the procurement is to be done should be chosen wisely. It was mentioned that the contract should not be for the entire project at once, because then the synergy effects with packaged projects and the possibility of continuous improvement disappear. What would have been good is to investigate the possibility of making option contracts. Which means that if a consultant or contractor does the first sub-projects well, they will continue with more sub-projects and otherwise the contract will be cancelled.

Financially, using previous experiences regarding procurement documents makes it possible for some packaged projects to procure as much works as possible with a fixed price. This has reduced the deviations between expected cost and actual cost within projects. This requires a well-performed TKI-securing. While doing the TKI-securing, it should be discussed with the ordering business area how much deviation is accepted, both in terms of cost and time. It is suggested that a greater deviation should be accepted for these packaged projects as it is more difficult to do the securing of these measures. Administratively, it is preferable if there is a financially joint order for the entire package. If there are separate orders, a monthly economical forecast must be reported for each sub-project, which costs both money and time in itself. Smaller projects also have limited economical mobility, which makes deviations greater in percentage compared with sub-projects being merged into a packaged project. If the measures instead are packaged, the total finance of the package project stays the same but is flexible between sub-projects. Regarding the economic size of the procurement, the bus stops projects vary between 30-50 million per package while the walk and bicycle path projects aimed for packages of the size 20-30 million. Both economic sizes were prioritised by the market.

4.1.2.5 Project Delivery Method

There are different opinions about which project delivery method that is most suitable for packaged projects. It depends a lot on the prerequisites for the project and how well it is defined. Regardless of the project delivery method, it is desired to investigate the possibility to procure projects with option contracts as explained earlier. This discussion does however needs to be taken with respect to the Swedish Public Procurement Act (LOU).

From the interviews, it was found that the packaged projects use design-build contracts in about the same number as performance contracts. The predominant opinion is that using a design-build contract would be most beneficial and especially a controlled design-build contract. Previously, design-build contracts were the main method for packaged projects and are now being more common again. A design-build contract makes it possible to involve contractors earlier in the process, it may cost more but the project organisation will not put time into producing documents that the contractors may not need to use. Some of the interviewees are also of the opinion that design-build contracts are more suitable for more complicated projects such as railway projects. While others believe design-build contracts are more suitable for less complicated projects such as road projects since there are less technology, cables and wires along the roads. Another brought up example is that if the planning process is not completed, a design-build contract is preferred.

What contradicts the use of design-build contracts is the opinion that if the measures are technically simple, then a performance contract is preferred. It was also mentioned that it is easier to handle deviations from the project documents with a performance contract, so-called ÄTA-works. Another opinion is that the better the project organisation can define the project and the less the contractors are involved in the design phase, the more suitable a performance contract is. Regarding projects where there already are existing railway systems, an interviewee suggests to use performance contracts. This is because the current management data about the railway system is too poor which leads to insecurities regarding existing technology, cables and wires. Therefore, it is of great importance that either the project organisation or a hired consultant produces detailed tender documents before the project is procured.

4.1.2.6 Experiences Specifically for Level Crossing Projects

As for any packaged project, the interviewees have stated that putting effort into making a plan and to get a general picture of the project is of great importance for a successful result. Specifically for projects regarding railway and level crossings, it is also important to work with people who have experiences working in these types of projects. It is important to have a good land negotiator in the project organisation due to complicated processes, especially when the project is unable to use the railway planning process. Instead, the project needs to negotiate with several stakeholders owning land surrounding the level crossings.

The division of level crossing projects has initially been according to the railway lines and the sub-projects has been geographically packaged. For the Viskadal line (a railway between Varberg and Borås), the level crossings that are geographically close will be managed as a smaller package. Packaging by geography is a holistic way of thinking since some level crossings are for example going to be removed and then the road traffic can be redirected to other level crossings close by. Working this way brings synergy effects and enables a more holistic solution for the railway line.

An interviewee suggest to start investigations for many level crossings simultaneously due to long and uncertain lead times depending on the land negotiating process. Right now, there are ongoing investigations for 350 level crossings in the Western Region. This large amount of measures is investigated both due to the governmental order and to keep the total progression running. The initial packaging according to geography can change depending on the land negotiating process. The level crossings where this process goes faster can be produced first and thus packaged. Therefore, the interviewee deems that it is worth keeping in mind that the planned measures for each level crossing differ and thus the process will take various long time. It is not possible to work through the level crossings on a railway line from one side to the other due to the multiple landowners that need to be negotiated with. Doing it this way would have a negative impact on the project because a project organisation can be started without having anything to do except wait for the land negotiation process to be completed. Instead, it is rather positive to start the design phase successively when the processes are completed and it is also a suitable time to apply for "*times in track*". This will result in a different way of packaging for the design phase and the production phase, similar to what has been done with the measures for bus stops.

4.1.2.7 Possibilities and Challenges for Level Crossing Projects

Since the level crossing projects are upcoming packaged projects, it was discussed during the interviews what the interviewees were expecting in terms of possibilities and challenges for these projects. What will be useful during the first projects is the possibility to increase the knowledge and establish experiences about these types of projects. Thus, it will enable future projects to learn from previous experiences. Working with package projects several times will make the project organisation efficient since they know what problems usually appear and learn how to avoid them.

Regarding "*times in track*" it is seen as a possibility rather than a challenge for the level crossing projects. Most of the planned measures are to be implemented on railway lines with less traffic. The main lines already have protected level crossings to a large extent. Thus, getting confirmed "*times in track*" will be favoured since the interference with traffic is smaller. Also, these types of measures do not require the same length of time of temporary shutdowns of the railway lines as other railway measures, e.g. maintenance work of the overhead line. Instead, there will probably be more and shorter shutdowns. Another way would be to package measures according to confirmed "*times in track*" and thus merge the production to streamline

the "*times in track*" and have shorter and fewer shutdowns. It is difficult to package according to "*times in track*" in the design phase since the land negotiating process is of uncertain time length and complexity. However, a discussion can be held regarding the production whether to prioritise completing as many level crossing measures in the shortest possible time or to have as short temporary shutdowns of the railway lines as possible.

One challenge that is pretty specific to level crossing projects compared to other packaged projects is that the funding of the project is planned per calendar year, which is an economic plan important to keep. As a comparison, the walk and bicycle path projects have planned funding for each 5-year period. By getting help from previous packaged projects, the level crossing projects aim to find a good strategy for keeping the economic plan without feeling limited. At the same time, it is difficult to TKI-secure a large project like this which is an ongoing project with uncertain planning processes.

Regarding knowledge and experience, it is rather limited when it comes to level crossing projects, especially when doing measures for several level crossings at the same time. Thus, the experiences that do exist need to be used in a valuable way together with experiences from other packaged projects. It is therefore important to try to keep the people within the project organisation since there is a big risk for turnover of employees due to long lead times. Experiences are lost when the project organisation changes and it requires time to introduce new people in the project. For example, the time plan for Viskadal line is 6-8 years, and during this time period, it is difficult to secure that the project organisation stays the same. The long lead time is a challenge in itself, but there is not much to do about it since that is how the project process, land negotiating process and the funding process look like for railway projects. It is a part of the project that is important to be aware of when working in railway projects.

Speaking of the long lead times, the land negotiating process can be a rather difficult challenge if the project organisation lacks patience. Compared to other railway projects, level crossing projects are specifically complicated since they cover multiple dimensions. The projects differ widely depending on the type of measure; increasing the protection of a level crossing is a quite fast procedure compared to building a separated level crossing or a redirection road. This is mainly due to the land negotiating process and the dialogues that need to be held with private landowners, land negotiators, The Swedish National Land Survey (Lantmäteriet) and municipalities. It is thus very important to have a proficient land negotiator in the project organisation to cater to landowners interests. Many of these negotiations end in a voluntary agreement type of contract, which is an uncommon contract at Trafikverket, and this process can take 1-10 years depending on opinions of landowners. Usually, in railway projects, a railway plan is used which is a more straight forward process with shorter lead times. Therefore, the project planning process at Trafikverket is not so applicable to level crossing projects due to the uncertainty regarding time, cost and content which makes the TKI-securing difficult. It may result in time and money spent on securing a project that later changes completely due to the later completed

land negotiating process. After this process is completed and The Swedish National Land Survey has made their decision, the content of the project becomes more clear. It is then more suitable to do the TKI-securing, a more practical time plan can be produced and "*times in track*" can be applied for.

4.1.3 The Project Planning Process

This section presents the primary results that answer the second objective, "*What changes should be done in the project planning process to optimise measures for packaged projects?*". To answer this objective the interviewees were asked about their opinion about the project planning process and suggestions for improvement. The interviewees working for the section Planning at business area Investment (IVpp) were also asked about their role in the process and their view on packaging of projects.

4.1.3.1 Suggested Changes

The project planning process, known as the GÅ-process, used at business area Investment is mainly perceived to be a good and smooth process. The routines between the toll gate-decisions are logical to follow. You do need to understand how the process is constructed to make good use of it and thus it is easier to follow the second time. Initially, it can be difficult to determine which parts and documents in the process that are most relevant for each project. Especially, since the documents and descriptions in the process are written in a general way to suit most projects, all documents are not applicable in every project. It then appears odd that smaller projects have the same requirements as larger projects.

A lot of administrative improvement proposals were stated by the interviewees. Generally regarding the process, it is perceived that documents are added to the routine, but no documents are removed. For some parts of a project, there are about four documents that help to fill in one document. A suggestion from an interviewee was to make the main document self-explaining so additional documents are not needed. This would reduce the amounts of documents significantly and help finding relevant documents to follow in the project. This would especially favour new employees or consultants working for Trafikverket. If there is a step that does not seem suitable for the project, one interviewee suggests having a dialogue with the head of the project unit and ask if a deviation from the process can be accepted. Internally, there are high requirements on monitoring the progress of the project, but it is important to make sure it is on a reasonable level. Otherwise, there is a risk that focus is shifted from the real task which is the production of the project. It is therefore requested to ease some of the documentation in the project to favour the results of the project although it is understood that some of the monitoring is vital.

Concerning packaged projects, a desire from a few interviewees was to clarify the use of some documents in the project planning process. For example, it should be clarified what documents should be made for the package project in general

and what documents should be made for each sub-project. One interviewee also suggested to make a general plan with a project specification and monitoring plan for the packaged project and include the sub-projects as appendices instead of making separate documents for each sub-project. Dividing the packaged project into partial economic forecast reporting could also make the documentation more efficient. If the project were to report half of the sub-projects each month it would halve the time spent on making monthly economic forecasts. Would something special happen in one sub-project, an additional economic forecast could be done. Projects should have the flexibility to enable streamlining of the process, but the way it is done depends on the type of project. Further, one interviewee suggested a good question to start with, *"how can this project be streamlined in the best way possible?"*. The program of walk and bicycle paths has achieved this by adapting the documents from the GÅ-process to their specific projects. Thus, uncertainties have been reduced while similarities between sub-projects are increased.

According to interviewees, there is a will to combine measures of the same type in packaged projects more than what is done today, especially regionally and nationally separated projects. Packaging of projects should be done to a larger extent since this would be beneficial for the general picture. The cost is high when TKI-securing smaller projects. If these instead could be packaged, it would save both time and money. It is positive with cooperation and feedback exchange between project managers that have been involved in similar projects. A suggested way to increase the efficiency is to investigate if one project manager could be responsible for two packaged projects instead of having two project managers responsible for respective projects.

At the beginning of the project process, there are lots of discussions between business area Investment and the ordering business area, whether it is Market and Planning or Maintenance. This is usually done well, but even though an improved dialogue between the business areas requested. The business areas work together for the same authority and should have a common goal to receive good results by cooperating. Therefore, it is desired that the ordering business areas start to think in ways of packaging projects from the start since the lead times are long, especially in railway projects. Business area Investment wants to package projects, but this aim needs to be common to be done efficiently and enable business area Investment to follow their project planning process. Additionally, the project organisation wants to have a say in how the measures are packaged and thus improved cooperation between business areas is required. The content of the orders is also requested to be more clear. To get content connected to cost and time it is important that there is experience feedback between the business areas as well to make sure that both sides work with current numbers. This can be exemplified through *"times in track"* in railway projects; some projects are ordered with a tight time plan but are not practically able to be produced since applying for a larger temporary shutdown of the railway line needs to be done two years in advance. A possible solution to this if the ordering business area makes preliminary requests for *"times in track"*. Conflicts like this create issues and complicate good cooperation between the business areas and turns them against each other instead of working together as one common authority.

4.1.3.2 The Role of IVpp

Two of the interviewees work at section Planning at business area Investment (IVpp). Their role in the process is to be able to propose suitable programs or packages in an early stage, about 1-5 years before projects start. This role is important since thinking in packaging must come early in the project process to reach synergy effects. IVpp has an early contact with business area Market and Planning to make this possible. All planners do not have the experience or knowledge that it takes to know whether some projects should be packaged or not. This knowledge is instead possessed by business area Investment and people who have worked with these types of projects. Therefore, IVpp could work as a middleman to initiate this contact and to exchange knowledge about which projects that are suitable to package. These packaged projects form a suggestion of packaging, but lastly, it is up to the head of the project unit to decide whether the projects will be packaged or not. For example, regarding the level crossing projects, it was first planned as a nationwide program. Now it is proposed as regional programs, although in some districts the level crossings are separate projects. It depends mainly on how well the orders are prepared and if the order contains any prioritised measures. If so, these are to be produced first.

The interviewees also see a big opportunity with packaging of projects as a way of working that will be more common. IVpp has a positive view of packaged projects since they are pro finding large-scale solutions due to the innovative market. The goal is to find a more efficient and cheaper way of working with projects, and packaging of measures could be a way of doing this. Another important role IVpp has right now is the development project "*Affärsupplägg Järnväg*" regarding packaging of BEST-works in railway projects. More about their findings are presented in Section 4.2.1.

4.1.4 Experience Feedback at Trafikverket

This section presents the primary results that answer the third objective, "*How should the experience feedback be done efficiently within Trafikverket?*". To answer this objective, the interviewees were asked what they think about the current state of experience feedback and suggestions for future improvements.

4.1.4.1 The Current State

The experience feedback at Trafikverket is appreciated. Trafikverket wants to focus on it and to improve the systematic experience feedback. According to the interviewees, the current state of experience feedback at Trafikverket is very dependant on people. It is perceived to be each employee's responsibility to both find experiences by asking other employees and to show themselves available to share their own experiences. There is a lot of existing knowledge within the authority and everyone is willing to share it as long as someone asks for it. Discussing with people who have previously done similar projects can help in terms of finding out what has been positive and negative for the project. It is also possible to ask relevant and specific

questions. These contacts are usually found through each employee's contact network. This internal contact network is said to be one of Trafikverket's strengths.

Another positive thing about the existing experience feedback is that most projects have assigned support internally, often in terms of senior roles. This is important, especially for new and inexperienced project managers, for support, help and knowledge. Within the project organisation, the cooperation between the project manager and the project engineer is essential. Both roles are important since they overlap and contribute with different views. Further, experience feedback for several project units is sometimes done at their respective workplace meetings (APT). This discussion is not in detail, but some good examples and experiences worth keeping in mind are highlighted.

One type of meeting that several project units at business area Investment use is something called PULSE-meetings. The name PULSE-meeting comes from the purpose of the meeting, which is to take the pulse on ongoing projects (Tonquist, 2018). Status of each project is reported and rated with colors where green is good, yellow is okay and red is bad. At Trafikverket this is done for some project units, mainly red and yellow statuses are discussed to help each other between projects to solve problems. These periodic and short meetings are an effective way of solving issues and to exchange knowledge between project organisations at the project unit, both positive and negative experiences. This is a good way of sharing experiences inside the project unit, but the exchange between project units is more difficult to achieve. Another type of physical meeting where experiences are discussed is district days. Some well-performed projects are usually presented and thus, experiences can be drawn from what is told. This way of experience feedback is efficient and rewarding for the present project organisations, but the information can be hard to read about and to use in retrospect. At the end of a project, the project organisation and previously involved resources are usually gathered to discuss and reflect on the project. This helps the project collect experiences, but as with the discussion about experiences between two people, this information unfortunately often stays within the project organisation.

Administratively, the experience feedback is done in terms of a chapter in the final report for each project. These final reports should then be available for the project organisation to spread further and enable other projects to learn from their projects. The idea is good, but it does not work as efficient in practice. The calculator coordinators has started to work this past winter in a more structured way to gather each project's final report and cost accounting in a workroom that is accessible by everyone at Trafikverket. There is also an internal database called C2, where suggestions for improvements can be sent. This database should be updated to make sure it is used as it is aimed for.

What appeared to be missing is a well working systematical experience feedback. Doing the experience feedback efficiently appears to be hard for smaller projects. It is another thing for large projects where compilations and analyses of experiences

is a requirement for approval. The risk with the lack of systematical experience feedback is that projects are started with a shortage of knowledge. This increases the risk of projects making mistakes which could be avoided, but this is the authority's responsibility rather than the individual employee. One issue is also that experiences are lost with the turnover of employees. Without systematical conservation of these experiences, they will disappear with the employees.

Experience feedback is particularly difficult if the employees do not know who to talk to if they have a limited contact network. This is especially hard for new employees and consultants working for Trafikverket with limited knowledge about the authority's systems. No matter how long an employee has been working at Trafikverket, there is always a desire for collecting experiences although the type of experience that is needed differs. One main issue with experience feedback is that a problem or a question that relies on personal contact needs to appear before an employee seeks help from others. This goes hand in hand with that experiences are not given and shared unless they are asked for.

Another issue is the lack of interest in experience feedback. The purpose of doing it is not clear and thus it is perceived to not be important. Time is not spent on reflecting and discussing experiences, challenges and possibilities. Instead, some prefer to start their assigned project in a way they are accustomed with and spend time doing the project from the start instead of reading about how others have accomplished a similar project. Information exists about how the project organisations should work and what problems to avoid, but yet this information is not always used accordingly.

Regarding the final reports and the cost accounting, the difficulty lies in actually finding them. Sometimes the final report does not exist or they are not visible for everyone employed at Trafikverket. This appears to be difficult for consultants working for Trafikverket since they do not have the same access to internal files as employees do. A workaround for this is, according to the interviewees, to ask employees at Trafikverket to find these documents and then share them. This is neither time-efficient or a reasonable way of working. If there are existing final reports or cost accounting's, they are not always usable since the way of working is tricky to explain well in text. There could also be details that separate the projects and makes the findings in the final reports unfitting to apply. Therefore, existing final reports are not always usable for other projects.

However the experience feedback is done, it is very important for the authority. Mistakes will always be made, but according to the interviewees, it is important to learn from them and then spread this knowledge so that the same mistakes are not repeated. There is already so much existing knowledge inside the authority that should be used more efficiently. Further, there are great opportunities regarding experience feedback, and it is successively getting better.

4.1.4.2 Future Improvements

As previously mentioned, the interviewees talked about multiple ways of improving the way experience feedback is done and that there is much potential within the authority. It is said that oral contact is more valuable than reading reports. Producing reports is not a waste of time, they also have an important purpose, but experiences can be difficult to write down in a helpful way. These oral discussions are enabled through having several contacts internally at Trafikverket. Therefore, a mentioned suggestion by an interviewee was to put time into establishing contact with people and projects you can rely on. New employees should receive help with this by having a designated supervisor or contact person with more experience. Through this supervisor, the new employee can be put through to other employees within the authority and thus increase their contact network. Also, if the packaged projects are formed as a program, the program manager could work as a contact person for project managers to pass on experiences and initiate contacts between projects. However, the right type of person is needed for this role, someone who wants to encourage experience feedback and development of Trafikverket.

There is no specific way experience feedback is preferred to be shared, but various forums with an exchange of experiences are said to be positive. Spreading positive and negative experiences should be a natural part of the project process to help the authority develop and learn. A problem should not need to appear to force employee's to look for advice. This is reliant on people showing that they are available to share their experiences. Similar to this is the absence of exchanging experiences between projects, which is not done unless it is asked for. Trafikverket should be better at doing regular meetings with similar ongoing projects to exchange experiences to help develop the way of working. This could be done either within the program or region, but also across regions to exchange knowledge further. These meetings should not take up too much time and the number of present people should be limited to get an efficient meeting.

Three of the upcoming level crossing projects have solved this by initiating a forum themselves to enable the exchange of experiences and documents. This was done to increase the cooperation between projects regarding the complexity of level crossing projects. Note that this was initiated from the project organisations themselves, and not by Trafikverket. According to the interviewee involved in this project, a program manager or another extra resource would not be needed to initiate the contact between similar projects. It is instead more efficient if the projects can cooperate directly with each other. A suggestion is to have a system with ongoing projects in a similar way as the system with incoming orders. Then it would be easier to find similar projects and involved project managers to discuss with.

Regarding the final report there is a suggestion to create this document early in the project and then fill this document continuously with experiences. This could be implemented as a milestone at the beginning of the GÅ-process. A benefit with doing this is that experiences early in the project is written down and not forgotten when the final report usually is written at the end of a project. This is especially beneficial for projects ongoing for several years. Writing down these experiences in

the final report could be done regularly at planning meetings. Another benefit is that similar ongoing projects can make use of these experiences directly during the project instead of waiting for the end and a written final report. This also requires a structured database with final reports to enable other projects to make use of this. When the project is finished, there should be a requirement that the project manager offer a meeting with the ordering business area and specialists where the final report is reviewed. This type of meeting benefits the experiences of being spread inside the authority. Otherwise, there is a risk for misunderstandings due to a lack of competence or comprehension. This was done for the first packaged project with measures for walk and bicycle paths and was very much appreciated.

Talking with more experienced employees is a suggestion often mentioned. For example in terms of separate meetings with one person from a similar project where it is possible to ask specific questions. Having a supervisor is also a requested suggestion which would be very beneficial for new project managers. At some project units, there are many new employees which increase the workload for the experienced employees who get all the questions. The opportunity whether more people could take on the responsibility of being supervisors or mentors should be investigated. This would help to answer questions and also widen the contact network. Another way of extending the contact network for employees is to have workshops or meetings inside the program, or by gathering project organisations from similar projects. The aim of these meetings should be to initiate contact and to start a cooperation.

A more administrative way of informing who has experience on specific topics is to have a CV system and is often used at consultant companies. This system may not be usable at an authority as large as Trafikverket. Instead, keywords can be added through the phone book which then are visible in Skype. In this way, employees can add their specific knowledge in terms of keywords which are then searchable internally. This could initiate a first contact, but there should be a better way to connect people to the projects they have been involved in. Additionally, there are employees who do not even know that this function exists.

One common thing that was discussed during the interviews is that some kind of database where experiences can be collected is requested. This is requested mainly for the final report, cost accounting and experiences from the project together with contact information such as the project manager and the project engineer. Gathering this type of information should be done without making an additional document that becomes one in the crowd. Through this database, one can get an indication about the project by reading a short introducing text and then get the possibility of contacting involved people and ask specific questions. It is crucial that this database is of suitable size, otherwise there are too many documents to handle and it will then not be used as efficiently. Another suggestion is that the database should be structured systematically based on project types, e.g. one folder for level crossing projects, one for bus stops, one for train stations and so on. Otherwise, the documents could be sorted by using metadata.

As previously mentioned, the calculator coordinators have initiated an internal workroom to gather each project's final report and cost accounting. This initiative is received with positive reactions from the interviewees although some emphasise the necessity of a good structure inside this workroom. Now, the thought is that each project manager should send their final report and cost accounting to their assigned calculator coordinators, who later should upload the documents to the workroom. One opinion is that this should be done directly by the project manager to reduce the number of middlemen. Gathering the cost accounting files should also enable a better cost securing process of projects, similarly to what most contractors do. Trafikverket has the actual cost of projects and should therefore also have the best knowledge of what things cost. This knowledge should be used more efficiently. Making this workroom fulfil its purpose relies on high awareness and actively working with the structure of the workroom. Time should therefore be spent on valuing how much effort is worth making a database like this. Will employees use the database if the calculator coordinators put in much time into its structure?

4.1.5 Effects on Time, Resource and Money

This section presents the primary results that answer the fourth objective, "*What effect will the effectiveness of measures bring in terms of time, resource and money?*". To demonstrate this, the method named Business Impact Analysis has been used, which is further described in section 3.4.2 Effect Analysis. The figures below show the events with the largest effects on the project planning process based on the conducted interviews. Some events are what the interviewees have stated while others are suggestions or opinions converted into an effect. There are nine positive events and nine negative events that were identified to be critical. Three different colors were chosen to visualise what type of direct effect the event has. Time is represented by the color black and is the total time of the project, resource is represented by the color grey and is human resources and manpower, and money is represented by the color red and is the total cost of the project. Worth keeping in mind is that this effect analysis considers primarily direct effects, and thus not indirect effects. In some way, all events have an indirect effect on all three parameters.

4.1.5.1 Positive Effects

The nine most critical events with positive effects are shown below in Figure 4.1 with no particular order.

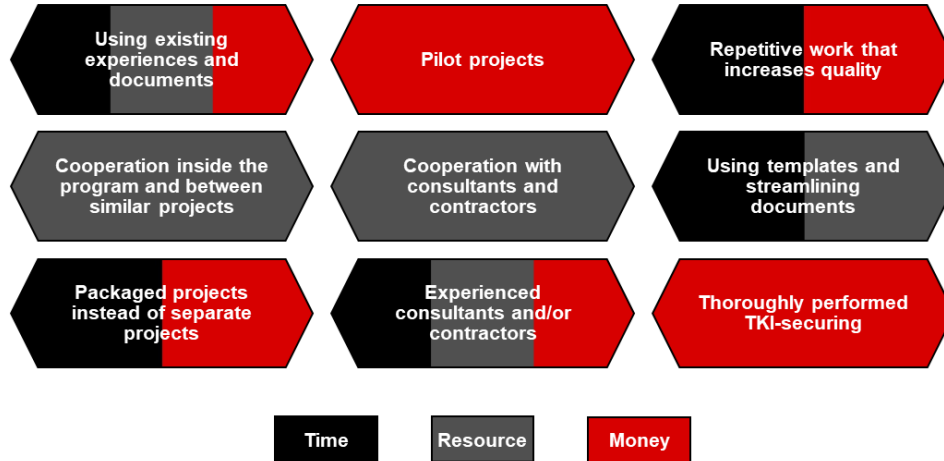


Figure 4.1: Events with positive effects.

Two of these nine identified events have a direct positive effect on both time, resource and money. One of them is *"using existing experiences and documents"*, which saves time since documents can be copied and money since known problems are avoided. Human resources are also saved since they do not need to spend time on already completed events. The effect is similar for *"experienced consultant and/or contractor"*, especially as resources save time introducing the consultant and/or contractor to the packaged type of project since they already know how they should work from previous experiences.

"Repetitive work increases quality" has a direct effect on money and time since an increased quality provides more value for the money as well as repetitive work speeds up the working process. A positive effect on money and time is also the case for *"packaged projects instead of separate projects"*. Doing all measures as separate projects would take much longer time and cost more since many things are then done multiple times instead of efficiently being done only once.

The event of *"using templates and streamlining documents"* would have positive effects on both resources and time, especially for specialists who need to review the project documents. If the templates are streamlined, the amount of time that is needed to understand the structure of the document is highly reduced and the time can instead be put into the actual review of the document.

"Pilot projects" and *"thoroughly performed TKI-securing"* are two events with predominant positive effects on money. Doing a few sub-projects first as a pilot project reduces the cost for upcoming sub-projects by revealing challenges and possibilities through testing before producing the packaged project in full scale. A thoroughly

performed TKI-securing has a positive effect in terms of reducing the amount of contract deviations and thus the cost of the project.

Cooperation is an event that in many ways has a positive effect on resources, both in terms of *"cooperation inside the program and between similar projects"* and *"cooperation with consultants and contractors"*. Using feedback exchange enables good cooperation and makes the best possible use of the existing resources.

4.1.5.2 Negative Effects

Below, in Figure 4.2, the nine most critical events with negative effects are shown with no particular order.

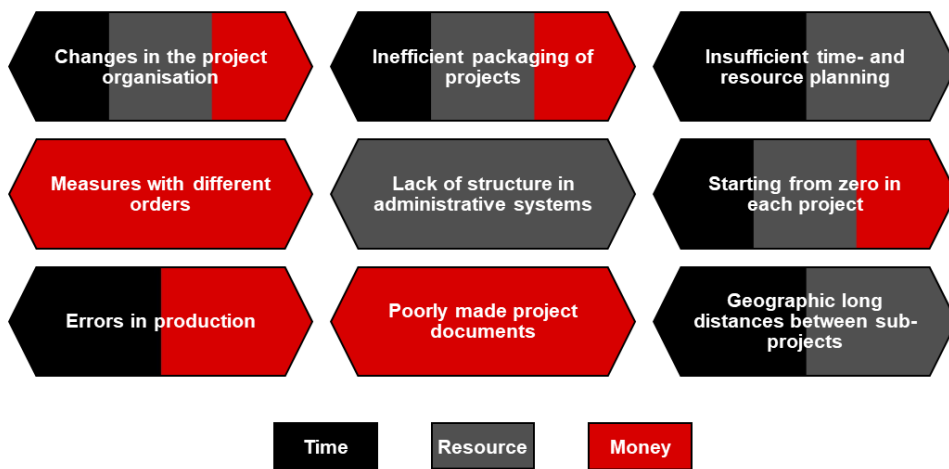


Figure 4.2: Events with negative effects.

Direct negative effects on both time, resource and money occur from *"changes in the project organisation"*. These changes have an effect on resources, but introducing new people to the project takes time and therefore also costs money. *"Starting from zero in each project"* is needed if existing experiences are not used and has a negative effect that could have been avoided through communication. Instead, the same mistakes are made which costs money, while time and human resources are spent on already existing documents and maybe even on unnecessary things. Another event that has negative effects is *"inefficient packaging of projects"*. This could for example be a packaged project with too many or too few sub-projects. Working with a project with inefficient packaging requires more from the project organisation to still get a good result, which thus has a negative effect on time, resource and money.

"Insufficient time- and resource planning" has a negative effect on human resource and time and appears to be a challenge for the industry. The consequences of a poorly done planning can be significant for these packaged projects due to the complexity and lack of experience in efficiently planning multiple sub-projects. This can lead to an extended project in time and irregular workload for the project

organisation. Further, this can lead to an indirect and following increase in cost for the project. *"Geographic long distances between sub-projects"* also has negative effects on resource and time but in another way. Instead, human resources' time is spent on travelling between sub-projects for site visits.

One event that has a significant negative effect in packaged projects is *"errors in production"*. If there is an error in for example a tender document for one sub-project and this document has been copied to all other sub-projects, the error is multiplied by the number of sub-projects and thus multiplies the damage. Correcting errors of this magnitude has a big negative effect on both money and time.

"Measures with different orders" and *"poorly made project documents"* have both negative effects on money. Measures that are ordered separately are harder to manage as a packaged project and thus the cost increases. Avoiding this requires packaged orders from the ordering business area. Poorly made project documents, for example tender documents, will have the consequence of more contract deviations which usually makes the project more expensive than planned for.

Lastly, one event that has a negative impact on human resources is *"lack of structure in administrative systems"*. This requires resources to spend time on finding specific documents rather than doing something usable for the project. It will not affect the timeline of the project to that extent, but it will have an effect on the way of working for the resources.

4.2 Secondary Results

This section presents the secondary result that strengthens the primary result based on the conducted interviews. The secondary result contains information about an ongoing packaged project at Trafikverket, another Master's thesis about repetitive approach in railway projects and opinions from employees at Trafikverket about both the project planning process, and the experience feedback according to a survey conducted at Trafikverket.

4.2.1 An Ongoing Packaged Project at Trafikverket

A development project carried out by Trafikverket is called *"Affärsupplägg Järnväg"* and concerns the packaging of BEST-works, which includes railway works related to tracks, electrification, signal, and telecommunications (Trafikverket, 2020a). This project is currently in the design phase. However, both consultants and contractors have a dominating positive attitude of doing these projects as packaged projects. One reaction is that the cooperation between all actors is going to be challenging but believed to be the right way of doing the projects. Further, opinions concerning the contracts indicate that they should not be too extensive. The spread of geographical locations seems insignificant and most people involved recommend technically oriented contracts, but it may be possible to have contracts oriented by railway lines. There are also different thoughts if consultants and contractors should be procured

together or individually. After getting these reactions, the purpose of the projects is set to be that Trafikverket should have an early involvement, that it should be good cooperation between all stakeholders, and that they want to reach innovations in the climate aspect.

When looking at all sub-projects, the contracts should be both geographically and technically oriented to enable the annual workload to be quite uniform (Trafikverket, 2020a). Another discussion is if the contracts should cross the regions or not. If a contract crosses regions, it is easier to get full manpower over the whole period and it is an affordable number of projects to conduct every year. The regions must thus have a joint organisation for such a contract. With contracts limited by regions, there is no need for cooperation across the regions but the number of projects and the manpower may vary every year.

The BEST-project will be ongoing for several years, which will imply that a lot of information about different kind of works will be missing from the start (Trafikverket, 2020a). Therefore, the contracts need to be adjustable so that changes can take place during the contract period. Also, if the cooperation between the actors involved does not work, the contracts must be able to be aborted.

The current thought is that there will be one main project manager for the contracts and thereafter project managers for every measure in the regions (Trafikverket, 2020a). An overall goal is also to have a common risk and target management as well as jointly conflict methods for all measures.

4.2.2 Another Master's Thesis About Repetitive Approach in Railway Projects

Another Master's thesis conducted by Sara Edman (2016) stated that interviewed persons in the study believe that railway projects could be done with a more repetitive approach. Though, the administrative work which should be made for every project inhibits the ability to find and create this approach. It is also difficult to use old documents and templates from previous projects since new restrictions often are added about the administrative work. To change this, the administrative work should be more systematic and standardised so the same documents can be used again for several projects, which create a repetitive way of work. Further, the total cost can be reduced if many sub-projects or measures are procured as one contract instead of several. If this is the case, the same establishment, documents and other administrative works can be used for the whole contract. The more similar and repetitive the including sub-projects are, the more administrative work can be the same. The greatest cost reduction, when many similar sub-projects are procured in one contract, occurs during the design phase.

One contract with many sub-projects can also promote the cooperation between all actors involved in the project (Edman, 2016). Since a project of this type is ongoing for a longer time than if every sub-project was done separately, involved actors can work together under a longer period and with several sub-projects. Also, good

cooperation can promote both the result of the project and the experience feedback within the project. The result can be affected due to the projects long time period where actors have time to find the best possible and effective way of doing the sub-projects. If the sub-projects are quite similar, a repetitive process should go faster and faster each time it is done. One thing to bear in mind is that infrastructure projects can have many specific site conditions where specific solutions need to be executed. The experience feedback can be better when knowing which person to ask when a problem occur, which is easier when having good cooperation within the projects. The interviewed persons said that most experience feedback happens when discussing problems and projects with other employees within the company. There should be a digital system where experiences can be shared if there is no person to ask. A digital system is even more important for a large organisation to ensure that experiences reach the right people and that experiences will not get lost when employees quit. The system needs to be systematic, continuously updated and should be easy to use to promote the experience feedback.

When it comes to the production phase, Edman (2016) suggests that one should start with a sub-project which include many different technical areas and processes. By doing this, all technical areas are tested and conducted with adjusted and formed processes at the beginning of the project, which facilitates future sub-projects. The more sub-projects that are ongoing at the same time, the more establishments need to be created, which is a cost. Therefore, it is better to start up establishments at sub-projects when processes and techniques are found at the first project, to reduce the other projects production time.

4.2.3 The Project Planning Process and Experience Feedback at Trafikverket According to a Survey

This section shows employees' thoughts and opinions whether Trafikverket is a learning organisation according to a survey conducted by IVpp for the Director-General's assignment "*Tid- och kostnadskontroll för styrning*" (Trafikverket, 2020g). The survey was sent out for two weeks in March 2020. It was conducted to see what employees think of the TKI-securing, but there were also some questions about how Trafikverket can be a learning organisation and when the authority already is it. These questions were most relevant for this thesis and were used as secondary data for the project planning process and the experience feedback within the authority.

The survey was sent to 1818 employees within business area Investment and business area Market and Planning in different regions at Trafikverket. Among these employees, there were 679 who answered the survey. The majority of these employees work as project managers, project engineers or as support and specialist resources. Most of them are from the performing business area, but some are from the ordering business area or have other roles within Trafikverket.

Opinions about the project planning process are presented and thereafter opinions about experience feedback which are divided into two sections; the current situation and employees' suggestions for improvements in experience feedback.

4.2.3.1 The Project Planning Process

The employees' opinions about the project planning process vary according to the survey. The survey indicates that Trafikverket needs to create, change and improve certain organisational procedures e.g. the GÅ-process. Today, the authority has a lot of templates, routines and governing documents, but old documents are not removed when new are added. This creates an overwhelming feeling where employees have too many guidelines to relate to and, at the same time, it is difficult to find specific documents. Therefore, employees desire that existing documents should either be rewritten or replaced by new documents, instead of having many documents about the same thing in different versions. Further, an opinion is that many projects do the same mistakes and getting the same ÅTA due to a missing system for quality assurance. There is also a desire for approximate key ratios about the cost, for example, a road per square meter and changes of tracks per square meter to ease the project planning process.

Moreover, the ordering business area should be involved during the whole project process to get experiences which can be applied in future projects. The dialogue between business area Maintenance, business area Market and Planning and business area Investment should also be better throughout the whole project process to avoid misunderstandings. Another opinion is that project managers work in different ways in different regions when they should instead work quite the same throughout business area Investment. Further, an improvement suggestion is to use mentors for new project managers and that project organisations should include both new and old employees to get different ways of seeing things within the project.

When the ordering business area designs orders, they should make them together with experienced project managers and specialists to gain experiences from previous projects. It can also be useful to look at information from other projects about time, cost and content, i.e. old TKI-securings. These should also be used as a basis together with documented experiences, cost accountings and time plans when business area Investment makes new TKI-securings.

4.2.3.2 Experience Feedback - The Current State

The survey implies that the employees have seen that Trafikverket wants to develop the experience feedback within the authority. About 30% answered number three in the interval one to five to the question of whether Trafikverket is a learning organisation. The current state shows that the experience feedback at Trafikverket is via digital systems, arranged experience occasions, and through discussion with colleagues. Employees mention several positive aspects that occur today, such as information meetings, discussion about both good and bad experiences in the project organisation, and that new processes and documents is added on the authority's digital platform frequently. An overall opinion is that employees at Trafikverket have many good examples which the authority can learn from.

Experience feedback can be both easier and more time-efficient by knowing people within the authority because one can immediately know which person to ask if a

problem occurs. Today, much knowledge transferring and problem-solving takes place outside the meeting rooms, during lunch and coffee breaks or in more informal meetings. By discussing problems with colleagues from other projects, experiences spread throughout the authority. This kind of knowledge sharing can be just as effective as experience feedback via arranged experience occasions.

Furthermore, experience feedback is a process which is difficult to get orderly and employees have individual opinions about it. There are several positive and well-functioning aspects of the current state, the survey indicates a need for improvement. Employees feel that the authority has a lack of a systematic and routine system for collecting and disseminating positive and negative experiences. There are different processes to handle the experiences within the authority, but they are not always compatible with each other. Today, project organisations discuss their problems within the group or with colleagues they already know since before. When the problems are solved, experiences from them are rarely documented or mentioned in other forums, which could have helped colleagues with the same problem and prevented e.g. contract variations and its following costs. It is therefore likely that mistakes and problems are being repeated in many projects, which could be prevented if employees start to document both good and bad experiences. If employees at Trafikverket, either in a project organisation or not, instead try to ask about problems in a digital system within the authority, it takes often a long time to get an answer with a suggestion or a directive. This contributes to that it is easier to ask people themselves, but then the mistakes are repeated.

When a project is finished, the project organisation shall write a final report about the project which should include experiences. According to the survey, some find it unclear where this report should be sent and if someone reads it. One opinion is that the final report is only a support for the very last meeting when the project organisation discusses the whole project. While another opinion is that it should be requested centrally from the authority and thereafter placed in a forum so employees can reach it. The project organisation can be changed during the project period, as infrastructure projects are ongoing for several years. Experiences and problems are rarely being documented during the project process, which can lead to difficulties for new project organisation members and result in experience losses, i.e. the knowledge the replaced project member possess are often lost when that employee leaves the project.

Moreover, the base for analysis and following up improvements is not extensive enough, since the experience feedback are not documented in the extent it should be. The digital system C2 is a database for improvement suggestions used by Trafikverket. It collects all kinds of improvement suggestions in one location, including suggestions from employees and customers as well as incidents and variations. The intentions are good, but the survey indicates that the employees at Trafikverket perceive the process as inefficient and not as well-functioning as it could be. When an improvement proposal is handed in it takes time to process the proposal and, in some cases, specific project-related questions are managed after the project is finished and the questions are then no longer relevant.

Another raised issue are reductions in economical means for employees, which inhibits their personal development. The survey implies that cost reductions are present for e.g. educations, meetings and cross-organisational experience exchange. This issue is also present when suggestions for change, which could improve the project units or the authority, are raised. Except for the economical restraint, the employee's workload does also inhibit personal developments and experience feedback. Today, employees perceive that they only have time to focus on the progression of their projects and lacks time for experience exchanges and knowledge transfer. Employees feel the need for evaluation and experience feedback, but it is not prioritised and not a part of the everyday work. The lack of time and high workload is more present in some roles than others, but generally a common issue according to the survey.

The survey implies that the authority is not agile and responsive enough, in order to handle improvement suggestions from the employees. Though, employees are sometimes not taking their responsibility, but are waiting for system changes within the authority to solve the problem. Everyone has to take their responsibility to secure the experience feedback by e.g. set aside time for evaluation and documentation, learn from earlier mistakes and practise the suggested improvements in their own projects.

4.2.3.3 Experience Feedback - Future Improvements

The answers to the survey imply that the employees at Trafikverket have several suggestions on how the experience feedback should be improved. One opinion is that cooperation should be developed during the whole work process. This concerns more communication between business area Maintenance, business area Market and Planning, business area Investment, specialists and project managers as well as more involvement from contractors. Today, most communication occurs within the project organisation, but better external dialogue can promote experience feedback and improve upcoming project orders. It might also speed up decisions and promote understanding. To achieve this, a suggestion is that projects should be analysed from project start by the project organisation, so involved persons know their role during the whole process. This could be even more advantageous if the same project manager and assistant project manager have several projects together, as they know how to work together after their first project. Another suggestion is that project managers should be rewarded for their ability to collaborate with other stakeholders to implement the project in the best possible way, not just because they manage to follow the plan in terms of finances and time.

According to the survey, the experience feedback within the project organisation is seen as well-functioning today, but there is a need to spread the experiences across the project boundaries, e.g. to other project organisations and regions. This could be achieved through letting final reports be placed in a database which is available for everyone and having presentations about experiences from certain projects. A project faces a lot of problems which have already occurred and have been solved by other projects in other areas. It is therefore important to create a platform for

knowledge sharing and experience feedback to ensure that the same mistake is not repeated twice. Additionally, Trafikverket should create an organisational routine for how improvements will be handled and how they will be implemented. Not only how to handle the improvements in theory, but also how to practice them in reality. This also concerns the C2 database. The database needs to be easy to use and it must ensure that the experience feedback and suggestions of improvement are taken care of and put into value.

Even the employees have a responsibility to improve the experience feedback within the authority. Employees should change their way of working before and during their projects. The survey implies the need to set aside time for reflections and evaluations, not only after the project is finished when writing the final report, but also during the project. It easily happens that employees get consumed by their everyday work and do not have time to focus on anything else than finishing their current task. The time for reflections and evaluations are seen as necessary to ensure positive experience feedback and it might also result in creating a work environment with an easier workload. Also, one thing to bear in mind according to the survey, is that experience feedback can come from both positive and negative experiences. Negative experiences can prevent the same mistakes from being made again.

Some of the answers from the survey imply that the experience feedback should not just only be seen as a tool, but also be a part of the culture at Trafikverket. If the authority has a learning attitude, where it is alright to ask questions and to talk about mistakes, employees will follow this attitude too. Sometimes it is necessary to stop a process to get time for reflection and to get help to avoid upcoming mistakes. After all, a good and helpful atmosphere within the authority can promote the experience feedback.

Moreover, employees think that it would be helpful to look at information concerning other similar projects at Trafikverket, to get time and cost aspects, before starting a project. To get this information, one suggestion is that someone in the authority will be responsible for providing it to new project organisations. Further, employees think that people in project organisations should have different experiences from start, so they can learn from each other. Mentors and sponsors might also be a good suggestion to ensure the experience feedback. By letting inexperienced employees meet more experienced in more relaxed meetings, knowledge and routines can be shared in a more personal way where the inexperienced employee can ask anything.

Another opinion is to create both formal and informal areas for experience feedback. As mentioned, the informal ones do often occur in the everyday work during lunch and coffee breaks, but it is also important to regularly set aside time for more formal occasions. Examples of formal occasions are internal workshops, seminars or conferences where the employees can exchange their knowledge within their project unit as well as across the authority. Instead of physical meetings, it can also occur through digital media such as Skype, Zoom or other digital platforms. According to the survey, even the ordering business area have an interest in participating in such formal experience occasions to see how the performing business area work.

Furthermore, a lot of experience feedback can occur when a project is completed. The entire project will be documented in a final report. But before submitting the report, an evaluation meeting should be held so that all important experiences are documented. An evaluation meeting should be standardised for all project. Also, specialists should attend this meeting so that they can take part of and provide experiences.

There are also several suggestions of digital improvements that can promote experience feedback. One example is to present good examples of problem-solving in specific projects at the intranet, which other projects or employees can be inspired of. Another example is to create a platform or database with both good and bad experiences, which is sorted after different categories. The survey also includes suggestions of placing final reports in a database. Thus, employees at Trafikverket want to have a system where it is easy to search and access specific experiences and final reports. It might also be a good idea to provide experience feedback allocated to costs to see what consequences a certain decision might result in such as material costs or a comparison of project costs depending on if it is variable or fixed price.

5

Discussion

This chapter discusses the results from the previous chapter. The discussion compares the primary data from the interviews with the secondary data from other sources. To facilitate for the reader, this chapter is structured similar to the results chapter and with connectivity to the objectives.

5.1 Experiences From Packaged Projects

This section discusses the previously presented results regarding the first objective, "*What previous experiences from packaged projects should be used in level crossing projects?*".

Packaging of projects and using a more repetitive approach is mentioned to be positive by the primary data consisting of the interviews and is also supported by the secondary data from the ongoing packaged BEST-project at Trafikverket (Trafikverket, 2020a) and the other Master's thesis by Edman (2016). The collected information from all three sources corresponds regarding positive and negative experiences, especially regarding administrative works and cooperation within the project organisation and other actors. The interviews and the other Master's thesis by Edman (2016) both highlight that time needs to be put into working with documents and templates in a standardised and systematic way to make sure they are updated and follows current restrictions. Even though infrastructure project can be very specific, there are multiple effective gains by packaging projects. Possibilities and a desire for improvement is something that shines through clearly, which is the first step towards a change for the better.

How the projects are packaged appears not to be crucial for the design phase, but it is rather important for the production phase according to the interviews and the BEST-project (Trafikverket, 2020a). The contracts should not be too extensive while still being large enough to be prioritised by the market. For the design phase, a larger number of sub-projects can be procured at once to make the administrative work more efficient. The geographical locations are less significant for this procurement. While for the production phase, a fewer number of sub-projects should be procured at once and divided geographically. For both phases, partial deliveries are preferred to make use of experiences from one delivery to the next one. This is particularly important for the level crossing projects due to the uncertainty in the land negotiating process. Regarding railway projects, the opinions about which way is most effective to package differs. Some say it may be best to package according to "*times in track*", meaning that that the measures should be packaged depending

on when the railway line could be temporary shutdown, to ensure a simultaneous production for geographically close measures. It was found that this depends on how busy the railway line is. It may be more suitable to have more and shorter temporary shutdowns for railway lines with less traffic, and fewer and longer temporary shutdowns for railway lines with more traffic to produce as many measures as possible at the same time. For railway projects, a discussion about what is prioritised should be held whether it is to complete as many measures as fast as possible or to have as short temporary shutdowns as possible. Again, due to the uncertainty regarding the length of the land negotiating process for level crossings, these measures should be implemented successively as this process is completed. It is also recommended to package the level crossings geographically to get a more holistic solution for the railway line.

Considering which type of project delivery method that should be used, according to the interviews it is not possible to recommend one specific method depending only on the fact that it is a packaged project. The content of the project and what types of measures it contains differs too widely to make this kind of generalisation. Also, the opinions about whether a design-build contract or a performance contract is best differs. There is no single answer to this question since some packaged projects have been successful with design-build contracts and some with performance contracts. It can also depend on how the employees prefer to work with this type of project since some of the opinions are opposites. For railway projects it is recommended to use performance contracts since the current management data about the railway system is too poor. Regardless of the project delivery method, it is recommended by several to investigate the possibility to procure with option contracts. In this way experienced workers can be kept within the project if they do a good job and thus the whole packaged project proceeds more effectively. This would also be specifically important in railway projects since the knowledge can be more limited than for road projects.

One positive effect mentioned by the interviews and supported by the other Master's thesis by Edman (2016) is the uniformity. Merging several measures into one packaged project increases the similarity of the sub-projects. Important to notice is that between packaged projects, the result should be the same although how it is achieved may differ. Doing similar projects in different ways can lead to finding the most efficient solution. Also, just because one solution is good does not mean it can not be even better. To achieve this similarity between packaged projects, it is important with some kind of cooperation and to determine which solution is best, a comparison is needed. It has been suggested to have a program manager or similar who is responsible for coordinating the packaged projects. Some say that this human resource is not needed, instead it is better with direct communication between the project organisations. One solution would be to have a more systematised way of finding similar projects, either ongoing or previous, to be able to communicate, exchange documents and discuss issues. Also, this system would increase knowledge about what other types of projects that are ongoing due to the size of the authority. This solution would not need an extra resource that coordinates the projects, instead it would be up to each project to report project status in this system. Following,

employees with similar projects can contact each other and exchange experiences.

For the level crossing projects, which is the first packaged project of this kind, it is recommended to discuss the management and administrative questions with previous packaged projects. To find answers to more specific questions it is recommended to either talk with railway specialists or to do a few level crossing measures as a pilot project. This would test the packaged way of working for level crossings and to eliminate errors for the upcoming full-scale production. The other Master's thesis by Edman (2016) recommends starting with an overarching project which is then testing all sub-areas initially. For example, this would mean to package level crossings with different types of measures as a pilot project. Doing pilot projects requires not having a tight time plan.

5.2 The Project Planning Process

This section discusses the previously presented results regarding the second objective, *"What changes should be done in the project planning process to optimise measures for packaged projects?"*.

Unsurprisingly, the opinions about the GÅ-process from the interviews and the survey (Trafikverket, 2020g) are similar since both studies represent Trafikverket's employees, but in different magnitudes. The general opinion is that the GÅ-process is good, although it must be clearer, since the amount of documents makes it hard to find governing documents, especially for new employees. There are already existing internal education programs about the GÅ-process and the process is continuously improved by the authority. To make sure employees use this education it should be made compulsory for employees working with investment projects. Thus, the GÅ-process would be easier to understand and the use of it would be more efficient. New project managers should also be given the opportunity of having a supervisor who is familiar with the process and the authority's organisation. Another way of integrating knowledge is to mix employees with different and varying experiences in project organisations to enable learning from each other.

Additionally, the process itself is proposed to be developed to be more agile and to promote the development of project management. If the process promotes development, the employees will become more curious and driven to find new and better solutions. On the other hand, if the process is too definite, the employees will not dare to challenge the established ways of working. To enable a more flexible process, it is suggested by both sources to ease some of the monitoring of projects. It is also requested to mainly order measures with functional requirements without requirements on how it is implemented. Most monitoring is necessary, but with too much monitoring of projects, there is a risk that the focus is shifted from the actual aim of the project to the detailed monitoring. To make the process more efficient for packaged projects, it should be clarified which documents that are governing and which are to be done for the whole packaged projects versus for each sub-project. This clarification could be written in the already existing routine about how projects are to be packaged most efficiently (Löfgren, 2018).

Another important part of the process is the cooperation between business areas at Trafikverket and this is mentioned by both the interviews, the BEST-project (Trafikverket, 2020a) and the survey (Trafikverket, 2020g). There is a somewhat alarming appearance of competition and reluctance towards cooperating over the business areas rather than working together as one common authority, and this is harming the internal relations. Better cooperation towards common goals should be prioritised and will result in better performed projects. The performing business area has stated the desire for better formed orders from the ordering business area, but this can work both ways. If the performing business area were to exchange their experiences about implementing projects more, this would enable the ordering business area to form more accurate orders. Also, if the ordering business area would be more active during the rest of the project process, they could use the performing business area's experiences to improve their orders and to avoid misunderstandings and having to handle deviations. For example, it is suggested that all involved actors are invited to a meeting at the end of the project where the content of the final report and cost accounting is presented and explained. This would enable specific questions to be asked and to make use of the experiences more efficiently regardless of their role in the project. Working on improved cooperation between the business areas will favour all parts of the authority. As previously mentioned, the section IVpp could facilitate this cooperation for packaged projects. They also see this role as an opportunity if packaging of projects is a way of working that will be more common since the authority aims to find more efficient and cheaper ways of implementing measures.

One part of the process with multiple opinions is the TKI-securing of projects. According to the information from the BEST-project (Trafikverket, 2020a), there are insecurities about the project content from the start which makes the project difficult to TKI-secure. This is common for railway projects, also according to the interviews and the survey (Trafikverket, 2020g). Railway projects have long lead times and usually complicated land negotiating processes which could take up to 10 years. After this time period, the project may be completely different compared to what was first intended. The whole focus on TKI-securing a project is strongly questioned and has even proven to counteract agile project management and innovative ways of working. Regarding the insecurities in packaged projects and specifically railway projects, it should be discussed how much time is worth spending on TKI-securing a project that may change totally depending on the outcome of the land negotiating process. Instead, there should be a discussion about how large deviations are accepted and how the contracts will be written to be adjustable over time. To avoid spending too much time and money on TKI-securing a project with insecure content, other parameters of valuing projects should be developed.

5.3 Experience Feedback at Trafikverket

This section discusses the previously presented results regarding the third objective, *"How should the experience feedback be done efficiently within Trafikverket?"*.

What all three sources which discuss experience feedback agree on; the interviews, the other Master's thesis by Edman (2016) and the survey from Trafikverket (Trafikverket, 2020g), is that experience feedback should be done more systematic and continuous through digital systems to enable the spread of experiences further. Experience feedback is an important subject which raises several opinions. Oral feedback is very efficient for the individual project, but if these experiences also were to be shared publicly, every project at Trafikverket would be able to use this information and may avoid repeating the same mistake. Existing meetings, for example the PULSE-meetings, are beneficial for the specific project unit. To enable the rest of the authority to make use of the same findings, the discussed positive and negative experiences should be documented and made accessible for all employees inside the authority. Mistakes are likely to be repeated if experiences or solved problems are not documented, according to the survey (Trafikverket, 2020g). The interviews mentioned that this documentation needs to be in some kind of system to not create another document that becomes one in the crowd. Additionally, due to the turnover of employees in an authority as large as Trafikverket, it is of great importance to systematically document experiences. Otherwise, the knowledge will disappear with the employees who quit.

It is recommended to implement new systems for a systematic and digitised experience feedback, but it should first be considered how much time is put into creating and making a new system work. It has been done several times, not necessarily at Trafikverket, but without success. Instead, the weight should be put into improving already existing systems such as C2, the forum DigiTräff and the workroom with final reports and cost accountings initiated by the calculator coordinators. The survey states that the intention with the C2 systems is good, but due to lack of documentation the base for analysis and following up improvements is not extensive enough (Trafikverket, 2020g). Additionally, the authority's way of working is not agile or responsive enough to handle the improvements. It is then suggested that Trafikverket should create an organisational routine for how improvements should be handled in theory and how to practice them in reality. The forum DigiTräff should be promoted as a forum to spread good examples and solutions to problems that many other projects could benefit from. Thanks to the width of the forum, the experiences could regard almost anything and can receive input from any role at Trafikverket. Ultimately, it is up to Trafikverket as an authority to promote existing systems such as C2 and DigiTräff to encourage employees to use them in their daily work.

The workroom initiated by the calculator coordinators is new, but producing a final report and a cost accounting is a well implemented routine that should be followed more accurately. To make the workroom as efficient as possible, the interviews state that a good structure is vital, preferably according to the type of projects. Then this workroom can work as a knowledge database across project units with experiences from the final report and key ratios from the cost accounting. Further, it could be developed into working as some kind of quality assurance system to avoid making mistakes during future projects. To enable a more efficient way of working with the final reports, it is according to the survey important to clarify the purpose of

writing the final report (Trafikverket, 2020g). Some are of the perception that the final report is only for the last meeting with the project and not a document that will be used further. Therefore, it is important to clarify how important a well written final report can be for other upcoming projects and thus, it should be based on an evaluation meeting with actors involved in the project to cover the whole project.

Another dimension that could be developed is a systematic collection of experiences during the projects, not only after like the final report. Either to have a document with positive and negative experiences which each project can fill continuously or to create the final report document at the beginning of the project to fill with experiences during the progress of the project. Additionally, a system of what projects are ongoing, or even completed, with contact information could be added to initiate contacts between similar projects which then can exchange experiences. This last mentioned system is suggested to work similarly to the system with upcoming internal orders.

The overall solution to a more efficient and thoroughly experience feedback is to integrate it into the process and the everyday work. It should be seen as a part of the culture at Trafikverket, not only a tool, according to the survey (Trafikverket, 2020g). Positive and negative experiences should always be searched for, whether the project has a problem that needs to be solved or not. Unfortunately, a problem often needs to appear to force the employee to ask for other's experiences. This is why it needs to be systematised and accessible by all. Yes, it is sometimes difficult to put experiences into words, but doing this could develop the authority's way of working and help the whole authority to learn from mistakes. The attitude towards experience feedback needs to change towards realising how important it could be to value and pass on experiences. A helpful atmosphere promotes experience feedback and motivates the employees to put time into something that they know will be used in the future. Connecting back to the theory in Section 2.4, the first step of capturing lessons learned which is to identify, review and analyse experiences is already done in several ways at Trafikverket. What may be inadequate is the following two steps of the process, which secondly is to assign an action to the lesson and thirdly implementing and communicate the action of the lesson. It is mostly up to Trafikverket to integrate experience feedback into the daily routine and the authority could also reward project managers who prioritise collaboration between projects or suggesting developing ideas. It is also each employees' responsibility to set aside time for reflecting and discussing experiences, to learn from earlier mistakes and to practice suggested improvements.

5.4 Effects on Time, Resource and Money

This section discusses the previously presented results regarding the fourth objective, *"What effect will the effectiveness of measures bring in terms of time, resource and money?"*.

Determining which of these events that are most critical is difficult to compare in terms of time and money without actual numbers. The effect of all events could

be measured in both time, resource and money if secondary effects were to be considered. This analysis primarily focuses on direct effects. Worth mentioning is also that the opposites of the positive events often have a negative effect and vice versa, which is important to consider.

Considering the positive effects on time it is even between the identified events which have the largest effect. Overall, *"packaged projects instead of separate projects"* is most beneficial for the time aspect. Doing all measures separately through the whole project planning process would not be rational and would take an unnecessarily long time. Therefore it is beneficial to package measures into projects to enable implementing them simultaneously and thus save time for the project organisation. Later within the packaged project the rest of the events related to time will probably have the same amount of effect and be of positive use. *"Using templates and streamlining documents"* and *"repetitive work that increases quality"* will have positive effects on time for implementation of the projects. While *"using existing experiences and documents"* and *"experienced consultants and/or contractors"* will enable the whole project process to go faster and be more efficient when using already existing knowledge.

Positive effects related to human resources would probably be most beneficial for the events involving cooperation. *"Cooperation inside the program and between similar projects"* and *"cooperation with consultants and contractors"* would enable more efficient use of existing knowledge and would facilitate a good working environment. If the working environment is good, the employees are motivated and with that comes positive effects on results and thus the use of human resources. Good cooperation inside a project can often be the key to a successful project. The two events regarding using existing experiences also facilitate for employees since existing knowledge can be used and already made mistakes can be avoided. *"Using templates and streamlining documents"* would reduce the effort human resources need to put into understanding unique documents. If the design is the same, the effort can rather be spent on reviewing the content. A more streamlined administration also entails uniformity in what is produced. This effect may not be crucial, it reduces the workload mainly for specialists.

"Packaged projects instead of separate projects" would be the event with the largest positive effect on money as well with similar arguments to the effect on time. Doing all measures separately would cost more since especially the administrative parts in the start and end of the project would be done multiple times. Packaging measures would give a smaller total cost, especially for the design phase. *"Pilot projects"* could have a large positive effect on money for more untested packaged projects, for example level crossings. If a few measures were to be packaged and tried out in a pilot project, ways of working can be implemented and mistakes can be discovered before producing the larger mass. For example, if a mistake were to be made for these few measures it would cost much less than if the same mistake were to be made for the larger mass and this would save lots of money. For packaged projects that have previously been done this may not be necessary. experiences can be collected from these previous projects instead of putting time into making pilot

projects. Additionally, *"thoroughly performed TKI-securing"* can have a positive effect on money since it would reduce the amount of contract deviations during the production phase. This must however be weighed against money (and time) put into performing the TKI-securing.

Continuing to the negative effects, *"starting from zero in each project"* and thus not making use of already existing experiences can be considered to have the largest negative effect in terms of time. This extends the length of the project since time is spent on for example writing already existing documents or repeating the same mistakes. This is also strongly connected to the negative effect on time caused by *"insufficient time- and resource planning"*. A too tightly planned project would not be beneficial if something unexpected occurs, then this will affect the time planning for the whole project. Also, a poorly made time planning can cause parts of the project to be missed or not valued and will thus cause time delays. Depending on the size, *"errors in production"* may have a large negative impact on the time planning of the project which is also multiplied by the number of measures with the same error. *"Inefficient packaging of projects"* can also have a large negative effect in terms of time, although an optimal packaging can be difficult to determine beforehand. One example of this is the event *"geographic long distances between sub-projects"* which will lead to longer travel times between measures and thus an inefficient way of working. Another type of negative effect is the event *"changes in the project organisation"* which forces adaptations and spending time on introducing new people to the project. With good cooperation inside the project, this effect would be comparatively small.

"Insufficient time- and resource planning" would probably be the event with the largest negative effect on human resources closely connected to *"inefficient packaging of projects"*. For example, if there are too many measures in one packaged project and the reviewing time of documents for specialists is too short, the administrative workload would be overwhelming. Additionally, *"changes in the project organisation"* could have a large negative effect if important resources in the project disappear or have a tight schedule and thus no time for helping the project. The other identified events with effect on resources are not as crucial, although it requires more effort from resources if these events do occur.

All events connected to money can have a large negative effect, although what seems to be most crucial is *"errors in production"* if these occur. Especially in package projects since the cost for these errors is multiplied with the number of measures. On the other hand, if no errors occur this effect does not exist. Closely connected is *"poorly made project documents"* which would increase the risk of errors and thus the negative effect on money. During the project, this would also result in more contract deviations which are more expensive to correct longer into the project. The rest of the events regard how packaged projects are managed and would have a negative effect on money but may not be crucial for the project. Although what distinguishes *"measures with different orders"* is that they are more difficult to package and thus needs to be managed as separate projects which increases the total cost.

5.5 Overall Discussion

Looking at the findings from a larger point of view, there are three concepts connecting all objectives; culture, communication and administration. Several of these findings are highly reliant on a business culture that advocates experience feedback and learning lessons. The culture of Trafikverket can be developed to be more cooperative, especially across the internal business borders. A good culture is, in turn, dependant on a good and candid communication which can be achieved through discussing across borders and asking for opinions. As already mentioned, the communication then needs to be captured in administrative systems to be spread further inside the business. Therefore, it is beneficial to promote the existing administrative systems and ensure that the employees want to work accordingly.

Focusing on these three concepts; culture, communication and administration, is the key to successfully implementing the findings of this thesis, and also to enable business development and a good working environment. Some of the found problems would also not exist with a helpful business culture and better communication. This is not only a recommendation for Trafikverket, but for all types of businesses.

5.6 The Thesis Methodology

This Master's thesis adds important information to the business development of Trafikverket and identifies consequences of different processes. Since there is a lack of systematical observation of experiences, this thesis can work as a tool for gathering important knowledge about packaged projects. Therefore, future projects can use this already gathered information as a base and then further discuss specific questions with previous project organisations. Also, roles responsible for the development of processes at Trafikverket can use this thesis as a source of information about what improvements and suggestions that employees working inside the authority think should be implemented. This thesis can work as a tool in multiple ways for the development and spreading of knowledge within the authority.

The aim of this thesis has been the same during the whole time period although the content has shifted a bit from what was expected depending on the conducted information during the interviews. Early in the process, it was expected to find more detailed information about working with level crossings and recommendations on how upcoming projects should work. Instead, the information found through the interviews were more general about packaged process which then was discussed further and applied to the level crossing projects through interviewing employees with knowledge about railway projects. As was a hopeful intention, the identified information can be used for other packaged projects than only level crossing projects and may also be used in other regions of Trafikverket outside the Western Region.

The chosen methods have been perceived to be useful throughout the work with this thesis. The methods were flexible enough to adapt to the small changes of collected content from the initial thought. Although, the effect analysis had to

be done more shallow than wished for due to the type of data collected from the interviews. Initially, the wish with the Business Impact Analysis was to also quantify the effects of each event with numbers, e.g. the effect of one event would cost this much and use this much time and human resources. This could unfortunately not be done, both due to the difficulty of actually creating this data since the projects differ widely and also due to the limited amount of time. Additionally, some of the secondary sources internally from Trafikverket were discovered late in the work. Therefore, the planning and search for more useful internal information could have been done better by starting earlier. For example, promoting the thesis internally would enable further discussion of the found suggestions regarding the possibility of implementing them.

5.7 Suggestions for Future Research

The research of this Master's thesis has mainly focused on collecting experiences and suggestions regarding working with packaged projects, the project planning process and experience feedback at Trafikverket. This thesis did only investigate through interviews but could, thanks to an ongoing internal investigation, have its answers supported by a survey with similar questions. A natural next step would therefore be to again discuss the findings of this thesis with the interviewees to analyse which suggestions the authority should focus on implementing. In addition to this, future research could dig deeper into the effect analysis to also quantify the actual effect of the identified critical events. This would give a good comparison on which events to focus on in specifically a packaged project. To deepen the research of way of working in packaged projects, analyses and comparisons between similar projects should be made to find out the most efficient way of implementing these projects.

Furthermore, the identified suggestions should be discussed with roles at Trafikverket responsible for development regarding how to integrate these suggestions into their existing processes. Also, ways of making the project planning process more agile and flexible could be beneficial to investigate. An investigation whether it is possible to adjust the existing process into a more lean production, similar to the way of working in the industry, for packaged projects could also be interesting future research. A follow-up investigation about how and if the suggestions have affected the authority's way of working would be relevant to see which suggestions that have been the most successful. To widen the investigation further, the researcher should look outside of Trafikverket by asking consultants and contractors about their opinions. This could be both regarding experiences with packaged projects and how they are managing experience feedback at their companies.

6

Conclusion

The main purpose of this Master's thesis was to investigate in what ways Trafikverket can work with packaged projects for level crossings more efficiently, as well as investigating how the project planning process and experience feedback could be improved. This has been achieved through literature studies about the current situation, interviews with employees at Trafikverket involved in packaged projects and additionally through secondary sources as another Master's thesis by Edman (2016) and a survey internally conducted at Trafikverket. Thereafter the gathered material was analysed with respect to the objectives to find patterns and general perceptions which then could serve as recommendations for Trafikverket.

Through this thesis, it is obvious that working with similar measures as packaged projects is predominantly positive and is therefore a recommended way of implementing upcoming measures for level crossings. Making use of already existing experiences by discussing with project organisations who have previously done packaged projects before the project is started can have a positive effect on the whole project. This would enable the actors to put time into the specifics of each measure instead of starting a project from zero each time. Administratively, it is recommended to use templates and to copy existing documents which will save time during the design phase. A geographically oriented packaging of projects would be preferred, although separated into partial deliveries to make use of experiences continuously between deliveries. A general recommendation of what type of project delivery method to use for packaged projects can not be made since it highly depends on the specific content of the project. One recommendation is however to investigate the possibility of using option contracts. Specifically for the level crossing projects, it is recommended to investigate multiple level crossings simultaneously due to the varying land negotiating process and thereafter package the measures geographically to get a holistic solution. Also, due to the lack of experience about level crossings as packaged projects, some measures should be done first as a pilot project to discover ways of working before applying the concepts on all level crossings projects.

Regarding the project planning process, this thesis has found that the GÅ-process is good but could benefit from suggested improvements. To facilitate for project organisations, these suggestions are mainly to clarify what documents are governing and to specify how documents are to be used in packaged projects. I.e. which documents are for the whole package and which documents are for each sub-project to reduce the administrative workload for the project organisation. Easing requirements on sub-projects regarding monitoring and monthly reporting would be beneficial for the whole packaged project. Additionally, Trafikverket should ensure that the GÅ-process is understood and efficiently used by making the existing education about

the process compulsory for employees involved in investment projects. Further, the project planning process itself should be eased to be more agile and thus promoting the business development and way of working with projects. One main part of the process is to TKI-securing a project, which appears to be doing more harm than good regarding innovative ways of working and agile project management. Instead, it is recommended that Trafikverket should investigate other parameters for valuing projects.

The findings of this thesis imply that the experience feedback at Trafikverket is mainly done through discussions or smaller meetings. Oral discussions about experiences are also preferred over reading reports. There is a common opinion that a systematic way of experience feedback is needed to organise and capture experiences and knowledge. Meetings about experiences are useful, for example PULSE-meetings, but should be supplemented with documenting the information digitally to enable spreading the experiences further within the authority. To systematise the experience feedback, Trafikverket would benefit from developing already existing systems such as the C2 system, DigiTräff and the workroom with final reports and cost accounting initiated by the calculator coordinators. The C2 system would enable collecting suggestions for improvement of processes at Trafikverket. DigiTräff would enable discussions across internal borders. The workroom would enable projects to exchange specific project information and could be developed further as a place to continuously collect experiences. In other words, the attitude towards experience feedback needs to change to make this possible. It should become part of Trafikverket's culture to motivate employees to involve reflecting, discussing and documenting experiences in their daily work.

Finally, the effect analysis in this thesis has mainly shown that packaging of projects will have predominantly positive effects on time, money and resource. To increase the positive effects, each project should invest in enlarging the three following events: *"packaged projects instead of separate projects"*, *"cooperation inside the program and between similar projects"* and *"cooperation with consultants contractors"*. To decrease the negative effects, each project should spend time on eliminating the three following events: *"starting from zero in each project"*, *"insufficient time- and resource planning"* and *"errors in production"*. Focusing the work on these events would increase the change of having a packaged project with successful results.

Conclusively regarding all four objectives, the ways of working with packaged projects are sufficient although there is much room for improvement. As mentioned before, it is of high importance to focus on culture, communication and administration which would both enable these findings to be implemented and also to eliminate some of the existing problems. More importantly, what this thesis has helped to discover is that there are many existing suggestions for development inside the authority and also a desire to improve the way of working with packaged projects at Trafikverket. Further, what should be investigated is how these suggestions are implemented most efficiently.

Reference List

- Brinkmann, S., & Tanggaard, L. (2020). *Kvalitative metoder - En grundbog* (3rd ed.). Hans Reitzels Forlag.
- Bryman, A., & Bell, E. (2015). *Företagsekonomiska forskningsmetoder*.
- Denscombe, M. (2014). *The good research guide : for small-scale social research projects* (5th). Maidenhead.
- Diener, E., & Crandall, R. (1978). *Ethics in Social and Behavioral Research* (tech. rep.). Chicago, University of Chicago Press.
- Dymmel, D. (2018). *Fördjupad erfarenhetsåterföring* (TDOK 2015:0137), Trafikverket.
- Edman, S. (2016). Effects of a repetitive approach when planning and constructing railway in Sweden.
- Esaiasson, P., Gilljam, M., Oscarsson, H., Towns, A., & Wängnerud, L. (2017). *Metodpraktikan* (5th ed.). Wolters Kluwer Sverige AB.
- European Union. (2020). GDPR. <https://gdpr.eu/>
- Guba, E. G., & Lincoln, Y. S. (1994). *Handbook of Qualitative Research*.
- Hox, J. J., & Boeijs, H. R. (2015). Data Collection, Primary vs. Secondary.pdf. Elsevier Inc. https://dspace.library.uu.nl/bitstream/handle/1874/23634/hox_05_data+collection,primary+versus+secondary.pdf?sequence=1
- Kalander, L. (2016). *Systematisk erfarenhetsåterföring från genomförda investerings- och förbättringsåtgärder* (TDOK 2016:0618), Trafikverket.
- Kohne, A. (2019). *Business Development*. Dortmund, Springer Vieweg. <https://link.springer-com.proxy.lib.chalmers.se/content/pdf/10.1007%2F978-3-658-24726-3.pdf>
- Löfgren, Å. (2018). *Paketering av projekt - VO IV* (TDOK 2016:0173), Trafikverket.

- Milton, N. (2010). *The Lessons Learned Handbook: Practical approaches to learning from experience*. Chandos Publishing. <https://ebookcentral.proquest.com/lib/chalmers/reader.action?docID=1579940>
- Phillips, P. P., & Stawarski, C. A. (2008). *Data Collection: Planning For and Collecting All Types of Data* (1st ed.). Center for Creative Leadership. <https://ebookcentral.proquest.com/lib/chalmers/detail.action?docID=331440>
- Rådbo, H. (2019). *Trafikverkets hantering av plankorsningar*, Trafikverket.
- Rönnerman, K. (2019). *Aktionsforskning och kvalitetsarbete*. Gothenburg, University of Gothenburg.
- Snedaker, S., & Rima, C. (2014). *Business Continuity and Disaster Recovery Planning for IT Professionals*. <https://www.sciencedirect.com/science/article/pii/B9780124105263000052>
- Tonnquist, B. (2018). *Projektledning* (7th ed.). Stockholm, Sanoma utbildning.
- Trafikverket. (2018). DigiTräff - ett digitalt forum för erfarenhetsåterföring. <http://intranat.trafikverket.local/Aktuellt/Nyhetsarkiv/Nyheter---Aktuella/Notiser---Stod-och-verktyg/2018/2018-05/digitraff--ett-digitalt-forum-for-erfarenhetsaterforing/>
- Trafikverket. (2019a). Plankorsningar. <https://www.trafikverket.se/for-dig-i-branschen/Arbetsmiljo-och-sakerhet/sakerhet-pa-jarnvag/Plankorsningar/>
- Trafikverket. (2019b). Plankorsningar - korsningar mellan väg och järnväg. <https://www.trafikverket.se/resa-och-trafik/Trafiksakerhet/Din-sakerhet-vid-jarnvag/Plankorsningar/>
- Trafikverket. (2019c). Strategisk utveckling. <http://intranat.trafikverket.local/Om-Trafikverket/Organisation/organisationsbeskrivning/Strategisk-utveckling/>
- Trafikverket. (2019d). Sveriges järnvägsnät. <https://www.trafikverket.se/resa-och-trafik/jarnvag/Sveriges-jarnvagsnat/>
- Trafikverket. (2019e). Trafikverket prioriterar korsningar med förhöjd risk. <https://www.trafikverket.se/resa-och-trafik/Trafiksakerhet/Din-sakerhet-vid-jarnvag/Plankorsningar/trafikverket-prioriterar-korsningar-med-forhojd-risk/>
- Trafikverket. (2019f). Vår verksamhet. <https://www.trafikverket.se/om-oss/var-verksamhet/>
- Trafikverket. (2020a). *Affärsupplägg järnväg - paketering av BEST-arbeten*.

Reference List

- Trafikverket. (2020b). Gång- och cykelvägar i väst. <https://www.trafikverket.se/nara-dig/projekt-i-flera-lan/gang--och-cykelvagar-ivast/>
- Trafikverket. (2020c). Hållplatser för alla, tillgänglighetsanpassning av busshållplatser i Västsverige. <https://www.trafikverket.se/nara-dig/projekt-i-flera-lan/hallplatser-for-alla/>
- Trafikverket. (2020d). Processer och arbetssätt - Genomföra åtgärder. <https://p.sp.trafikverket.se/sites/workprocess/home/sidor/process.aspx>
- Trafikverket. (2020e). Säkrare järnvägsövergångar. <https://www.trafikverket.se/nara-dig/ostergotland/vi-bygger-och-forbatttrar/sakrare-jarnvagsovergangar/>
- Trafikverket. (2020f). Tillgänglighetsanpassning av stationer i väst. <https://www.trafikverket.se/nara-dig/projekt-i-flera-lan/tillganglighetsanpassning-av-stationer-i-vast/>
- Trafikverket. (2020g). *TKI Genomlysning*.
- White, M., & Cohan, A. (2018). *A Guide to Capturing Lessons Learned*, The Nature Conservancy. https://www.conservationgateway.org/ConservationPlanning/partnering/cpc/Documents/Capturing_Lessons_Learned_Final.pdf

Reference List

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Appendix - Interview questions

The interviews were based on a guide with topics. The questions that were asked during the interviews, based on the topics, are presented below in Swedish since the interviews were conducted in Swedish.

Allmänna frågor:

- Får vi spela in denna intervju? Du kommer vara anonym.
- Vad har du för roll på Trafikverket?
- Hur länge har du jobbat på Trafikverket?
- Vad för typ av paketerat projekt jobbar du med och vad är din roll i projektet?

Frågor om paketerade projekt:

- Vad har du för positiva erfarenheter i samband med paketerade projekt?
- Vad har du för negativa erfarenheter i samband med paketerade projekt?
- Vilken effekt tror du att dina förslag (positiva och negativa erfarenheter) kan ge på tid, resurs och pengar?
- Vad tycker du om att arbeta med projekt som paket gentemot separata projekt (alltså ett flertal liknande åtgärder i samma projekt)?
- Vilka erfarenheter borde användas när man startar upp ett nytt paketerat projekt?
- Vilka ändringar borde göras i projektplaneringsfasen (processen) för att optimera och effektivisera projekt (underlätta för paketerade projekt)?
- Tror du att det finns en möjlighet att hitta gemensamma faktorer i projekt som kan effektiviseras så att man inte behöver göra alla steg på nytt i varje projekt?

Frågor om erfarenhetsåterföring:

- Hur tycker du att erfarenhetsåterföringen fungerar idag på Trafikverket?
- Hur hade du velat att erfarenhetsåterföring skulle gå till på Trafikverket? Förbättringar?
- Tror du att en databas med samlade erfarenheter hade varit en bra lösning?
 - Hade du använt dig av den?
 - Har du något annat bra alternativ?



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